EIS Volume 1

EIS Document Information

JBS&G

project energy connect

Contents

Acknowledgements **1**
Disclaimer **2**
EIS Project Team **3**
Abbreviations and Acronyms used in the EIS **5**
Glossary of Terms used in the EIS **11**
Definition of Study Areas discussed in the EIS **13**

Acknowledgements

EletraNet acknowledges all Traditional Owners of the land upon which Project EnergyConnect will be constructed and celebrates their enduring connections to Country, knowledge and stories. We pay our respects to their Elders and Ancestors and recognise the deep and ongoing feelings of relationship and attachment they hold for their lands.

ElectraNet places great value on our relationships with all stakeholders and seeks to work in partnership with them, to develop the Project in a manner that generates the maximum benefit for both local communities and the broader South Australian community. ElectraNet has appreciated the cooperation of members of the local community, landholders, local councils and government agencies in identifying potential issues and assisting in the development of Project design and management solutions. This process will be ongoing as the Project design is finalised, and ElectraNet is committed to open and transparent engagement with stakeholders and community members throughout the EIS process and beyond.

This EIS was prepared with assistance from a number of people and organisations. ElectraNet and JBS&G would like to extend their appreciation to the Project EnergyConnect Steering Committee and Working Group, which included representatives from the Department of Agriculture, Water and the Environment (Commonwealth), Department for Energy and Mining, Department for Infrastructure and Transport, Planning and Land Use Services within the Attorney-General's Department, Department for Environment and Water, Environment Protection Authority (SA), NSW Department of Planning, Industry and Environment and TransGrid.

Disclaimer

This Environmental Impact Statement (EIS) has been prepared by JBS&G on behalf of ElectraNet Pty Ltd (ElectraNet) for submission to the South Australian Minister for Planning and Local Government under the *Development Act 1993* (SA), and the Commonwealth Minister for Environment under the *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth). The EIS has been prepared for that purpose only and the information contained in the EIS should not be relied upon by any other person to make any decision.

In preparing the EIS, JBS&G and ElectraNet have relied upon the assistance of specialist consultants, government agencies and other third parties. While all reasonable care and effort has been taken to ensure the accuracy of the material provided, none of ElectraNet or its related entities or any of their respective advisors or representatives takes any responsibility for any statement or representation contained, nor any omission from it. Any projections and forecasts contained in this Application represent best estimates only.

The EIS has been prepared for information purposes only and to the full extent permitted by law, ElectraNet, in respect of all persons other than the Ministers, makes no representation and gives no warranty or undertaking, express or implied in respect of the information contained in the EIS and does not accept responsibility and is not liable for any loss or liability whatsoever arising as a result of any person acting or refraining from acting on any information contained in the EIS.

Copyright

Except where expressly stated otherwise, all right, title, and interest in all content, designs, technologies (‘Content’), are fully vested in ElectraNet and JBS&G, our licensors, or our suppliers and protected by applicable copyrights, or other proprietary rights and laws. Ownership of the Environmental Impact Statement remains with ElectraNet.

EIS Project Team

In 2018, ElectraNet appointed JBS&G Australia Pty Ltd (JBS&G) as independent environmental and social practitioners to undertake the route selection and environmental assessment and approval process for the South Australia portion of Project EnergyConnect.

JBS&G is a leading environmental consultancy with offices across Australia and more than 250 multi-disciplined environmental professionals. The contact details for JBS&G are as follows:

JBS&G Australia Pty Ltd
ABN 62 100 220 479
100 Hutt St
Adelaide SA, 5000
T: +61 8 8431 7113
F: +61 8 8431 7115
www.jbsg.com.au

The EIS team is provided in the table below.

Activity	Person and organisation
EIS Project Management	Steve Green (JBS&G) Andrew Hickman (JBS&G) Angie Mayo (JBS&G) Scott Haynes (ElectraNet)
ElectraNet Project Management, Engineering and Environment	Ralf Riccardi (ElectraNet) Alan Firman (ElectraNet) Chris Moore (ElectraNet) Esther Olsson (ElectraNet)
EIS Authors and Document Compilation	Andrew Hickman (JBS&G) Bronny White (JBS&G) Stephen Milne (JBS&G) Lachie Wilkinson (JBS&G) Dr Agnes Cantin (JBS&G) Erinn Carter (JBS&G) Dr Jamie Bruce (JBS&G) Dr Nicole Patten (JBS&G) Dr Zeta Bull (Jacobs) Georgie Stewart (JBS&G) Roberta Magoba (JBS&G)
Digital Delivery and Communications	Kyle McDonald (JBS&G) Patrick Newsome (JBS&G) Stephanie Glue (Consentium) Tilly Oborn (Consentium) Sylvia Rapo (Consentium) Hannah Winter-Dewhurst (Consentium)
Specialist Studies	
Flora and Fauna	Stephen Milne (JBS&G) Dr Zeta Bull (Jacobs)

Activity	Person and organisation
	Rick Barrat (Jacobs) Dr Sonia Croft (Jacobs) Dr Nick Bull (Jacobs) Dr Lucy Clive (Jacobs) Rose-anne Bell (Jacobs) Brett Lane (Nature Advisory) Curtis Doughty (Nature Advisory) Peter Lansley (Nature Advisory)
Cultural Heritage	Jon Bok (ElectraNet) Laura Johnston (JBS&G) Dr Vivienne Wood (Vivienne Wood Heritage Consulting) Craig Westell (Vivienne Wood Heritage Consulting) Kylie Lower (Blackwood Heritage)
Visual Amenity	Dave Blair (JBS&G) Anna Tuncks (JBS&G) Tom Bratovic (JBS&G)
Air Quality	Gary Graham (North Star) Nick Phillips (North Star) Martin Doyle (North Star)
Noise and Vibration	Nick Henrys (Resonate) Darren Jurevicius (Resonate)
Traffic and Transport	Dr Agnes Cantin (JBS&G) Nicholas Firth (Tonkin) Sarah Murphy (Tonkin) Sharon Billinger (Tonkin)
Socio-Economic Environment	Erinn Carter (JBS&G) Dr Jamie Bruce (JBS&G) Julian Morison (BDO) Heather Bailey (BDO) Anders Magnusson (BDO) Nick Angelakis (BDO)
Planning Assessment	Richard Dwyer (Ekistics) Rob Gagetti (Ekistics) Bronny White (JBS&G) Kym Pryde (JBS&G)

Abbreviations and Acronyms used in the EIS

Abbreviation/ Acronym	Definition
AADT	annual average daily traffic estimates
AARD	Aboriginal Affairs and Reconciliation Department (SA)
ABS	Australian Bureau of Statistics
AC	alternating current
ACARA	Australian Curriculum, Assessment and Reporting Authority
ACCC	Australian Competition and Consumer Commission
ACECQA	Australian Children's Education and Care Quality Authority
ACT	Australian Capital Territory
AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
AHIMS	Aboriginal Heritage Information Management System (NSW)
AHSA	Aboriginal Heritage Study Area
AIHW	Australian Institute of Health and Welfare
ALA	Atlas of Living Australia
ALT	Australian Landscape Trust
AMEMP	Asset Maintenance Environmental Management Plan
ANU	Australia National University
ANZG	Australian and New Zealand Guidelines
ARENA	Australian Renewable Energy Agency
ARPANSA	Australian Radiation Protection and Nuclear Safety Agency
ASC NEPM	National Environment Protection (Assessment of Site Contamination) Measure 1999
ASL	altitude sea level
ASS	acid sulfate soils
AUD	Australian dollar
AWS	automatic weather station
BAM	Bushland Assessment Method
BCM	Bushland Condition Monitoring
BDBSA	Biological Databases of South Australia
BESS	battery energy storage system
BOM	Bureau of Meteorology
CASA	Civil Aviation Safety Authority
CBD	Convention on Biological Diversity (UN)
CCA	Climate Change Authority
CEC	Clean Energy Council
CEFC	Clean Energy Finance Corporation
CEMP	Construction Environmental Management Plan
CER	Clean Energy Regulator
CFS	Country Fire Service
CAMBA	China–Australia Migratory Bird Agreement
CGE	computable general equilibrium

Abbreviation/ Acronym	Definition
CHMP	Cultural Heritage Management Plan
CO_2	carbon dioxide
COAG	Council of Australian Governments Energy Council
CP	conservation park
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DA	Development Application
DAWE	Department of Agriculture, Water and the Environment (Cth) (formerly DEH)
dBA	A-weighted decibels
DC	District Council
DCLW	District Council of Loxton Waikerie
DEH	Department of Environment and Heritage (Cth)
DEM	Department of Energy and Mining (SA)
DER	distributed energy resources
DESE	Department of Education, Skills and Employment
DEW	Department for Environment and Water (SA) (formerly DEWNR)
DELWP	Department of Environment, Land, Water and Planning (Vic)
DEWNR	Department of Environment, Water and Natural Resources (SA)
DISER	Department of Industry, Science, Energy and Resources (NSW)
DIT	Department for Infrastructure and Transport (SA) (formerly DPTI)
DoE	Department of the Environment (Cth)
DoEE	Department of the Environment and Energy (Cth) (formerly DoE)
DO	PDI Act Desired Outcome
DOJSB	Department of Jobs and Small Business (Cth)
DoTaRS	Department of Transport and Regional Services (Cth)
DPC-AAR	Department of Premier and Cabinet – Aboriginal Affairs and Reconciliation (SA)
DPE	Department of Planning and Environment (NSW)
DPF	designated performance feature
DPIE	Department of Planning, Industry and Environment (NSW) (formerly DPE)
DPTI	Department of Planning, Transport and Infrastructure (SA)
DSM	demand side management
ECD	ecological character description
ECI	early contractor involvement
EIS	Environmental Impact Statement
EMF	electromagnetic fields
EMP	environmental management plan
EMS	environmental management system
EP Act	*Environment Protection Act 1993* (SA)
EPA SA	Environment Protection Authority South Australia
EPA WA	Environment Protection Authority Western Australia
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)
EPC	engineering, procurement and construction
EPP	Environmental Protection Policy
ERP	emergency response procedure
ESA	ecological study area (50 km corridor centred on the proposed alignment)

Abbreviation/ Acronym	Definition
ESCOSA	Essential Service Commission of South Australia
ESD	ecologically sustainable development
EV	electric vehicles
FCAS	frequency control ancillary services
FIRB	Foreign Investment Review Board
FLB	Flinders Lofty Block IBRA Region
FTE	full-time equivalent
GIS	geographic information systems
GPG	gas-powered generation
GPS	global positioning system
GR	game reserve
GRP	gross regional product
GSP	gross state product
GW	gigawatt
GWh	gigawatt hour
Ha	hectare
HA	Heritage Agreement (also see VHA)
HC	hydrocarbons
HCM	Highway Capacity Manual Volume 2
HSA	non-Aboriginal cultural heritage study area
HSE	health, safety and environment
HSEMS	health, safety and environment management system
HV	heavy vehicle
HVAC	high-voltage alternating current
HVDC	high-voltage direct current
HVNL	Heavy Vehicle National Law
IA	impact assessment
IAIA	International Association for Impact Assessment
IAP2	International Association for Public Participation
IBRA	Interim Biogeographic Regionalisation for Australia
ICN	industry capability network
ICNIRP	International Commission on Non-Ionizing Radiation
IEO	Index of Education and Occupation
IER	Index of Economic Resources
ILUA	Indigenous Land Use Agreements
IMS	incident management system
IRSAD	Index of Relative Socio-Economic Advantage and Disadvantage
ISA	Infrastructure South Australia
ISP	Integrated System Plan
ISRD	Index of Relative Socio-Economic Disadvantage
IUCN	International Union for Conservation of Nature
JAMBA	Japan–Australia Migratory Bird Agreement
km	kilometres
km2	square kilometres

Abbreviation/ Acronym	Definition
kV	kilovolt
LCV	light commercial vehicle
LGA	local government area
LiDAR	light detection and ranging
LRET	large-scale renewable energy target
m	metres
MAB	UNESCO Man and Biosphere programme
MCA	multi-criteria analysis
MDBA	Murray-Darling Basin Authority
MDBP	Murray-Darling Basin Plan
MDBSA	Murray-Darling Basin South Australia
MDD	Murray-Darling Depression IBRA Region
mG	milligauss
Mg/L	milligrams per litre
ML	megalitres
MNES	matter of national environmental significance
MP	Member of Parliament
MW	megawatt
NEL	National Electricity Law
NEM	National Electricity Market
NEMMCO	National Electricity Marketing and Management Company (refer to AEMO)
NEPM	National Environment Protection Measure
NER	National Electricity Rules
NGERS	National Greenhouse and Energy Reporting Scheme
NHVR	National Heavy Vehicle Regulator
NNAC	Ngadjuri Nation Aboriginal Corporation
NO_x	nitrogen oxides
NPW Act	*National Parks and Wildlife Act 1972* (Schedules 7, 8 and 9 of the Act)
NRHA	National Rural Health Alliance
NRM	natural resources management
NSESD	National Strategy for Ecologically Sustainable Development (Cth)
NSW	New South Wales
NTTT	National Native Title Tribunal
NTU	nephelometric turbidity units
NVC	Native Vegetation Council (SA)
OEMP	Operations Environmental Management Plan
OHL	overhead line
OPGW	optical ground wire
ORMs	Objectives for a Healthy River Murray
OTR	Office of the Technical Regulator (DEM)
PACR	Project Assessment Conclusion Report
PADR	Project Assessment Draft Report
PASS	potential acid sulphate soil
PDI Act	*Planning, Development and Infrastructure Act 2016* (SA)

Abbreviation/ Acronym	Definition
PHIDU	Public Health Information Development Unit
PIRSA	Primary Industries and Regions South Australia
PLUS-AGD	Planning and Land Use Services within Attorney-General's Department (formerly part of DPTI)
PM	particulate matter
PMST	EPBC Act Protected Matters Search Tool
PO	PDI Act Performance Outcome
PSCR	Project Specification Consultation Report
PUA	Pastoral Unincorporated Area
PV	photovoltaic
RCG	Regional Council of Goyder
RDA	Regional Development Australia
RDAMR	Regional Development Australia Murraylands and Riverland
RET	Renewable Energy Target
REZ	Renewable Energy Zones
RISE	Regional Industry Structure and Employment model
RIT-T	Regulatory Investment Test for Transmission
RIV	Riverina IBRA Region
RoCoF	Rate of Change of Frequency
ROKAMBA	Republic of Kora–Australia Migratory Bird Agreement
RMMAC	River Murray and Mallee Aboriginal Corporation
RMPA	River Murray Protection Areas
RPC	Renmark Paringa Council
RR	regional reserves
SA	South Australia
SAET	South Australian Energy Transformation
SAMDBNRMB	South Australian Murray-Darling Basin Natural Resources Management Board
SANI	South Australia-New South Wales Interconnector project (mid-1990s)
SANTS	South Australia Native Title Services
SAPN	South Australia Power Networks
SAPOL	South Australia Police
SARIG	South Australian Resources Information Gateway
SATC	South Australian Tourism Commission
SEB	significant environmental benefit
SEIFA	Socio-Economic Index for Areas
SEP	stakeholder engagement plan
SNI	South Australia-New South Wales Interconnector project (2002)
SO_x	sulphur oxides
SPC	State Planning Commission (SA)
SPP	State Planning Policy
SPRAT	Species Profiles and Threats Database
SSC	state suburbs
SSNVA	State Significant Native Vegetation Areas
SWL	standing water level (below ground surface)

Abbreviation/ Acronym	Definition
TDS	total dissolved salinity
TEC	threatened ecological community
TLC	transmission line corridor (1 km corridor centred on the proposed alignment)
TMP	traffic management plan
TRA	Tourism Research Australia
TSA	**traffic study area**
TTS	temporary threshold shift
TWh	terawatt hour
TZVI	theoretical zone of visual influence
UAV	unmanned aerial vehicle
UCL	urban centres / localities
UGC	underground cable
UIA Riverland	Unincorporated Riverland area
UNESCO	United Nations Educational, Scientific and Cultural Organisation
UNFCCC	United Nations Framework Convention on Climate Change
UXO	unexploded ordinance
VHA	Vegetation heritage agreement (pursuant to section 23 of the Native Vegetation Act 1991)
VIA	visual impact assessment
VLT	visual landscape type
VPP	virtual power plant
VRET	Victorian Renewable Energy Target

Glossary of Terms used in the EIS

Term	Definition
access track	A cleared and graded track to allow the safe movement of vehicles and equipment. A permanent access track to each tower base is required for ongoing operation and maintenance. Some access tracks would be temporary and only used during the construction phase.
approval	The act of formally confirming, sanctioning, ratifying or agreeing to something. Approval must be obtained from an appropriate person with accountability or delegated authority.
aspect	An element of an organisation's activities or products or services that can interact with the environment.
brake / winch site	A temporarily cleared area where plant and equipment is located for the purposes of spooling and winching a conductor into place on erected towers along a transmission line corridor. Dependent upon the angle of line deviation, the location of the brake and winch site at that angle may or may not be within the nominated transmission line easement. The brake and winch site is only required for the construction phase. It does not need to be maintained for ongoing operation and / or maintenance of the transmission line.
disturbance area	The area that would be directly impacted by construction and operation (including maintenance activities). This incorporates all infrastructure elements (including the proposed transmission line alignment, substation site works and other ancillary works i.e. the operational footprint) as well as locations for proposed construction elements such as construction compounds, access tracks and site access points, laydown and staging areas, borrow pits, concrete batching plants, brake/winch sites, site offices and accommodation camps.
effect	An effect can occur on a pathway as a result of an aspect/source. It is a deviation from the expected and can be positive and/or negative.
EIS Guidelines	Guidelines issued by the State Planning Commission to be followed by ElectraNet when preparing the EIS
impact	Any certain and defined change to a receptor, whether adverse or beneficial, wholly or partially resulting from an aspect / source. Note, an impact is not a risk as it is deemed to be certain.
internal audit	Systematic reviewing of process undertaken internally by experts in specific disciplines.
investigation corridor	Refers to the initial 20 km wide route investigation corridor and subsequent refined 15 km investigation corridor encompassing all route options assessed in this EIS
linkage	Source-pathway-receptor linkage. A linkage is confirmed where a source affects a pathway and ultimately leads to an impact on an identified receptor. The linkage can be broken by the application of a control strategy or inherent nature of location, e.g., distance to sensitive receptors.
monitoring locations	Monitoring locations are used to demonstrate compliance with approval conditions, outcomes and operational performance.
nominal route alignment	This refers to the initially identified potential alignment based on initial constraints and opportunities mapping, preliminary environmental studies and early stakeholder consultation.
operational footprint	The area that would be directly impacted by permanent components of the project, including all proposed infrastructure elements such as transmission towers, substation infrastructure and permanent access tracks. The operational footprint includes: • areas where vegetation is permanently removed (e.g. immediately around towers and substations and on access tracks) • areas between towers where vegetation trimming would be undertaken where required to meet vegetation clearance heights. Vegetation clearance heights are set under the Electricity (Principles of Vegetation Clearance) Regulations 2010 for operational and safety requirements, including bushfire risk management.
pathway	The means by which material originating from the source reaches a receptor.

Term	Definition
the Project	The construction of ~204 km of 330 kV transmission line between Robertstown and the SA-NSW border, including a substation near Robertstown
Project EnergyConnect	A proposed high voltage electricity transmission interconnector to be constructed between Robertstown in South Australia (SA) and Wagga Wagga in New South Wales (NSW), with an added connection from Buronga in NSW to Red Cliffs in north-west Victoria
proposed alignment	The alignment of the transmission line identified through the Project route selection process which is the subject of this EIS. The proposed alignment will be subject to ongoing refinement at the local level as the design phase progresses and engagement continues with landholders, Traditional Owners and other stakeholders.
receptor	A discrete, identifiable attribute or associated entity that is measurably impacted by an effect to a pathway.
risk	'The impact of uncertainty on objectives' (ISO 31000:2009). It consists of two components—the consequence and its likelihood.
transmission line corridor	A nominal 1 km wide corridor (500 m buffer either side of the alignment as at January 2021) used as a guide for the assessment of impacts. The final alignment of the transmission line is expected to remain largely within the transmission line corridor
transmission line easement	An area surrounding and including the transmission line, which is a legal 'right of way' and allows for ongoing access and maintenance of the line and will be acquired from landholders. The easement would typically be 80 metres wide.
sensitive receptor	A discrete, identifiable attribute or associated entity that is measurably impacted by an effect to a pathway. Examples of a sensitive receptor are a third party, workers, or a particular species or assemblage of a species.
source	A natural entity, a specific location or infrastructure component of a project.
stringing access corridor	A temporary corridor along the centre of the transmission line used during construction to enable stringing of cables between towers. This would typically be 10 m wide and suitably prepared (e.g. by slashing or rolling) to allow a dozer to lay the draw wires out on the ground.

Definition of Study Areas discussed in the EIS

Environmental Aspect	Study Area Definition
Ecological study area	A 50 km wide corridor (i.e. a 25 km buffer either side of the proposed alignment). Note that the early ecological constraints investigations and the EPBC referral used an ESA centred on the indicative alignment at the time. The alignment has subsequently been refined (as described in Chapter 4 Route Selection) and the ESA used in this EIS is based on the proposed alignment presented in this EIS.
EPBC Protected Matters search area	A 10 km corridor (i.e. 5 km buffer either side of the proposed alignment).
Aboriginal heritage study area	A 10 km corridor (i.e. 5 km buffer either side of the proposed alignment).
Non-Aboriginal cultural heritage study area	A 1 km corridor (i.e. 500 m buffer either side of the proposed alignment).
Visual impact assessment study area	Theoretical Zone of Visual Influence established for the Project. This is a maximum radius of 6.2km from each tower location along the length of the transmission line corridor.
Air quality study area	A 1 km corridor (i.e. 500 m buffer either side of the proposed alignment) used to identify sensitive receptor locations.
Noise assessment study area	A 6.4 km buffer of the proposed alignment comprising 1 km corridor (i.e. 500 m buffer either side of the proposed alignment) and an extra 5.4 km buffer (i.e. 2.7km either side of the 1 km corridor) to assess the extended noise impact.
Traffic study area	A 10 km corridor (i.e. 5 km buffer either side of the proposed alignment).
Socio-economic study area	The LGAs of Regional Council of Goyder, Mid Murray Council, District Council of Loxton Waikerie, Berri Barmera Council and Renmark Paringa Council. Within the study area, the local Project context considered a 5 km buffer either side of the proposed alignment and the four communities closest to the alignment – Robertstown, Morgan, Cadell and Cooltong

EIS Volume 1 Chapter 1

Introduction

JBS&G

project energy connect

Contents

1. Introduction 1-1

1.1. Project Overview 1-1
1.2. Details of the Proponent 1-1
1.3. Background to the Proposal 1-5
1.3.1. Previous proposals 1-5
1.3.2. Transition of the energy market 1-5
1.4. Objective of Project EnergyConnect 1-6
1.5. The Proposal 1-6
1.6. Project Timeline 1-6
1.7. Overview of Regulatory Approvals Process 1-8
1.8. Purpose and Description of the EIS 1-10
1.8.1. Purpose of the EIS 1-10
1.8.2. Consultation 1-10
1.8.3. EIS Guidelines 1-10
1.9. Structure of the EIS 1-11
1.10. Key EIS Terminology 1-13

List of Tables

Table 1-1: EIS Guidelines addressed in the Introduction chapter 1-11
Table 1-2: Volume One - EIS 1-11
Table 1-3: Volume Two - Supporting documentation and technical reports 1-12
Table 1-4: Volume Three – Environmental and social management plans 1-12
Table 1-5: Key EIS terminology 1-13

List of Figures

Figure 1-1: Project overview 1-3
Figure 1-2: Proposed Project location 1-4
Figure 1-3: Indicative Project timeline 1-7
Figure 1-4: Overview of the assessment and approval process 1-9

1. Introduction

1.1. Project Overview

Project EnergyConnect is a proposed high voltage electricity transmission interconnector to be constructed between Robertstown in South Australia (SA) and Wagga Wagga in New South Wales (NSW), with an added connection from Buronga in NSW to Red Cliffs in north-west Victoria (refer Figure 1-1). The transmission line would be the second major interconnector between SA and the National Electricity Market (NEM).

The owner and operator of the South Australian transmission network, ElectraNet, has partnered with TransGrid, the manager and operator of the high voltage electricity transmission network in NSW, to deliver Project EnergyConnect which will ultimately be built, owned, operated and maintained by ElectraNet and TransGrid.

Project EnergyConnect is comprised of several sections that would be subject to separate environmental planning approvals under the relevant jurisdictions:

- SA – Robertstown to SA / NSW border (ElectraNet)
- NSW – Western Section extending from SA / NSW border to TransGrid's existing Buronga substation and Buronga substation to the NSW / Victoria border at Monak (near Red Cliffs in Victoria) (TransGrid)
- NSW – Eastern Section extending from the Buronga substation to the existing Wagga Wagga 330 kilovolt (kV) substation (TransGrid)
- Victoria - NSW/Victoria border to Red Cliffs substation (TransGrid).

ElectraNet would be responsible for constructing and operating the SA portion of Project EnergyConnect from Robertstown to the SA / NSW Border. This South Australian section of Project EnergyConnect is referred to as 'the Project' for the purposes of the South Australian assessments and approvals processes (refer Figure 1-2).

The Project was declared a Major Development under the *Development Act 1993* (SA) by the Minister for Planning on 24 June 2019 requiring preparation of an Environmental Impact Statement (EIS). The Project was also declared a Controlled Action by the Commonwealth Environment Minister, on 17 July 2019, requiring assessment under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act). An EIS has been prepared in accordance with the guidelines issued by the South Australian State Planning Commission (EIS Guidelines) for the consideration of both governments. Environmental authorisation from both the South Australian and Commonwealth governments is required before the South Australian portion of Project EnergyConnect may proceed.

The NSW sections of Project EnergyConnect have been declared to be Critical State Infrastructure and will be assessed under the corresponding NSW EIS process. Assessment as a Controlled Action under the EPBC Act will also be undertaken for the NSW sections.

1.2. Details of the Proponent

ElectraNet is an Adelaide-based private company and principal owner and operator of the South Australian transmission network. ElectraNet specialises in electricity transmission, delivering safe, affordable and reliable solutions to power homes, businesses and the economy. ElectraNet builds, owns, operates and maintains high-voltage electricity assets, which move energy from traditional and renewable energy generators in SA and interstate, to large load customers and the lower voltage distribution network.

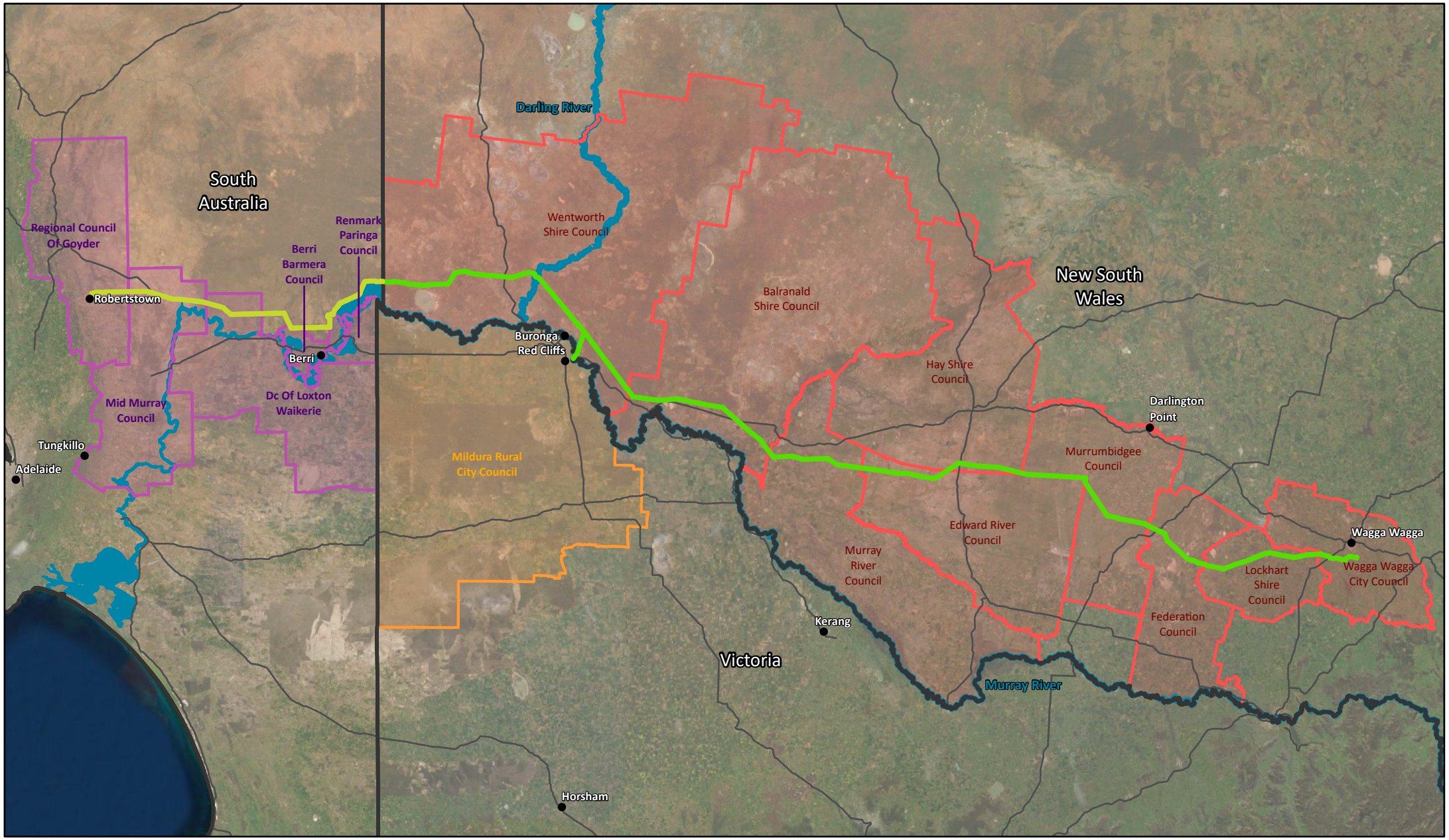
The South Australian electricity transmission network operated by ElectraNet covers an area of more than 200,000 square kilometres (km^2). This network consists of 6, 267 circuit kilometres (km) of transmission lines and underground cables, together with 97 substations and switchyards, predominantly operating at 132 and 275 kV.

In all, ElectraNet owns and operates more than $2.5 billion of high-voltage electricity transmission assets and is one of the highest reliability network providers in Australia.

The owners of ElectraNet Pty Ltd, trading as ElectraNet, are:

- State Grid International Development Asia and Australia Holding Company (the international arm of the State Grid Corporation of China)
- YTL Power Investments Limited (an investment company of YTL Power International Berhard); and
- Australian Utilities Pty Ltd (as trustee for the Australian Utilities Trust).

ElectraNet operates under the governance of the ElectraNet Board of Directors, which includes up to nine Directors representing the shareholding companies, and an independent Chairman.



ElectraNet route alignment
Transgrid indicative route alignment
New South Wales council boudary
Victoria council boundary
South Australia council boundary
Watercourse
National highway

Figure 1-1
Project overview

0 100
Kilometres

N

ElectraNet
energy connect
JBS&G

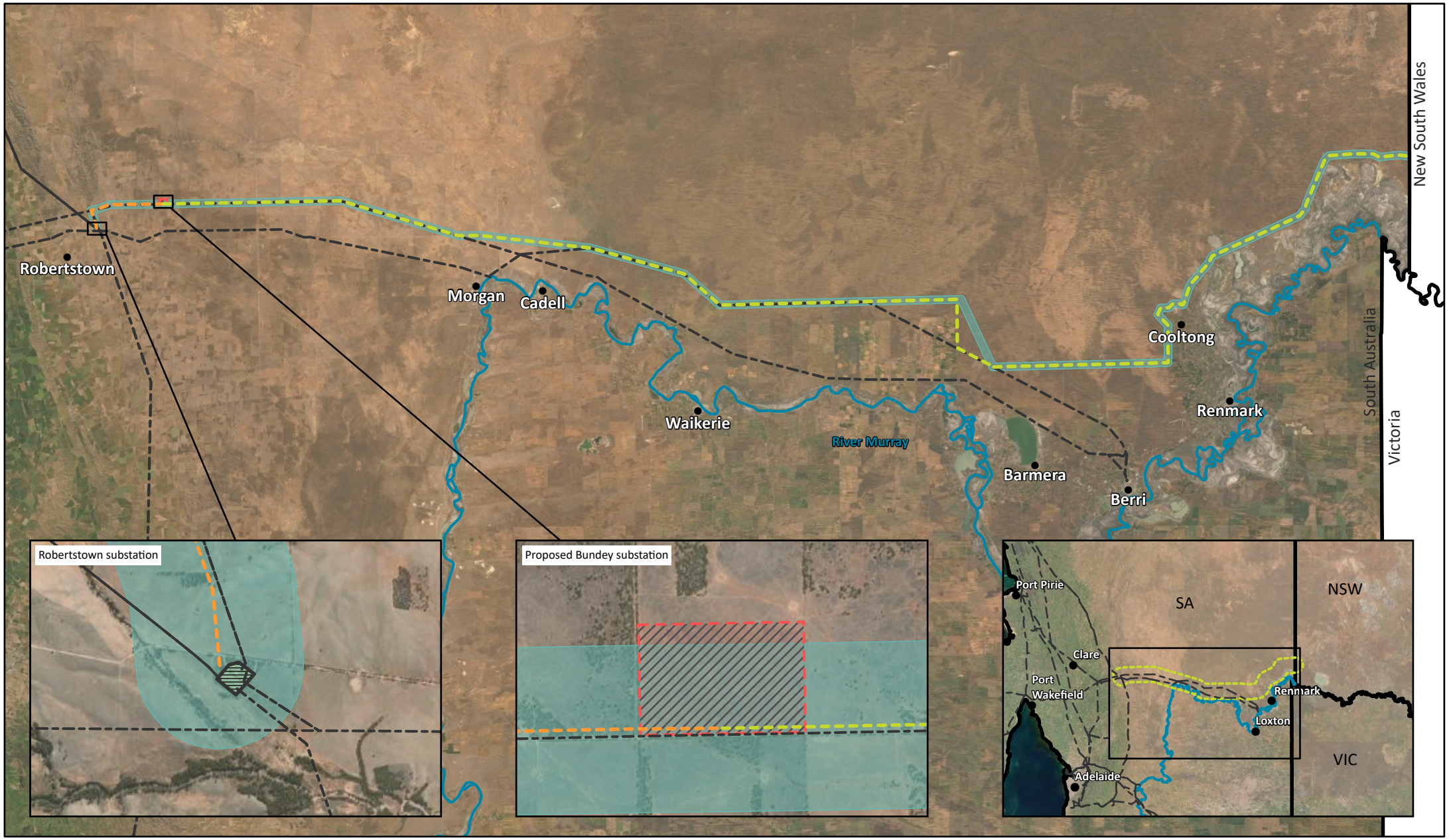


Figure 1-2
Proposed Project location

ElectraNet
energy connect
JBS&G

1.3. Background to the Proposal

1.3.1. Previous proposals

There have been several previous proposals to link the SA and NSW energy markets through the construction of an interconnector, which did not proceed largely due to historical issues in the administration of the NEM.

In the mid-1990s, the South Australia-New South Wales Interconnector project (known as SANI) was proposed with support from both States. Following a decision by the then electricity market operator[1] not to approve the project as a regulated interconnector, (based on considerations of customer benefit, as opposed to public benefit), the South Australian government withdrew its active involvement in the project. The regulated asset test which was used to assess the SANI was later reviewed by the Australian Competition and Consumer Commission (ACCC) to address perceived inadequacies (SKM 2002).

Similarly, the subsequent South Australia-New South Wales Interconnector project known as SNI which was proposed in the early 2000s, also failed to progress. Regulator approval for the SNI was sought at the same time as the MurrayLink market link was being built and operated, which exposed deficiencies in the national electricity code in relation to interactions between market and regulated transmission companies. While market benefits could have been maximised using a co-operative approach, the proponents of the regulated and market interconnectors were unable to achieve this. The approval process for SNI was the subject of ongoing appeals and TransGrid as proponent of the SNI eventually decided not to proceed with the project. (ACCC 2004).

1.3.2. Transition of the energy market

A significant energy market transition away from traditional fossil fuel-based electricity generation to a greater input from renewable energy sources and other emerging technologies has been underway in Australia since the early 2000s. This movement has had implications for energy prices and system stability and security in SA.

Wholesale electricity prices are increasingly volatile while SA remains solely reliant on Victoria for interconnection with rest of the NEM. The growing penetration of renewable energy generation (wind and solar) and uptake of rooftop photovoltaic systems in SA, combined with the looming closure of ageing coal-fired generators elsewhere in the NEM over the next 20 years, are also significant factors driving the need to ensure the national power system remains reliable and secure.

The Finkel Review in 2017, which followed the State-wide blackouts in SA in 2016, similarly found that better system planning was required to provide access for emerging renewable energy technologies and to protect the integrity of the system from extreme weather and climate effects.

To address these issues, and as part of planning for securing reliable supply and lower prices for South Australian consumers in the future, ElectraNet has been exploring options to facilitate South Australia's Energy Transformation (SAET). This has involved the assessment of the technical and economic feasibility of constructing and operating a new interconnector (including an assessment of alternative non-network solution options), through a Regulatory Investment Test for Transmission (RIT-T)[2] process. In February 2019, ElectraNet released the SAET Project Assessment Conclusions Report (PACR) and on 24 January 2020, the Australian Energy Regulator (AER) approved the RIT-T.

[1] National Electricity Marketing and Management Company (NEMMCO)

[2] The RIT-T process is the economic cost-benefit test overseen by the Australian Energy Regulator (AER) and applies to all major network investments in the NEM.

ElectraNet has lodged their Contingent Project Applications with the AER which is the final step in the regulatory approval process.

1.4. Objective of Project EnergyConnect

The objective of Project EnergyConnect is to improve the affordability, reliability and sustainability of electricity supply in the NEM through increased electricity transmission between SA, NSW and Victoria of about 800 megawatts (MW).The Project aims to create a net benefit to consumers and producers of electricity and support transition of the energy market to a lower carbon economy using the following means:

- enhancing security of electricity supply in SA by providing a second major interconnector to the rest of the NEM
- increasing electricity supply competition and trade by improving network access and capacity, thereby reducing wholesale electricity costs using market means
- providing new opportunities for renewable energy and other energy projects to connect to the NEM, thereby stimulating economic activity and facilitating transition to a low carbon economy.

It is expected that achievement of these objectives will provide a wide range of benefits at a local, state and national level, as discussed in Chapter 2 Project Justification.

1.5. The Proposal

The proposed Project involves the construction and operation of the South Australian portion (Robertstown to SA / NSW border) of Project EnergyConnect which comprises:

- approximately 10 km of 275 kV transmission line supported by steel towers from the existing Robertstown substation to a proposed new substation located towards the western extent of the transmission line at Bundey, near Robertstown
- approximately 195 km of 330 kV transmission line supported by steel towers from the new Bundey substation to the SA / NSW border
- associated telecommunications infrastructure
- associated access tracks
- associated temporary facilities (e.g. temporary construction compounds, site offices, laydown areas and mobile construction camps).

The route selection process for the proposed interconnector alignment is described in Chapter 4 Route Selection. The proposed Project infrastructure, works and activities are described in detail in Chapter 7 Project Description.

1.6. Project Timeline

Construction on the Project would commence once all access to land and necessary environmental and development approvals are obtained. ElectraNet anticipates that construction would take approximately 18 - 24 months to complete, with energisation occurring progressively through 2023 (refer Figure 1-3). Where possible, scheduling in relation to approvals and construction of the Project is being aligned with the NSW portion of Project EnergyConnect, with ElectraNet and TransGrid executing a coordinated approach in order to optimise construction timeframes as far as possible. Details of Project activities, staging and timeframes are provided in Chapter 7 Project Description. The operational life of the asset is expected to be 100 years.

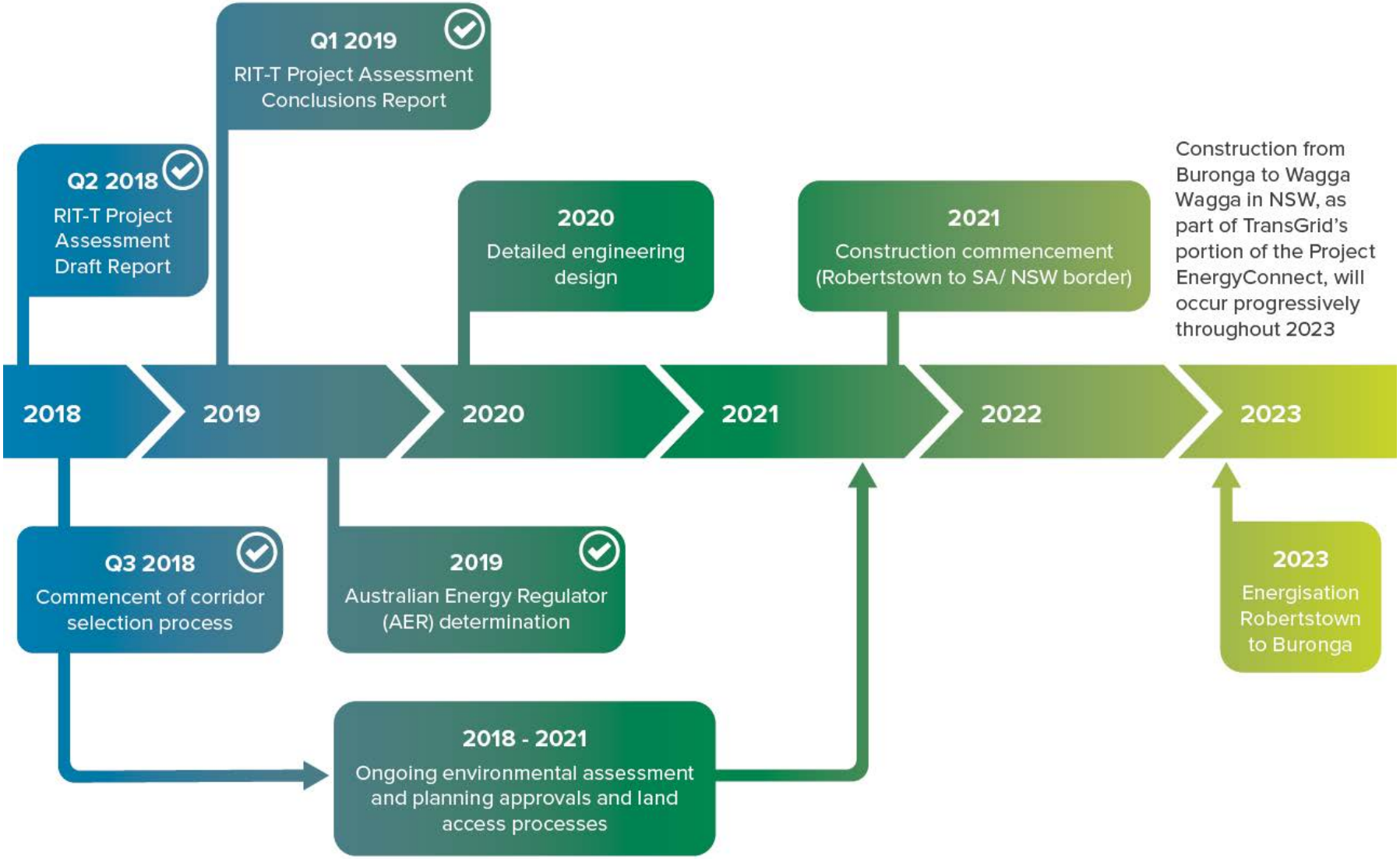


Figure 1-3: Indicative Project timeline

1.7. Overview of Regulatory Approvals Process

This EIS has been prepared by ElectraNet as the proponent for the Project in accordance with the EIS Guidelines for the Project issued by the Minister for Planning on 20 November 2019 (refer Appendix B Guidelines for the Preparation of an EIS). The EIS Guidelines include the Commonwealth's environmental assessment requirements for the Controlled Action.

The Project will be assessed by the State and Commonwealth governments under the Major Development provisions of the *Development Act 1993* (SA) in accordance with the Bilateral Agreement between the Commonwealth and South Australian governments under Section 45(2) of the EPBC Act (refer Section 5.3.4).

An EIS for the Project was considered appropriate by the State Planning Commission due to the number of issues that required investigation and an EIS level of assessment also aligns with the assessment assigned by the NSW planning system for the section of the transmission infrastructure located from the NSW border to Wagga Wagga via Buronga.

In addition to ensuring each Guideline is addressed, the EIS is required to provide a clear, detailed and comprehensive analysis of the proposed development, the existing environment in which it will be located (physical and socio-economic), the likely impacts of the development and how those impacts will be addressed.

Assessment of the EIS involves the following steps:

- submission of a draft EIS to Planning and Land Use Services in the Attorney-General's Department (PLUS-AGD) for review before being released for public consultation
- a public exhibition / consultation period of at least 6 weeks
- preparation of a Response Document by ElectraNet responding to submissions made during the public consultation period
- assessment of the Response Report by PLUS-AGD, and preparation of an Assessment Report for the consideration of the SA Planning Minster and the Commonwealth Environment Minister
- decision to approve or not approve by the SA Planning Minster, and the Commonwealth Environment Minister in relation to Matters of National Environmental Significance.

An overview of the EIS approvals process is set out in Figure 1-4.

The Major Development and EIS provisions under the Development Act, the Bilateral Agreement arrangements under the EPBC Act and other relevant Commonwealth, State and local legislative planning and approvals in relation to the Project are discussed in detail in Chapter 5 Legislative and Planning Framework.

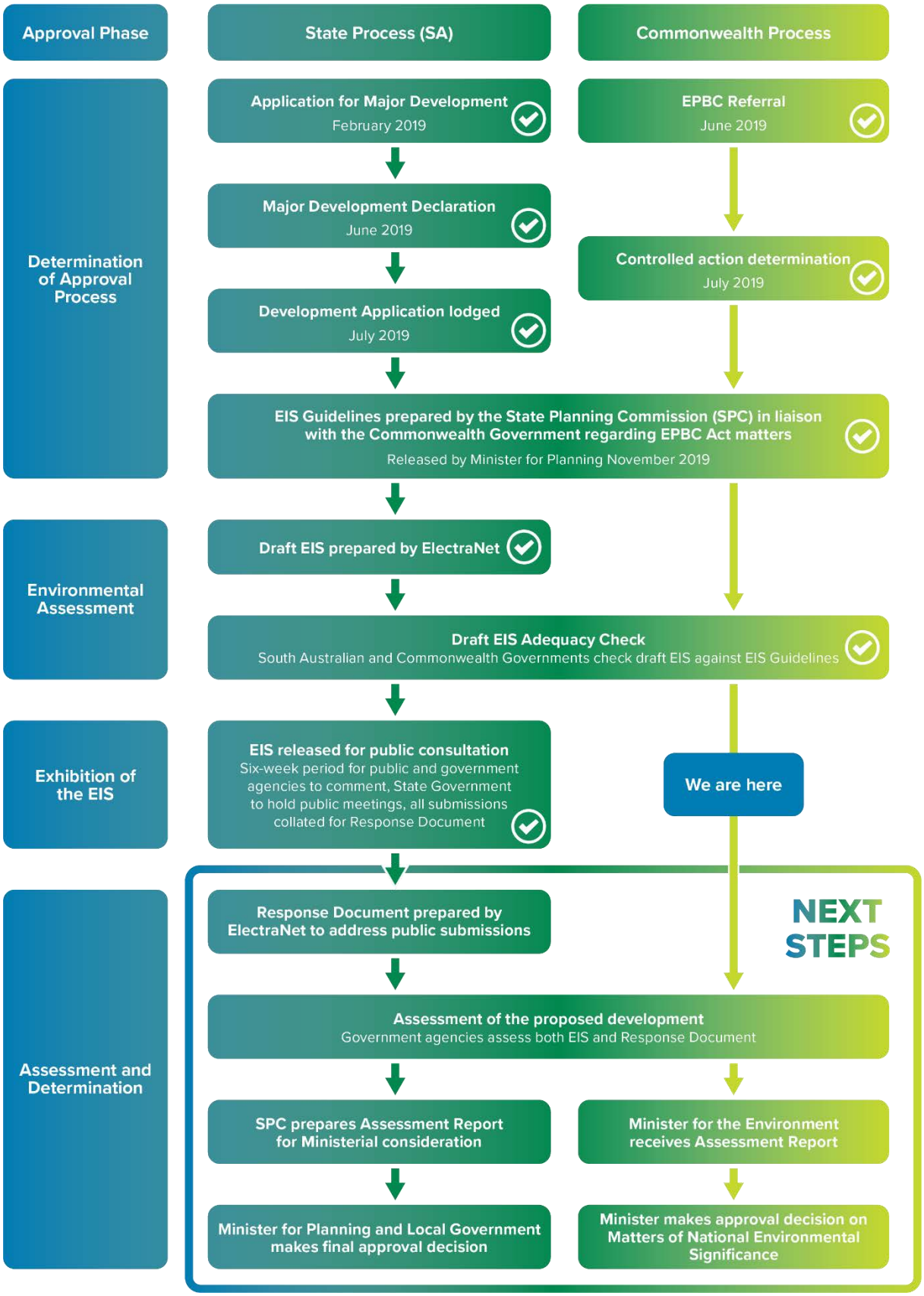


Figure 1-4: Overview of the assessment and approval process

1.8. Purpose and Description of the EIS

1.8.1. Purpose of the EIS

An EIS is an important, iterative process that will inform the construction and operational requirements of the Project. By understanding the relevant positive and negative environmental impacts of a development, appropriate mitigation measures and management actions can be incorporated into the concept and detailed design of the Project.

This EIS has been prepared to identify and assess the environmental, social and economic impacts and benefits of constructing the proposed interconnector between Robertstown and the SA / NSW border, including cumulative impacts and benefits.

The objectives of the EIS are to:

- provide a source of information for stakeholders to facilitate informed consultation and feedback
- explain the need for the Project and evaluate the case for approval of the Project over the alternatives which have been considered
- identify and assess the potential impacts of the Project on the community and the environment, and the measures to avoid, minimise and mitigate those impacts
- provide a framework for decision-makers to consider the Project in line with environmental, social, economic, cultural and technical factors; and
- address the EIS Guidelines which will be assessed against the legislative framework described in Chapter 5 Legislative Framework and Planning.

1.8.2. Consultation

Community consultation is an integral part of the impact assessment process, contributing to understanding of impacts and through the development of mitigation measures and management actions, mutually benefitting both the community and the proponent. Engagement with the community provides understanding of what is happening in their 'backyard' and provides the proponent with useful feedback on the proposed development.

ElectraNet has undertaken extensive and ongoing stakeholder engagement during the preparation of the studies that support this EIS, the assessment of the interconnector options considered by the RIT- T process (refer Chapter 2), corridor and route selection studies and refinement of the proposed alignment (refer Chapter 4). Engagement will be ongoing as part of the consultation phase for the EIS and as part of micro-siting of infrastructure and final design. This engagement has included consultation with landholders, Traditional Owners, the broader community in the region of the Project, energy generators and developers, State and Commonwealth approval authorities and local government.

Stakeholder engagement undertaken for the Project is discussed further in Chapter 6 Stakeholder Engagement.

1.8.3. EIS Guidelines

This EIS has been prepared in accordance with the EIS Guidelines for the Project issued by the Minister for Planning (refer Appendix B Guidelines for the Preparation of an EIS). The specific Guidelines which are addressed in each chapter are listed at the beginning of the chapter and a summary table cross referencing each Guideline requirement (action or investigation needed) with the relevant section and page of the EIS is at Appendix C EIS Guidelines Reference Table.

The Guidelines relating to the Introduction Chapter of this EIS are set out in Table 1-1.

Table 1-1: EIS Guidelines addressed in the Introduction chapter

EIS Guidelines and Assessment Requirements
General Requirements
• Background to, and objectives of, the proposed development.
• Details of the proponent.
• Staging and timing of the proposal, including expected dates for construction and operation.
• Relevant legislative requirements and approval processes.
• Purpose and description of the EIS process.

1.9. Structure of the EIS

This EIS has been prepared to ensure that the Project is described adequately, the potential environmental impacts are assessed and proposed mitigation measures are identified. To present this information, the EIS consists of three volumes incorporating:

- Volume One – EIS main report
- Volume Two – Supporting documentation and technical reports (Appendices A – O)
- Volume Three – Environmental and social management plans (Appendices P – S)

The structure and contents of these volumes is detailed in Table 1-2 to Table 1-4.

Table 1-2: Volume One - EIS

Chapter	Title	Chapter Summary
1	Introduction	Provides background to the proposed Project, the proponent and structure of the EIS.
2	Project Justification	Sets out the objectives and justification for the Project
3	Alternatives to the Project	Sets out the Project alternatives and other options which have been investigated
4	Route Selection	Describes the approach used to refine the transmission line corridor to date, and how a preferred route was identified.
5	Legislative and Planning Framework	Describes the Commonwealth, State and local government legislative framework relevant to the Project, together with an assessment against the relevant State and local planning documents.
6	Stakeholder Engagement	Presents a summary of the key engagement activities undertaken as part of the EIS process, as well as future engagement opportunities.
7	Project Description	Provides a detailed description of the proposed Project
8	Impact Assessment Methodology	Describes the impact and risk assessment process employed for the EIS
9	Land Use and Tenure	These chapters set out the impact assessment for each environmental and social-economic element and: • describe the existing baseline conditions for each environmental and social element and identify relevant environmental values • identify and discusses potential impact events and proposed controls and mitigation strategies • present the outcomes of impact assessment for identified impact events for each environmental and social element, including any additional mitigation where relevant.
10	Physical Environment	
11	Flora and Fauna	
12	Cultural Heritage	
13	Visual Amenity	
14	Air Quality	
15	Noise and Vibration	
16	Traffic and Transport	
17	Socio-Economic Environment	
18	Hazards and Risk Management	
19	Waste Management	

Chapter	Title	Chapter Summary
20	Environmental Management Framework	Describes the environmental management framework that will be applied during construction and operation for the Project.
21	Conclusion	Conclusions of the EIS
22	References	Lists references referred to or relied on in the EIS

Table 1-3: Volume Two - Supporting documentation and technical reports

Appendix	Report	Reference in EIS
A	Ministerial Major Project Declaration	Chapter 1
B	Guidelines for the Preparation of an EIS	Chapter 1
C	EIS Guidelines Reference Table	All chapters
D	Preliminary Plans of the Proposed Route	Chapter 7
E	Preliminary Plans of the Proposed Substation	Chapter 7
F	Certificates of Title	Chapter 9
G	Stakeholder Consultation Materials	Chapter 6
H	Route Selection Feedback Report	Chapter 4
I	Ecology Assessments I-1: Species Likelihood Assessments I-2: Vegetation Assessment Summary I-3: Significant Impact Assessments I-4: Threatened Mallee Birds Assessment I-5: Review of Potential Impacts to Wetland Birds I-6: Native Vegetation Clearance Data Report	Chapter 11
J	Environmental Noise Impact Assessment	Chapter 15
K	Air Quality Impact Assessment and Greenhouse Gas Assessment	Chapter 14
L	Visual Impact Assessments L-1: Visual Impact Assessment L-2: Addendum to the Visual Impact Assessment	Chapter 13
M	Traffic Impact Assessment	Chapter 16
N	Socio-Economic Assessments N-1: Updated Analysis on Electricity Prices and Assessment of Broader Economic Benefits N-2: Project EnergyConnect (South Australian portion) Socioeconomic Assessment	Chapter 17
O	Impact Event Uncertainty Evaluation	Chapter 8

Table 1-4: Volume Three – Environmental and social management plans

Appendix	Report	Reference in EIS
P	Draft Construction Environmental Management Plan	Impact Assessment Chapters
Q	Draft Operation Environmental Management Plan	Impact Assessment Chapters
R	Cultural Heritage Management Plan Framework	Chapter 18 and 19
S	Draft Fire Hazard Management Plan	Chapter 18
T	Draft Waste Management and Minimisation Plan	Chapter 19

1.10. Key EIS Terminology

Table 1-5 lists the key terms that are discussed throughout the EIS. A full list of terms used in the EIS is provided in the EIS Glossary.

Table 1-5: Key EIS terminology

Term	Definition / Explanation
Proposed alignment	The alignment of the transmission line identified through the Project route selection process which is the subject of this EIS. The proposed alignment will be subject to ongoing refinement at the local level as the design phase progresses and engagement continues with landholders, Traditional Owners and other stakeholders.
Transmission line corridor	A nominal 1 km wide corridor (500 m buffer either side of the alignment as at January 2021) used as a guide for the assessment of impacts. The final alignment of the transmission line is expected to remain largely within the transmission line corridor (refer Section 4.8).
Study area	The area used for investigation for an impact assessment study, which is specifically defined in each relevant EIS chapter (e.g. the ecological study area is defined as a corridor 50 km wide).
Transmission line easement	An area surrounding and including the transmission line, which is a legal 'right of way' and allows for ongoing access and maintenance of the line and will be acquired from landholders. The easement would typically be 80 m wide.

EIS Volume 1 Chapter 2

Project Justification

JBS&G

project energy connect

Contents

2. Project Justification 2-1
2.1. Introduction 2-1
2.2. EIS Guidelines 2-1
2.3. Overview of the National Electricity Market 2-2
2.3.1. Operation of the National Electricity Market 2-2
2.3.2. System connectivity 2-2
2.3.3. Energy market transition 2-5
2.3.4. South Australian context 2-6
2.3.5. New South Wales context 2-8
2.4. Electricity Network Planning 2-8
2.4.1. Integrated System Plan 2-8
2.4.2. New energy projects in South Australia 2-12
2.5. Commonwealth and State Energy Policy Context 2-12
2.5.1. Commonwealth policies 2-13
2.5.2. South Australia and New South Wales energy policies 2-14
2.6. The Need for a New Interconnector 2-16
2.6.1. Existing South Australian interconnections 2-16
2.6.2. Regulatory Investment Test for Transmission (RIT-T) 2-17
2.7. Benefits of Project EnergyConnect 2-20
2.7.1. Overall economic benefits 2-20
2.7.2. Benefits for the region and local communities 2-21
2.7.3. Benefits for South Australia 2-21
2.7.4. Benefits for New South Wales 2-23
2.7.5. Benefits for Australia 2-24
2.7.6. Ecologically sustainable development (ESD) 2-25
2.8. Consequences of Not Proceeding with the Project 2-25
2.9. Conclusion 2-27

List of Figures

Figure 2-1: National Electricity Market installed capacity 2-4
Figure 2-2: Forecast relative change in NEM installed capacity by generation type 2-5
Figure 2-3: NEM coal-fired and gas-powered generation (GPG) retirements (top) and capacity (bottom) 2-6
Figure 2-4: Generation capacity in the NEM, by region and fuel source 2-7
Figure 2-5: Renewable Energy Zones and indicative projects 2-11
Figure 2-6: South Australian energy generation by fuel type 2-12
Figure 2-7: SA total interconnector imports and exports 2-16
Figure 2-8: Overview of the options assessed in (SAET RIT-T) 2-19

List of Tables

Table 2-1: EIS Guidelines addressed in the Project Justification chapter 2-1
Table 2-2: Aspects of assessment requirements addressed in other chapters 2-1
Table 2-3: Current interconnectors 2-2
Table 2-4: Consequences and economic implications of not proceeding with the Project 2-26

2. Project Justification

2.1. Introduction

The justification for the Project is driven by the changing nature of electricity generation in Australia, the dynamics of the National Electricity Market (NEM) in response to that change, and the implications of these on energy affordability and security in South Australia. Justification for the Project and the expected benefits are discussed in this chapter in this context.

ElectraNet considered a range of alternatives to the Project which were thoroughly investigated, as described in Chapter 3 Alternatives to the Project. The process used to evaluate the route options and select the transmission line corridor and alignment considered in this EIS is presented in Chapter 4 Route Selection.

2.2. EIS Guidelines

The EIS Guidelines require a statement of the objectives and justification for the proposed Project as set out in Table 2-1.

Table 2-1: EIS Guidelines addressed in the Project Justification chapter

EIS Guidelines and Assessment Requirements	Assessment level
General Requirements	
• The specific objectives that the proposal is intended to meet, including market requirements.	
• Expected local, regional and state benefits and costs, including those that can be adequately described in monetary or physical terms (e.g. effects on aesthetic amenity).	
• A summary of environmental, economic and social arguments to support the proposal including the consequences of not proceeding with the proposal.	
Land Use and Economic Effects *Assessment Requirement 2*: The proposal will have an impact on the State's economy during construction and operation and may result in immediate and long-term effects on landowners and surrounding uses.	
• 2.13: Identify any economic implications for the State and the region if the proposal does not proceed.	Critical
Planning and Environmental Legislation and Policies *Assessment Requirement 16: A range of planning, environmental and energy related statutory requirements would need to be met for the construction and operation of the proposed development*	
• 16. 3: Outline any other Commonwealth or State Government initiatives that may relate to the proposed transmission line, including greenhouse issues, principles of ecologically sustainable development, power generation, and the conservation or protection of the biological environment. Describe the proposal in terms of its consistency with these initiatives	Standard

Aspects of assessment requirements identified in Table 2-1 above which are not addressed in this chapter are listed in Table 2-2 together with the applicable chapter.

Table 2-2: Aspects of assessment requirements addressed in other chapters

Assessment Requirement	Chapter
16.3 Commonwealth or State Government initiatives that may relate to the proposed transmission line including the conservation or protection of the biological environment.	Chapter 5 Legislative and Planning Framework Chapter 11 Flora and Fauna

2.3. Overview of the National Electricity Market

2.3.1. Operation of the National Electricity Market

The Australian NEM is one of the world's longest interconnected power systems and consists of around 40,000 km of transmission lines and cables across six states and territories[1], regulated by the Australian Energy Regulator (AER). The NEM enables electricity to be exchanged as a commodity between generators, transmission network service providers, distribution network service providers, electricity retailers and market customers.

Electricity is traded to match power supply and demand requirements in real time through a centrally coordinated dispatch process managed by the Australian Energy Market Operator (AEMO), enabling electricity demand to be met in the most cost-effective way (AEMO 2018a). AEMO oversees the operations and security of the NEM and is responsible for maintaining secure electricity and gas systems, managing electricity and gas markets and leading the design of Australia's future energy system.

The Australian Energy Market Commission (AEMC) sets the rules to ensure the market delivers efficient, reliable and safe energy for electricity and gas consumers and provides independent advice to policy makers.

2.3.2. System connectivity

The interconnection of otherwise separate electricity networks allows local electricity markets to be integrated into the NEM, enabling customers to purchase power from electricity generators in different regions at a price determined by the supply and demand dynamics of the market. The effect of interconnection is to increase pricing competition through supply of lower-priced electricity to regions experiencing relatively high electricity pricing. When states are unable to generate sufficient electricity to meet local demand (due to factors such as low supply, high demand or damaged transmission infrastructure), interconnectors facilitate the transfer of electricity to fulfil the market's needs.

As shown in Table 2-3 and Figure 2-1, the NSW electricity grid is directly connected to Victoria and Queensland, while the South Australian and Victorian networks are linked through the Heywood Interconnector and Murraylink. Victoria and Tasmania are connected via the undersea Basslink Interconnector.

There is no interconnector between SA and NSW.

Table 2-3: Current interconnectors

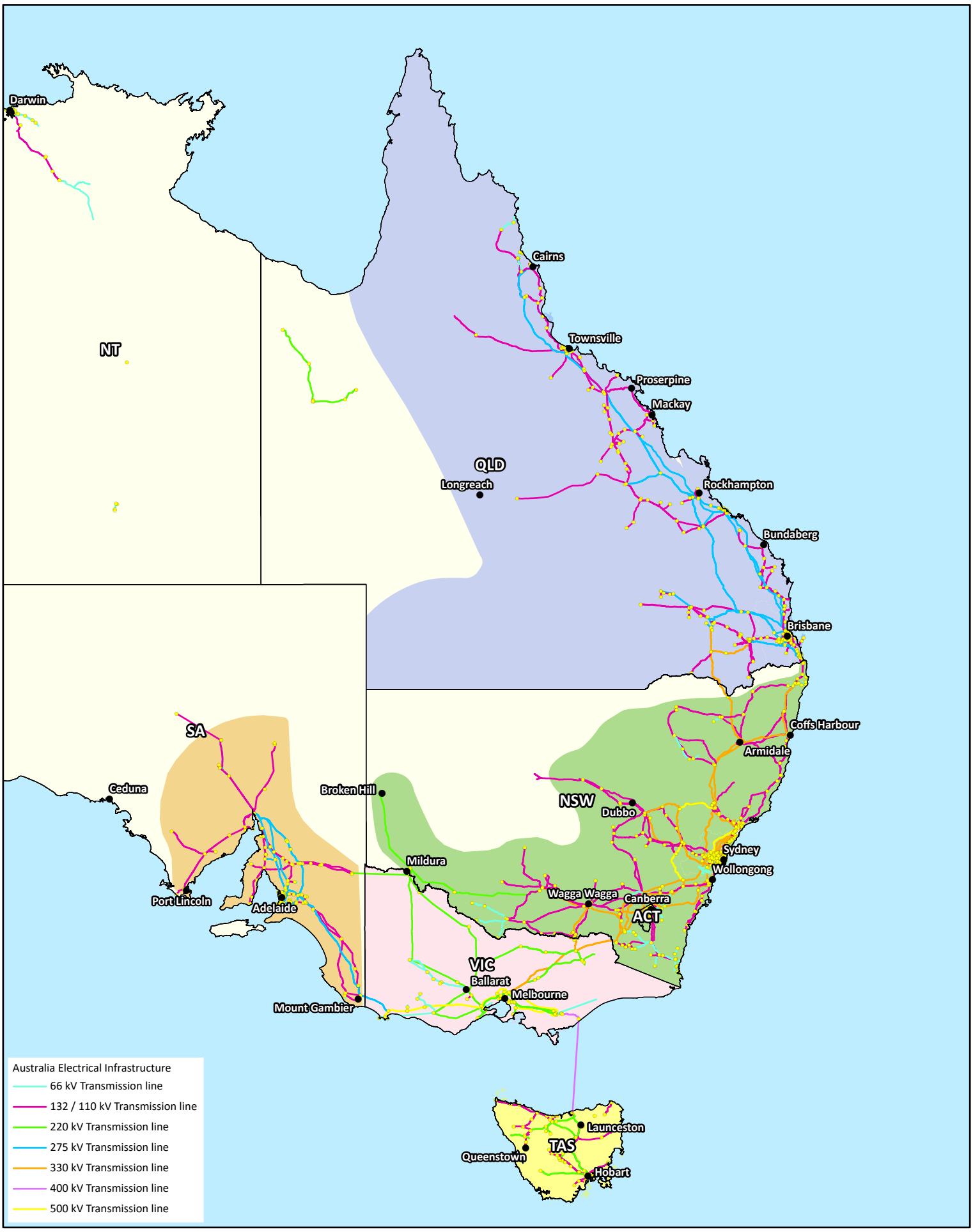
Interconnector	Description
Terranora Interconnector (N-Q-MNSP1)	110 kV lines from Mudgeeraba in Queensland to Terranora in NSW
Queensland to NSW (QNI)2	330 kV lines between Dumaresq in NSW and Bulli Creek in Queensland
Victoria to NSW (VIC1- NSW1)	330 kV line between Murray and Upper Tumut 330 kV line between Murray and Lower Tumut 330 kV line between Jindera and Wodonga

[1] The NEM interconnects five regional market jurisdictions comprising Queensland, New South Wales (including the Australian Capital Territory), Victoria, South Australia and Tasmania. Western Australia and the Northern Territory are not connected to the NEM, largely due to the large distances between them and the other participating states. The statistics for the Australian Capital Territory are incorporated into the New South Wales data.

[2] Proposed upgrades to QNI will be brought forward to mid-2022, delivering an extra 190 MW capacity into NSW during peak periods (AER 2020a).

Interconnector	Description
	220 kV line between Buronga and Red Cliffs 132 kV bus tie at Guthega
Basslink (T-V-MNSP1)	DC cable between George Town in Tasmania and Loy Yang in Victoria
Heywood Interconnector (V-SA)	275 kV lines between Heywood substation in Victoria and South East substation in SA
Murraylink (V-S-MNSP1	200 MW DC cable between Red Cliffs in Victoria and Monash in SA

Source: *Interconnector Capabilities: For the National Electricity Market 2017* (AEMO 2017)



NEM Region
- New South Wales
- South Australia
- Tasmania
- Queensland
- Victoria

Substation

Figure 2-1
National Electricity Market installed capacity

0 500
Kilometres

N

ElectraNet | project energy connect | JBS&G

2.3.3. Energy market transition

The Australian energy market is in the midst of a well-documented transition from a largely centralised generation fleet dominated by fossil fuel generation, to a more variable energy mix. This transition is characterised by increased penetration of renewable energy generation, dispersed generation and storage infrastructure, wide-scale behind the meter solar and storage installations, and the advent of emerging technologies including large scale batteries and virtual power plants.

There are many factors influencing the energy market transition including:

- decommissioning of the ageing coal-fired generation fleet
- government policies including renewable energy targets and state-based incentives
- greater awareness and positive sentiment for low-emission generation
- cost of electricity which is driving uptake in 'behind the meter' installations
- corporate power purchase agreements to underpin new utility-scale energy projects.

Over the next 20 years the retirement of ageing coal-fired generators is likely to result in the loss of around 70,000 Gigawatt hours (GWh), or one-third of the entire annual generation within the NEM. It is widely accepted that this generating capacity will be largely replaced by wind, solar (both small and large scale) generation and to a lesser extent hydropower and gas-fired generation (Figure 2-2) (AEMO 2020a).

This is particularly the case for NSW, where over 38,800 MW will be progressively retired over the next 15-18 years (refer Figure 2-3) representing over 80% of NSW coal-fired generation. The Clean Energy Council estimated that as of November 2020, there were 95 renewable energy projects in construction or due to start construction soon in Australia, which would generate around 12,021 MW of new renewable energy capacity (Clean Energy Council 2020).

As these new generation projects are more widely distributed, this transition will require significant investment in transmission and energy storage infrastructure to manage the diversity and intermittency of the future generation mix (AEMO 2020a).

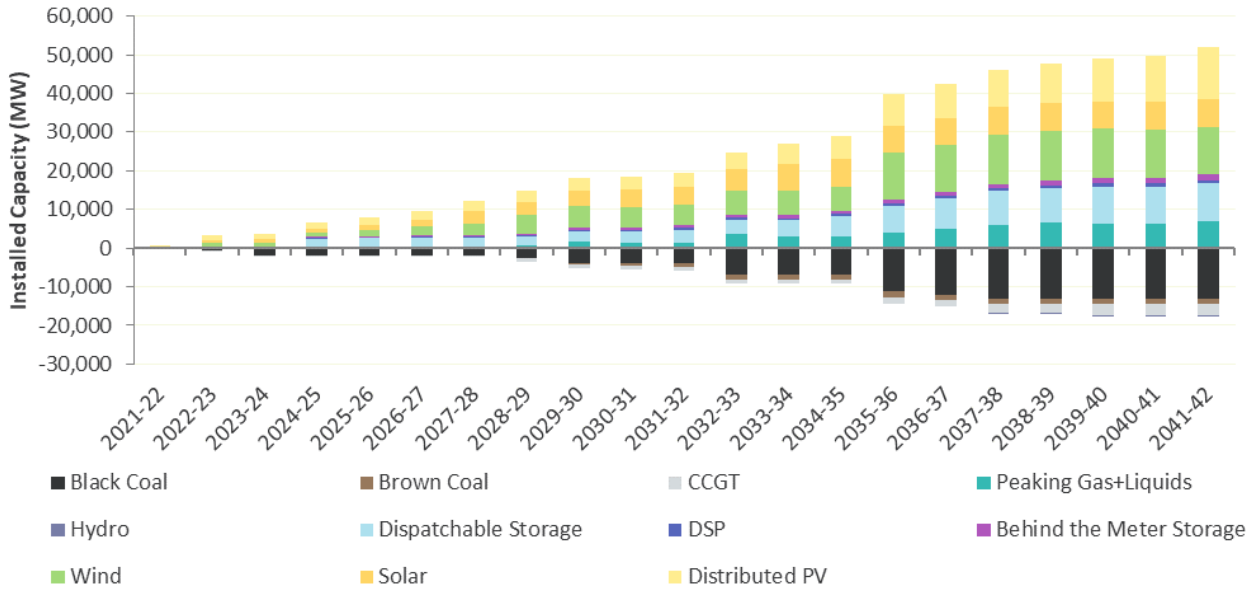


Figure 2-2: Forecast relative change in NEM installed capacity by generation type
(Source: AEMO 2020a)

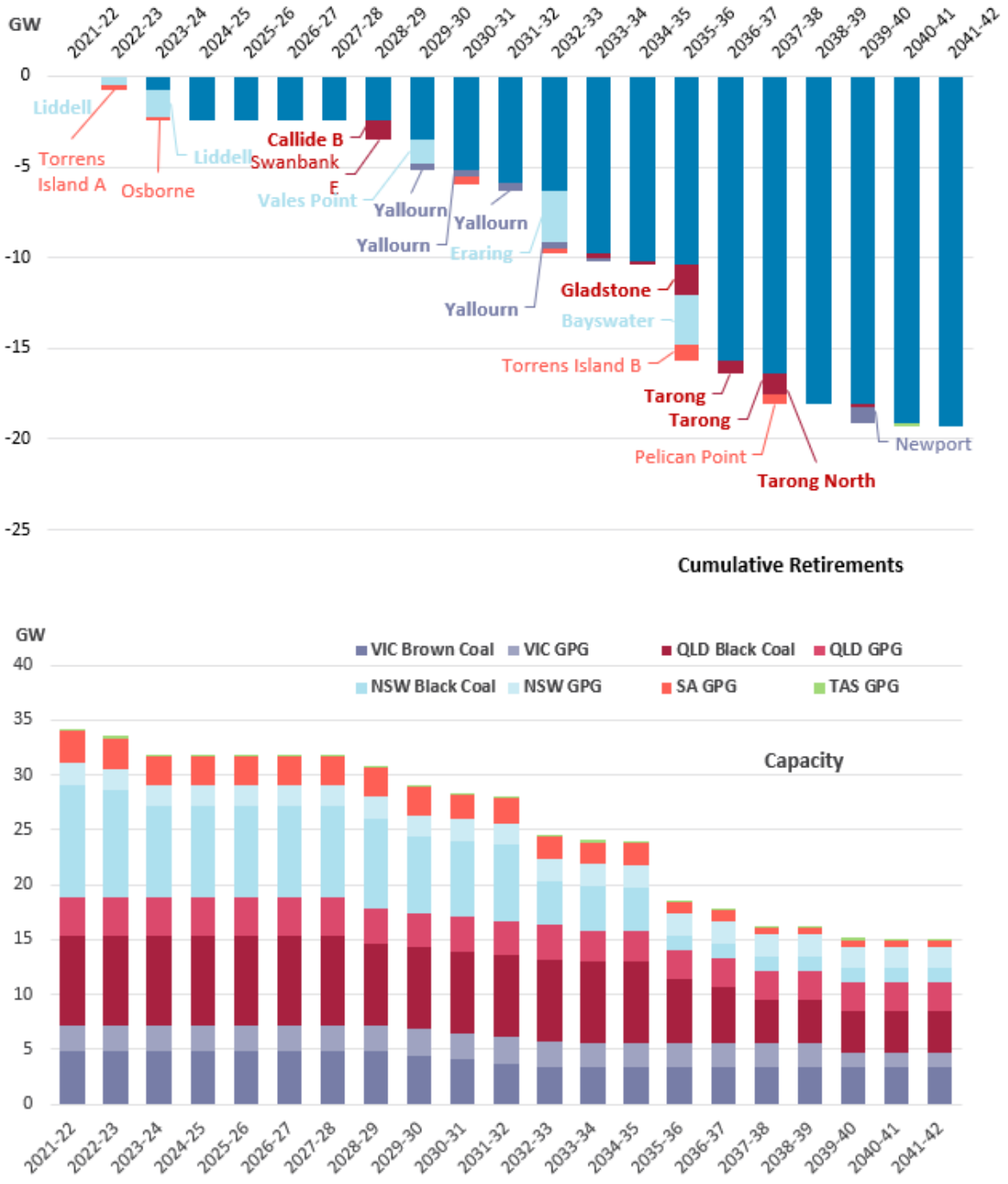


Figure 2-3: NEM coal-fired and gas-powered generation (GPG) retirements (top) and capacity (bottom)
(Source: AEMO 2020a)

2.3.4. South Australian context

Since the closure of the coal fired Northern Power Station in Port Augusta in May 2016, marking the end of coal-generated power in the state, SA has progressed to be a national leader in renewable energy capacity with the highest proportion of solar and wind of any state at 53%, and the second highest renewable energy penetration after Tasmania (which is dominated by hydropower) at 73% (refer Figure 2-4). In SA, gas and wind provide 71% of the energy generated compared to the significantly coal dependant networks in NSW and Queensland (refer Figure 2-4). Battery storage provides 1% of generation.

New investment and installations in SA are continuing with an overall increase of 9.3% in total installed capacity in 2019–20 compared with the previous year. This increase is mainly due to growth in wind, rooftop photovoltaic (PV) (particularly in the commercial sector), and gas generation (AEMO 2020a).

The largest energy generators in SA are currently the gas-fired Torrens Island, Pelican Point and Osborne power stations, and the Snowtown Wind Farm (Stages 1 and 2 combined). The Torrens Island A power station is scheduled to be progressively closed by September 2021, with two of the four turbines to be replaced by the 210 MW Barker Inlet Power Station. The Osborne Power Station is scheduled for closure in 2023–24.

The Barker Inlet Power Station commenced operation in November 2019 and will meet the increasing need for technologies that can complement the natural variability of renewable generation by providing rapid start capabilities and high operational flexibility. The Barker Inlet facility will be capable of increasing output to full capacity within five minutes at a higher level of efficiency than the pre-existing gas-powered generation fleet. The four Torrens Island B units will continue to operate until their currently-scheduled decommissioning in 2035–36 (AEMO 2020a).

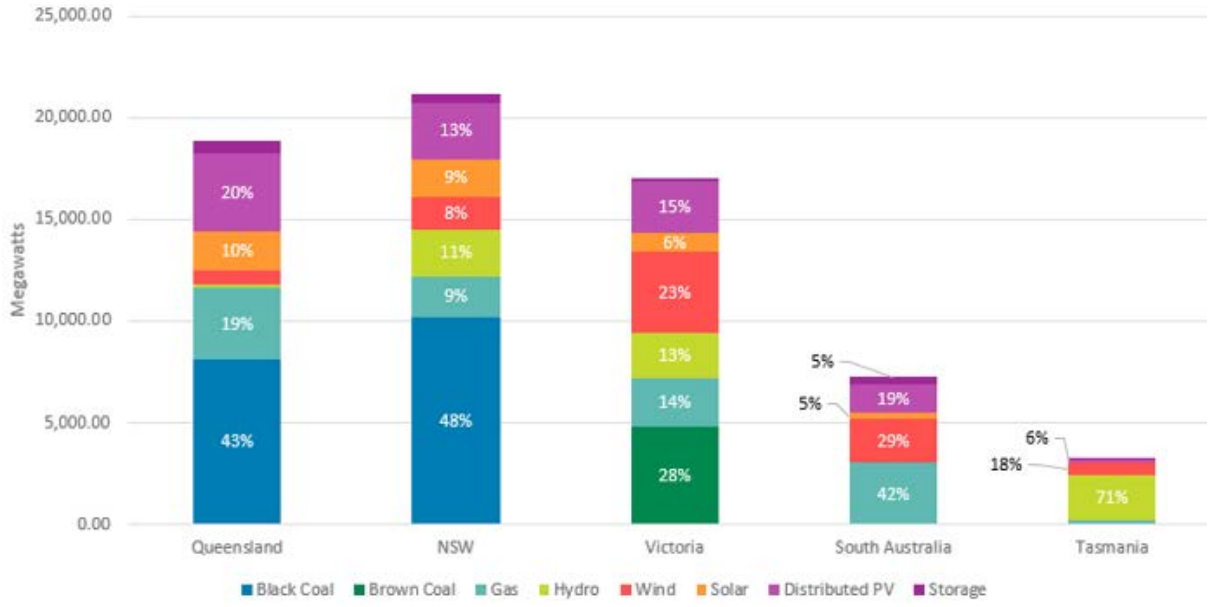


Figure 2-4: Generation capacity in the NEM, by region and fuel source
(Source: AEMO 2020a)

Changes to energy generation are presenting significant challenges for the South Australian electricity network, with flow on effects for all consumers. This is demonstrated by:

- the vulnerability of the State's electricity market to major and unforeseen events affecting the interconnectors connecting the State to the rest of the NEM
- variability in demand and supply causing significant price fluctuations influenced by intermittent supply and significant behind the meter installations
- the need for high cost gas peaking plants and battery energy storage systems to provide fast response dispatchable energy capacity during low supply or high demand scenarios.

In the recent past, these factors have collectively contributed to high wholesale electricity prices in SA, affordability concerns for consumers, system strength issues and vulnerability to major weather events and network damage resulting in wide-spread blackouts. Project EnergyConnect has been developed to address the need for improved affordability and reliability of electricity in SA, and to facilitate the ongoing transition of the NEM toward low emission energy sources.

2.3.5. New South Wales context

All electricity consumed through the NSW grid is generated within the State and supplied via the NEM. Thermal generation (i.e. burning fuel sources such as coal to propel turbines) and to a lesser extent gas, is the dominant electricity generation technology, however other technologies such as hydropower, wind and solar are playing an increasingly important role (DPIE 2019).

NSW is home to five operating coal power stations (and four of Australia's six oldest coal power stations) which generated almost 80% of NSWs' electricity in 2018 – 2019 (DPIE 2019). The Liddell coal power station is nearly 50 years old and scheduled to close by 2023, while three other coal power stations are also due to close by 2035–36 (DPIE 2019). This has the potential to put pressure on the future supply of energy, with electricity consumption across NSW increasing consistently over recent years and forecast to continue accelerating over the next decade (TransGrid 2018).

Approximately 40% of the State's energy generation in 2019–20 comes from renewable energy sources. The bulk of this comes from distributed PV, including rooftop solar comprising 13% and hydropower stations which contributed 11%. Wind and large-scale solar combined comprised 16% (AEMO 2020a). More recently, more than 30 wind and solar farms across the state (particularly in south-east and western NSW) have joined the grid (AEMC 2020) and there is a substantial investment pipeline of new wind, solar, gas and generator upgrade projects which have received or are seeking planning approval.

TransGrid has identified that the existing transmission network outside the Sydney – Wollongong – Newcastle – Hunter Valley area will reach its existing capacity to connect renewable generation in 2020 (SoE 2018) with only one in 20 of these projects being able to connect to the network (TransGrid 2020). The transmission grid will therefore require targeted augmentation, including strategically placed large-scale interconnectors and transmission line extensions, to balance resources and unlock Renewable Energy Zones (REZs) in new regions.

2.4. Electricity Network Planning

Finkel Review

In 2017, the Council of Australian Governments (COAG) Energy Council established a major independent review into the future security of the NEM, chaired by Australia's Chief Scientist Alan Finkel (Finkel 2017). The review was prompted in part by electricity blackouts in SA in September 2016 which focussed national attention on energy security and the implications of the changing electricity market.

The Finkel Review highlighted the need for better system planning as one of three pillars for ensuring that national energy security is preserved and costs are managed in each region as the generation mix evolves. Comprehensive network planning was promoted to ensure that emerging renewable energy resource regions can be economically accessed. Protecting the integrity of energy infrastructure against damage from extreme weather and future climate change, was also a key recommendation of the review.

2.4.1. Integrated System Plan

To address the findings of the Finkel Review, AEMO prepared the first Integrated System Plan (ISP) in 2018 which forecast the overall transmission system requirements for the NEM over the next 20 years. The 2018 ISP identified that the transmission network will play a critical role in the transformation of the national power system, by providing an 'interconnected energy highway' which allows diverse resources to be shared across the NEM more efficiently. Increased investment in an interconnected grid will provide the flexibility, security, and economic efficiency associated with a power system designed to take maximum advantage of existing resources, integrate variable renewable energy, and support efficient competitive alternatives for consumers (AEMO 2018a).

The 2020 ISP issued in July 2020 (AEMO 2020a) noted that the pace of development in new renewable and distributed energy generation has been even faster than that anticipated in the 2018 ISP and that this transition is predicted to continue over the next 20 years (AEMO 2020a). The 2020 ISP estimates that over 26 GW of new grid-scale renewable energy is needed to replace the approximately 15 GW (63%), of Australia's coal-fired generation that will reach the end of its technical life and likely retire by 2040. This will increase pressure on energy supply, particularly as energy consumption continues to rise in NSW (TransGrid 2018).

Project EnergyConnect was recommended in the 2018 ISP as an immediate priority project and confirmed as 'no regret' actionable[3] project in the 2020 ISP because it will 'increase transfer capacity between SA and NSW by 750 MW, deliver fuel cost savings and unlock already stranded renewable investments' (AEMO 2020a).

Renewable Energy Zones

AEMO have identified the benefits in concentrating development of grid-scale renewable energy projects in designated REZs to reduce total system and transition costs. The 2018 and 2020 ISPs assessed resource quality for potential new solar and wind installations and analysed these by region to identify potential REZs. Thirty-five potential REZs with good renewable resources were identified across the NEM through consideration of a mix of resource, technical and other considerations which were evaluated using a range of criteria (refer Figure 2-5).

The 2020 ISP prioritises REZ developments which are based on actionable projects and identifies Project EnergyConnect as development which is supportive of renewable energy projects (primarily solar) and will improve network capability in the Riverland REZ in SA (+800 MW), the South West NSW REZ (+380 MW) and the Victorian Murray River REZ near Red Cliffs (+600 MW) (AEMO 2020a). Incorporation of these REZs has been fundamental in the consideration of the transmission line corridor studies, assessment of alternatives in Chapter 3, and the route evaluation process described in Chapter 4 (refer Figure 2-5).

The NSW *Electricity Infrastructure Roadmap 2020* released in November 2020 also seeks to strengthen transmission development for REZs in NSW, which includes the South West NSW REZ traversed by Project EnergyConnect.

The establishment of Project EnergyConnect through these regions is expected to provide economic benefits by increasing the capacity of the network, opening the way for approximately 900 MW to 1,200 MW of renewable generation development in NSW (AEMO 2018a).

In SA, the Mid North REZ which incorporates the region at the western end of the proposed transmission line alignment would also potentially benefit from the Project.

New electricity network investments

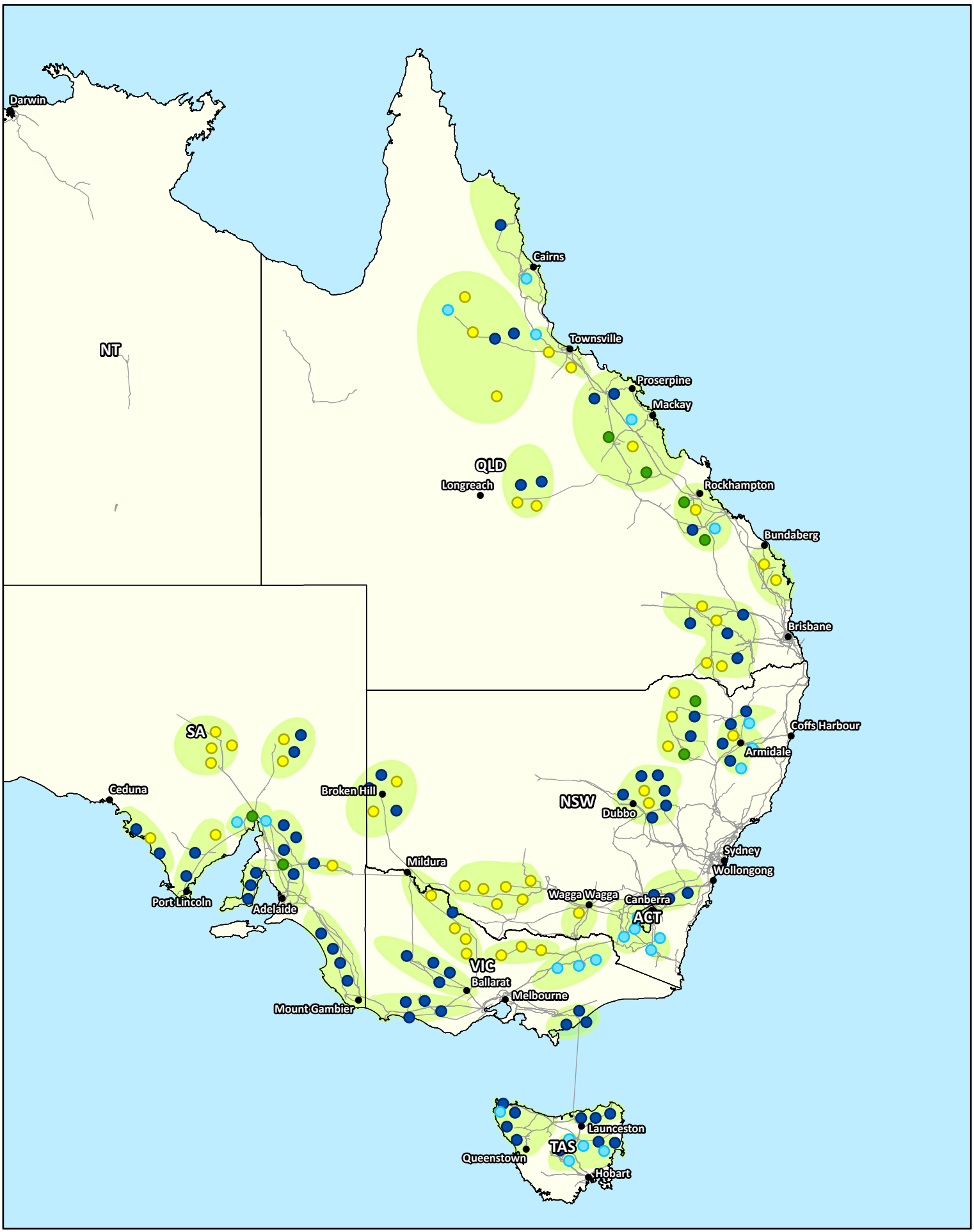
As an 'integrated' approach to network planning, the 2018 and 2020 ISPs note that the current NEM was historically developed primarily to connect large centres of thermal and hydro electricity generation to major demand centres. As the energy market transitions to a greater mix of generation, the NEM transmission network will need to adapt by investing in new network infrastructure in a strategic way to efficiently connect and transmit large amounts of dispersed renewable generation to more dispersed demand centres.

The 2018 ISP confirmed that a new interconnector between SA and NSW was an important element of the 'roadmap' for the NEM, and it was identified as one of the immediate priorities that would deliver positive net market benefits as soon as it can be built (AEMO 2018a). As noted above, a new

[3] Actionable ISP projects are projects which are identified in the 2020 ISP as critical to address cost, security and reliability issues, and are either already progressing or are to commence immediately after the publication of the 2020 ISP.

interconnector between SA and NSW has again been identified as a priority project in the 2020 ISP confirming Project EnergyConnect as a 'no regret' actionable ISP project.

The analysis within the 2018 ISP highlights the importance of new network investments to create an interconnected energy system which would enable greater transfer and trading of renewable energy, provide access to lower cost generation and realise the benefits of diversity from different resources in different locations with different generation profiles (AEMO 2018a). The 2018 ISP also proposes that further network investment would facilitate better use of the less flexible thermal generation assets by enhancing connectivity to meet the net operational demand of renewable generation.



Renewal Energy Zones - location

- Indicative pumped hydro
- Indicative solar farm
- Indicative wind farm
- Indicative battery storage

Existing electrical infrastructure

Renewable Energy Zone (REZ)

Figure 2-5
Renewable Energy Zones and indicative projects

0 500
Kilometres

N

ElectraNet

project energy connect

JBS&G

2.4.2. New energy projects in South Australia

By November 2020, publicly announced future energy supply projects in SA totalled 6,049 MW, with approximately 400 MW of this classified by AEMO as committed for development. New wind and open-cycle gas projects comprised the majority of new investment interest however there was a noticeable increase in the number of new battery, pumped hydro, and virtual power plant (VPP) projects publicly announced compared to previous years (AEMO 2020b).

Notwithstanding the increase in proposed rapid start gas and energy storage projects, overall the high penetration of intermittent renewable energy generation in the South Australian market is expected to continue, together with the challenges this brings to energy prices and system stability.

Figure 2-6 shows the mix of energy generated in SA by fuel type from 2015 – 2016 to 2019 – 2020 from:

- all scheduled generators
- all semi-scheduled and market non-scheduled wind farms
- all semi-scheduled solar farms
- selected smaller market and non-market non-scheduled generators
- estimated distributed PV.

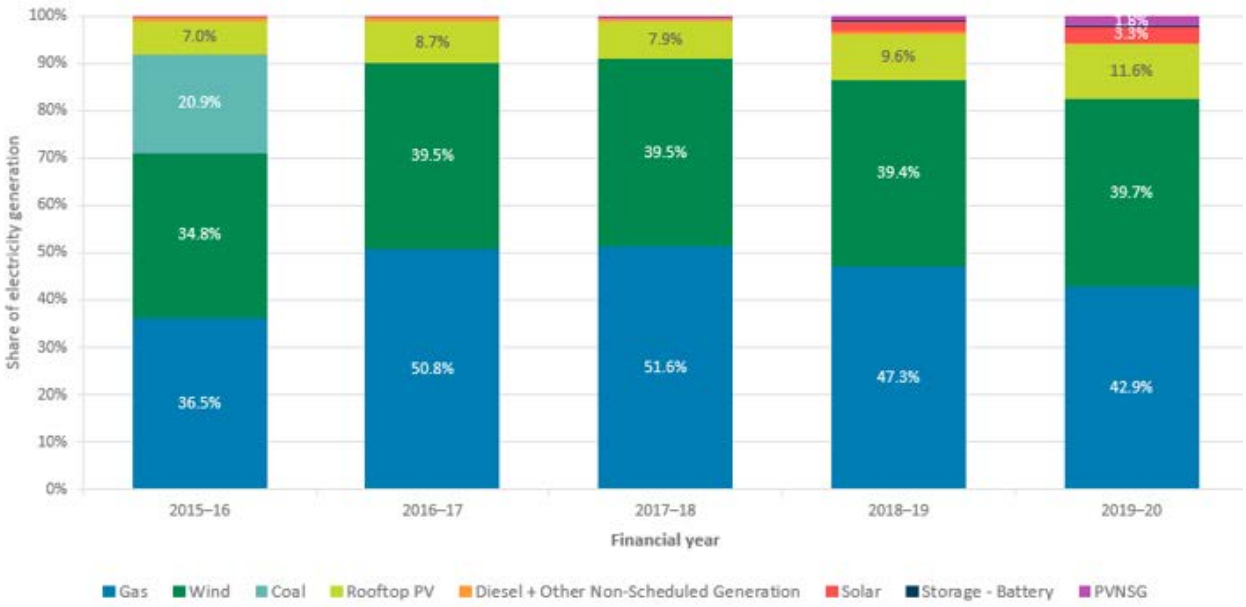


Figure 2-6: South Australian energy generation by fuel type
(Source: AEMO 2020b)

The above analysis demonstrates that the NEM is progressing at a rate which requires investment in transmission infrastructure to improve the affordability, reliability and sustainability of electricity supply for all electricity users.

2.5. Commonwealth and State Energy Policy Context

Commonwealth and State Government energy and emissions reductions policies reflect the need to adapt to and manage the transition of the energy market highlighted by the Finkel Review and the ISPs prepared by AEMO. Government policies at the national and state level are generally focussed on lower electricity prices, increased grid stability and protection from grid outages, and support for the transition of the Australian energy market to low emission / renewable sources.

2.5.1. Commonwealth policies

Energy policy

The Commonwealth government's stated priority is to ensure energy consumers receive affordable, reliable, sustainable and secure energy (DISER 2019). To this end, energy policies include implementation of an 'electricity price safety net' and proposals to:

- penalise poor electricity market practices
- establish a program to underwrite new generation investments
- require companies to invest in dispatchable energy to deliver the right level of 'on demand' sources (e.g. coal, gas, pumped hydro and batteries) needed in each state.

Emissions reduction

Emissions reduction and renewable energy policies are driven by the Commonwealth government's commitment to a reduction in emissions of 26 to 28% below 2005 levels by 2030 under the Paris Agreement4 for climate action post-2020, and net zero emissions in the second half of the century. In the international context, Australia's largest trading partners including Japan, the European Union, South Korea and the United Kingdom have all adopted a shorter-term goal of net zero emissions by 2050, with China setting the same target for 2060.

The Technology Investment Roadmap is a core element of the Commonwealth government's long term emissions reduction strategy and is aimed at accelerating the development and commercialisation of new and emerging low emissions technologies. The Roadmap envisages bilateral agreements between the Commonwealth and the State and Territory governments on initiatives that deliver increases in the supply of electricity and gas, improve grid security and reduce emissions (DISER 2020a).

The Commonwealth government's goal for emissions reduction has significant implications for the future operation of the NEM as meeting this commitment will necessarily lead to further replacement of some of Australia's emission intensive generators with lower emission alternatives, such as renewable energy generation.

Electricity generation is Australia's largest source of greenhouse gas emissions, accounting for 34% cent of Australia's total annual emissions (CCA 2020) and the NEM delivers around 80% of Australia's electricity consumption. The NEM therefore needs to significantly transition from traditional energy sources to lower emission alternatives including renewable energy for Australia to meet emission reduction targets (ElectraNet 2019a). The electricity sector is currently delivering on this outcome with the sector's emissions predicted to fall by 43 per cent between 2005 and 2030, in comparison to other sectors where stationary energy emissions are up 25%, transport emission are up 21% and fugitive emissions are up 45% (Ludlow 2020).

Renewable Energy Target

The Renewable Energy Target (RET) is an Australian Government scheme designed to reduce emissions of greenhouse gases in the electricity sector and encourage the additional generation of electricity from sustainable and renewable sources. Policies in place as part of the RET create financial incentives for the establishment or expansion of large-scale renewable energy power stations (e.g. wind and solar farms, or hydro-electric power stations) and small-scale renewable energy systems such as solar PV systems and small-scale wind or hydro systems.

The establishment of the RET has accelerated the progress of the renewable energy industry, assisted in the establishment of the necessary supply chains and expertise in Australia, and helped the industry

[4] A global agreement for climate action post-2020 was concluded at the Conference of the Parties (COP21) to the United Nations Framework Convention on Climate Change (UNFCCC) in December 2015.

mature to its place as a mainstream energy source today. In September 2019 the Clean Energy Regulator announced that the large-scale RET of 33,000 GWh of additional electricity from renewable sources by 2020 has been achieved (CEC 2019). The small-scale scheme continues to build momentum with a total cumulative capacity of 11,427 MW at the end of 2019-20 (CER 2020).

ARENA and CEFC

The Australian Renewable Energy Agency (ARENA) was established to fund research, development and commercialisation of renewable technologies including solar PV, hybrid, solar thermal, bioenergy, hydrogen, battery and pumped hydro storage projects with a focus on projects that integrate renewable energy into the electricity system (AER 2020b).

The Clean Energy Finance Corporation (CEFC) was launched in 2012 as a government-owned 'green bank' to promote investment in clean energy and provide financing for projects that will deliver a positive return. CEFC finance of around $5.5 billion has delivered 1.6 GW of large-scale solar capacity and 2 GW of wind capacity, and significant investment in storage and energy efficiency (AER 2020b).

As Australia's coal fired generation continues to close down, there is a clear need for further policy and regulatory reform so that the continued deployment of renewable energy and storage can help reduce Australia's energy sector carbon emissions, secure system reliability and lower energy prices.

2.5.2. South Australia and New South Wales energy policies

State-based policies in SA and NSW also place a significant focus on assisting the uptake of renewable technologies for households and businesses, energy affordability, emissions reductions and security and investment in new infrastructure (refer Chapter 5 Legislative and Planning Framework for further detail on the South Australian energy legislation framework).

South Australia

The South Australian government has a target to achieve 100% of the State's electricity supply from renewable energy sources by 2030. To achieve this, a range of policies have been adopted to progress uptake of renewable energy at the household, commercial and utility scales. Policies include a grid-scale storage fund to accelerate investment in utility scale energy storage, integration of grid-scale storage to address the intermittency of SA's energy supply and adoption of emerging technologies, including bioenergy and 'green hydrogen' for new markets.

Central to the South Australian government's target is the delivery of Project EnergyConnect to ensure the security of energy supply in a market which AEMO regards as the first gigawatt-scale power system in the world which, in coming years, may be capable of generating sufficient power from rooftop solar to provide its midday needs (DEM 2020). However the underlying risk of this capability is that, under extreme conditions, the dominance and growth of rooftop solar PV will pose a threat of disruption to energy supply. As a result of advice from AEMO requested by the SA government, the *South Australia's Energy Solution* policy statement was released by the government in June 2020 (DEM 2020). One of the primary recommendations for implementation during 2020 – 2023 was to ensure that Project EnergyConnect proceeds in order to underpin future power system operability (AEMO 2020a).

The State government's *Climate Smart South Australia* policy statement sets out the agenda for climate change and clean economic growth. The policy identifies the opportunities for the State in low emissions electricity supply and as an overall exporter of renewable energy, noting that the proposed SA-NSW interconnector will enable renewable electricity to be more easily exported to other states (DEW 2019a).

In December 2020, the SA government announced its *Climate Change Action Plan 2021 – 2025* which reiterates the State's goal for South Australian greenhouse gas emissions to be reduced by at least 50% (below 2005 levels) by 2030, to achieve net zero emissions by 2050 (GoSA 2020). Fast-tracking of the

SA-NSW interconnector for energy security and the export of excess renewable energy is also a key initiative of the action plan.

The South Australian government has established a specialist agency, Renewables SA, to focus on the implementation of its renewable energy and energy storage policies and demonstrate its commitment to maximising the economic opportunities associated with such projects that will help meet SA's current and future energy needs and Australia's Paris climate emission agreements.

New South Wales

In October 2018, the NSW Government released its Transmission Infrastructure Strategy to guide the development of new transmission projects (DPE 2018). The strategy outlines the need for new transmission to connect new wind and solar farms (and pumped hydro storage) to the electricity grid, which in some cases are located long distances from existing transmission capability which was built to accommodate coal-fired power generation.

Four priority projects are identified in the strategy, including a new interconnector with SA and interconnection expansions with Victoria and Queensland. The transmission infrastructure strategy also prioritises the development of three REZs in the New England, central-west and south-west regions of NSW (DPE 2018).

The NSW Electricity Strategy released in November 2019 re-emphasised the importance of unlocking regional investment in new energy generation infrastructure and connection of renewable energy projects to the power grid (DPIE 2019). The *Net Zero Plan Stage 1* for emissions reductions announced in March 2020 is also aligned with the objectives of the NSW Electricity Strategy (DPIE 2020a). The *Electricity Infrastructure Roadmap 2020* (DPIE 2020b) further builds on the state's energy policy platform by laying out the NSW government's 20-year plan to deliver Renewable Energy Zones, energy storage such as pumped hydro, and on demand supply like gas and batteries. The Roadmap complements the economic benefits of Project EnergyConnect and the NSW Government has committed to accelerate the development of Project EnergyConnect as one of four priority transmission projects.

A Memorandum of Understanding between the NSW and Commonwealth governments was signed in January 2020 with the objective of increasing gas and electricity supply in NSW, driving investment n transmission, achieving emissions reductions and working cooperatively with other States and Territories on areas of joint agreement and interest.

SA-NSW Interconnector

An interconnector to close the loop on South Australia's connection to the NEM was part of the South Australian government's energy policy platform when elected in 2018 and energisation of the Project by 2024–25 remains a significant priority for the government. As noted above, proceeding with Project EnergyConnect is regarded by AEMO as essential to protect SA from islanding and the resulting interventions that may be required to manage risks to system security.

The NSW government has also focussed on network connection through the NSW Transmission Infrastructure Strategy which is a plan aimed at encouraging private sector investment in priority energy infrastructure projects (DPE 2018). A NSW-SA interconnector is one of the four priority transmission projects under the strategy, as a means to unlock up to 750 MW of low-cost energy from SA and to assist in transmission of energy generated from renewable sources in the South-West Energy Zone of NSW to major demand centres.

The proposal for an interconnector between SA and NSW has been supported by governments of both States since the early 1990s and as noted above continues to be a priority of energy policy and planning in these two States. To this end, a Memorandum of Understanding on the establishment of an interconnector to carry electricity between SA and NSW was signed by the respective governments in

December 2018, establishing a framework for cooperation between the two governments that seeks to expedite the delivery of the Project.

2.6. The Need for a New Interconnector

2.6.1. Existing South Australian interconnections

Energy generated in SA is currently imported from and exported to the rest of the NEM via the Heywood and Murraylink interconnectors.

The Heywood interconnector comprises a 275 kV overhead transmission line between Heywood substation in Victoria and South East substation in SA. The interconnector was originally commissioned in 1989 and upgraded in 2015–16 from a nominal transfer capacity of 500 MW to a nominal design limit of up to 650 MW in either direction of flow. The Heywood Interconnector has generally operated at or near rated capacity, particularly during peak demand times in SA, with the upgraded capacity of 650 MW realised in the summer of 2018–19. Murraylink is a 180 km long 150 kV underground DC cable between Red Cliffs in Victoria and Monash in SA, with a much smaller 220 MW capacity commissioned in 2002 (AEMO 2018b).

These interconnectors are important transmission infrastructure as they are particularly relied upon during times of high power demand in SA. Should there be a loss of connection to the Heywood Interconnector, SA can effectively become separated from the rest of the NEM (i.e. 'islanded') due to limitations in the capacity and transmission infrastructure of Murraylink. This situation occurred in September 2016 and again in January and March 2020 and can leave the State's power system vulnerable to system interruption and potential outages.

Historically SA has been a net importer of electricity from Victoria with high utilisation of the Heywood Interconnector, however there has been a reversal in this trend following the retirement of the Hazelwood Power Station in Victoria, leading to SA being a net exporter of electricity in 2017–2018 for the first time in the preceding 10 years, a trend which continued through 2019–20 (AEMO 2020b) (refer Figure 2-7). SA achieved its first energy trade surplus in 2019 (AER 2020b).

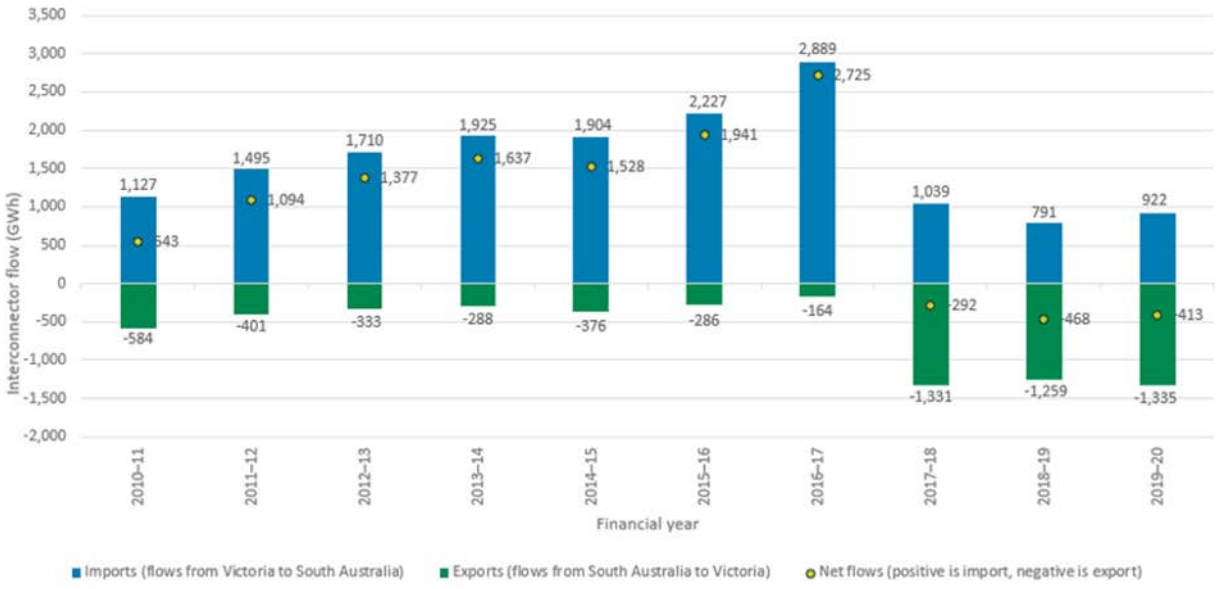


Figure 2-7: SA total interconnector imports and exports
(Source: AEMO 2020b)

SA and Victoria are characterised by similar weather patterns, with high correlation in renewable energy generation between the two states, as well as similar demand patterns with peak demand

occurring during summer. In contrast, NSW and SA are less closely correlated and in NSW peak demand historically arises in winter for heating. There remains a considerable diversity between the summer loads of NSW and those of SA and Victoria, and the weather patterns that drive the NSW summer demands are independent of the weather that drives demand in the southern States.

The reliance on one primary interconnector with Victoria, coupled with a high penetration of intermittent generation leaves SA vulnerable to extreme weather events and other disruptions. During extreme weather and prolonged summer conditions, there is a risk that supply through the Heywood Interconnector would be insufficient to meet South Australian demand. This situation is more likely to arise as Victorian coal fired generation retirements, such as Hazelwood Power Station, continue to occur in the coming years.

AEMO has highlighted that diversity in generation (fuel type and geographic distribution), as well as improved network interconnectivity is highly desirable to mitigate risks of supply interruption (AEMO 2017). The AEMC holds a last resort planning power to help ensure that sufficient investment in transmission infrastructure is occurring and assesses the need to invoke that power on an annual basis. The 2019 AEMC review was satisfied that inter-regional constraints associated with the Heywood interconnector and Murraylink (i.e. inter-regional transfers are limited in both directions) would be addressed by the proposed Project EnergyConnect interconnector (AEMC 2019).

In addition, investigations and modelling undertaken by AEMO at the request of the South Australian government determined that Project EnergyConnect was essential to reduce the likelihood of islanding of SA and to alleviate system security risks (AEMO 2020c). Constraints that limit imports on the Heywood interconnector during high solar PV generation periods have also been introduced by AEMO in response to the findings in (AEMO 2020d), to reduce the risk of SA separating from the NEM.

Direct interconnection between NSW and SA will provide the opportunity to utilise existing surplus electricity generating capacity in NSW during peak demand periods in SA and improve security and reliability of supply in SA.

2.6.2. Regulatory Investment Test for Transmission (RIT-T)

In line with AEMO's findings in the 2018 ISP which identified the benefits of an interconnector between SA and NSW, ElectraNet assessed the detailed economic cost-benefit of an interconnector through application of the RIT-T. The RIT-T is applied to all major network investments in the NEM and is overseen by the AER. The RIT-T process is discussed further in Chapter 3 Alternatives to the Project.

The South Australian Energy Transformation (SAET) RIT-T undertaken by ElectraNet explored the technical and economic feasibility of a new interconnector as well as alternative non-network solution options[5]. The four main options examined are shown in Figure 2-8 and are discussed in detail in Chapter 3 Alternatives to the Project.

The Project Assessment Draft Report (PADR)[5] prepared under the SAET RIT-T process found that of the options considered, Option C.3, comprising a new 330 kilovolt (kV) transmission between mid-north SA and Wagga Wagga in NSW, via Buronga (including a link upgrade between Buronga and Red Cliffs in Victoria), is expected to deliver the highest net market benefits (ElectraNet 2018).

As the final step in the process, a Project Assessment Conclusions Report (PACR)[5] was prepared by ElectraNet (ElectraNet 2019a) which further revised the credible options, addressed submissions from stakeholders and presented updated economic modelling. The analysis in the PACR took into account the extensive consultation and stakeholder engagement undertaken by ElectraNet over two years in

[5] South Australian Energy Transformation SAET RIT-T documents can be found here: https://www.electranet.com.au/projects/south-australian-energy-transformation/

the SAET RIT-T process, to ensure that the identified need for the investment as well as the options to address it, were thoroughly tested.

The SAET RIT-T process concluded that Option C.3 would result in the highest net market benefits and meet other objectives for security of supply in SA, energy affordability and support the transition of the Australian energy sector to a lower carbon emissions future. The AER announced its decision to approve the SAET RIT-T on 24 January 2020 , describing the business case for project as “robust” and determining that the proposed interconnector remained the most “credible option that maximises the net economic benefit” in the NEM, ultimately benefiting electricity customers (AER 2020c).

ElectraNet and TransGrid are proposing to deliver this option jointly as Project EnergyConnect involving construction of an approximately 900 km-long interconnector between SA and NSW with an added connection into Victoria.

An updated Cost Benefit Analysis undertaken by ElectraNet in September 2020 based on the latest information on the costs and benefits of the project – aligned with the inputs and assumptions of the ISP 2020 – confirms that Project EnergyConnect remains the preferred option under the RIT-T and continues to deliver positive net market benefits. While this was based on the central scenario under the ISP, this analysis also found that increased benefits could be expected under the majority of alternative scenarios considered in the ISP.

ElectraNet has lodged their Contingent Project Application (CPA) with the AER, which is the final step in the regulatory approval process.

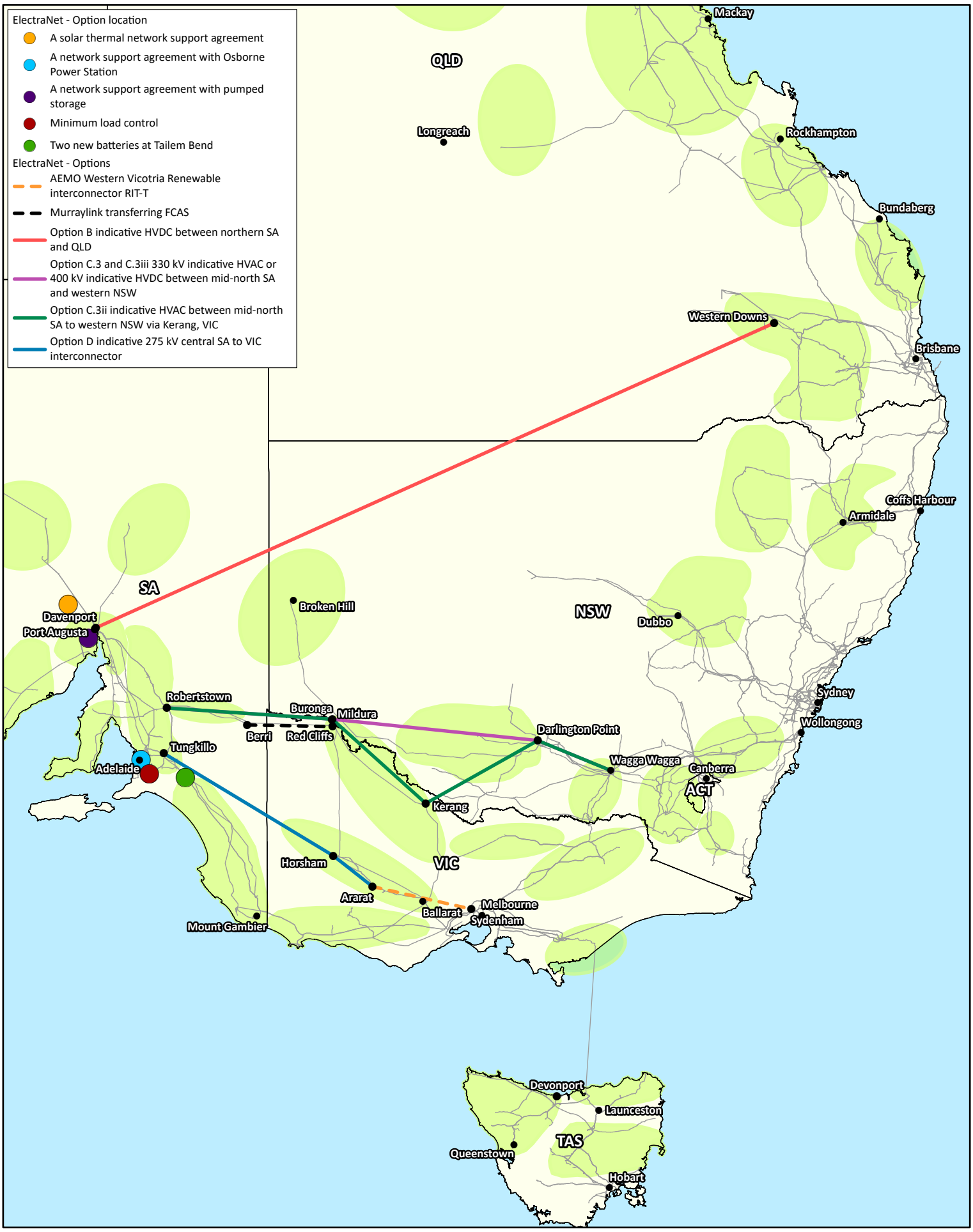


Figure 2-8
Overview of options assessed in SAET RIT-T

2.7. Benefits of Project EnergyConnect

Network interconnection provides a range of efficiency benefits which serve the long-term interests of consumers. These includes allowing electricity in lower priced regions to flow to higher priced regions, which dampens price volatility within regions and allows investment in generation and transmission to be optimised. Interconnection may also defer the need for investment in generation or intra-regional transmission which may otherwise have taken place, and contributes to reliability of supply across the NEM as regions can draw upon a wider pool of electricity supply and demand response (AEMC 2019).

The AEMC (AEMC 2019) has also noted that the growing proportion of generation coming from renewable sources is likely to increase the potential benefits of interconnection because:

- renewable energy sources are often geographically further removed from centres of demand than conventional generation
- the potential to exploit the geographic diversity of intermittent generation sources, may lead to more efficient generation siting decisions, and smoothing of the intermittency in aggregate across the NEM
- the potential for price separation between regions may increase as a result of lower variable-cost renewable energy in some regions
- the intermittency of some renewable energy sources such as wind and solar (without storage) in some circumstances may require sources of energy or load that can respond to instructions to increase or decrease output or usage to facilitate a reliable power supply. This may be provided by sources located in another region.

The proposed high-capacity interconnector is expected to provide a range of broader benefits to the NEM and will support State and Commonwealth energy policies through lowering energy prices, increasing access to and stimulating investment in renewable and low emission energy generation and improving security and reliability of the power network.

2.7.1. Overall economic benefits

The new 330 kV interconnector between SA and NSW will deliver substantial economic benefits as soon as it is commissioned. These would include:

- provision of diverse low-cost renewable generation sources to help service NSW demand going forward, particularly as existing coal-fired generators retire
- avoiding substantial capital costs associated with enabling greater integration of renewables in the NEM
- reduction in annual residential power bills by approximately $100 in SA and up to $63.90 in NSW, and corresponding larger savings for bigger customers
- delivery of flow-on economic benefits to the wider economy of more than $6 billion across SA and NSW
- generation of over 200 regional jobs in SA and over 80 regional jobs in NSW during construction, and create around 250 and 400 ongoing jobs in SA and NSW, respectively
- improving the ability of parties to obtain hedging contracts in SA and help relieve the tight liquidity in hedging markets currently.

The flow-on effect of the reduction in power bills on the wider economy is expected to be substantial, with a projected increase in total real income over the longer term of $2.4 billion in SA and $4 billion in NSW (in present value terms) through the construction and ongoing operation of the interconnector.

This is equivalent to an increase in average real income of $1,300 per person in SA and $500 per person in NSW in present value terms (ElectraNet 2019a).

2.7.2. Benefits for the region and local communities

Modelling undertaken for ElectraNet by ACIL Allen projected the Project's benefit to the real economic output in the SA host region over the period 2021 to 2040. The benefit in the region was predicted to be $120 million with $45 million during the construction phase and an average annual benefit of $4 million a year during the operations phase (ACIL Allen 2019)

A real increase in host region income from the Project over the same period of $163 million is predicted with $82 million during the construction phase and an average annual benefit of $4 million a year during the operations phase.

New opportunities will be provided for regional businesses, landowners and Councils to participate in renewable energy projects in the target REZs in regional SA as investors in new energy projects take advantage of the transmission capacity to distribute and sell their energy.

Direct jobs will be generated in regional and local communities during the construction and operation phases of the Project when a range of locally sourced goods and services will be required. Production and provision of these inputs will further increase the demand for labour across the regional economy.

Socio-economic impacts of the Project are discussed further in Chapter 17 Socio-economic Environment.

2.7.3. Benefits for South Australia

Energy policy outcomes

The proposed SA-NSW interconnector is a central policy commitment by the South Australian State government. Proceeding with Project EnergyConnect is regarded as essential by AEMO and will fulfill the commitments made by the SA government to protect the State from the effects of islanding, the risks posed from the dominance of solar PV in extreme conditions, and the need for expensive interventions to support the grid such as a moratorium on rooftop solar PV and retrofitting of existing household solar (DEM 2020).

The proposed interconnector will enable renewable energy generated electricity to be more easily exported to other states, meeting the agenda in the 'Climate Smart South Australia' policy statement which identifies opportunities for the State in low emissions electricity supply and as an overall exporter of renewable energy (DEW 2019a). It will also contribute to meeting the State's greenhouse gas emissions target to reduce emissions by at least 50% below 2005 levels by 2030, to achieve net zero emissions by 2050.

Lower electricity prices

The Project will enable surplus lower cost generation on the east coast of the NEM to be utilised to supply SA in the near term, reducing the State's reliance on expensive gas-fired generation. This will result in a reduction in the wholesale price of electricity in SA as soon as interconnection is established and a reduction in gas consumption for South Australian power generation, freeing up gas for other uses[6] (ElectraNet 2019a).

The ability for greater sharing of resources across NEM regions will help smooth demand and supply fluctuations, and in particular reduce reliance on increasingly expensive gas generation in SA, which will in turn reduce price volatility and trading risks.

[6] The positive net market benefits for the new interconnector identified in the SAET RIT-T were present for all future gas prices investigated.

As South Australian customers currently pay more for their electricity than most other regions in the NEM, a reduction in typical prices will be particularly important for vulnerable private consumers and for the competitiveness of South Australian industry. Independent economic modelling estimates that the greater supply, diversity and competition delivered by the new interconnector will reduce electricity prices by $100 for a typical annual residential bill in SA, and $200 for a typical annual small business customer bill (ElectraNet 2019a).

Increased security and reliability of supply

The Project will improve system security and resilience by reducing the vulnerability of South Australia's network to extreme weather events and system disturbances (and therefore the risk of islanding of the South Australian network) and help to mitigate system security risks under minimum demand conditions (AEMO 2018a, 2020a).

Reliability of supply to SA will be enhanced through connection into NSW energy supply which is less heavily reliant on renewable sources (AEMO 2018a).

Interconnection will also provide the flexibility to share demand and supply with two States and in particular with NSW which is more likely to have different weather patterns to those in SA and therefore different demand and supply scenarios.

It should be noted that due to the measures and investments put in place in SA since the 2016 state-wide power outage to address immediate system security challenges, the interconnector is no longer regarded as a primary source of system security. However, the interconnector will contribute to meeting system security standards in SA at lower cost (through reduction in the requirement for dispatch of higher cost gas generators in SA) than would otherwise be the case, through its impact in alleviating two constraints:

- the RoCoF[7] constraint on the operation of the existing Heywood interconnector, which limits the capacity of Heywood in certain circumstances
- the cap on the level of non-synchronous generation that may be online in SA due to system strength requirements.

Support for renewable energy

As SA became a net exporter of electricity in 2017–18, connection to NSW and Victoria will allow this extra capacity to be shared across more regions of the NEM (AEMO 2018a). The expanded capacity to export lower-cost renewable energy to the NEM will maintain SA as an attractive destination for investment in renewable energy projects such as large-scale solar installations and wind farms. The Project would enable REZs to be developed along the corridor, particularly the Riverland REZ which was identified by AEMO in the 2018 and 2020 ISPs as one of the potential opportunities for development of renewable energy projects in conjunction with the transmission investment options (e.g. interconnection).

Employment

The Project is expected to generate over 200 jobs in regional SA during the construction phase and create around 250 ongoing jobs in SA, in addition to the jobs generated in NSW and Victoria (ElectraNet 2019a).

[7] Rate of Change of Frequency

Economic output

Based on modelling undertaken by ACIL Allen, over the period 2021 to 2040, the interconnector Project is expected to increase the real economic output of SA by a cumulative total of $4.0 billion relative to the reference case using a real discount of 7%, equating to a net present value of $2.1 billion.

In the same period the Project is predicted to increase the real income of the State by a cumulative total of $4.4 billion relative to the reference case (with a net present value of $2.4 billion, using a 7 per cent real discount rate).

2.7.4. Benefits for New South Wales

Energy policy outcomes

The NSW Government has developed the NSW Electricity Strategy and the Net Zero Plan to support the transition of the NSW energy system in a manner which meets both energy generation needs and emissions reduction targets. Project Energy Connect will underpin these NSW policy objectives through supporting the unlocking of renewable energy generation in the priority REZs and increasing overall energy supply security for NSW which is typically a net importer of electricity (AER 2020b).

Lower electricity prices

Project EnergyConnect is also expected to lower electricity prices in NSW through the delivery of lower cost renewable energy from SA. Independent economic modelling estimates that the new interconnector will reduce typical annual residential bills in NSW by up to $63.90 (FTI 2020).

A new interconnector between SA and NSW will allow increased exports from existing and new high-quality renewable generation sources in SA and NSW, enabling supply requirements in NSW to be met at a lower cost than if NSW was required to draw on other generation sources, including new gas generation, to fill the gap.

Increased security of supply

As the electricity sector transitions, coal generators are expected to continue to retire from the market over the medium to longer term. The retirement of coal generation is expected to be most rapid in NSW where black coal is currently 48% of generation capacity but where 84% of the coal fleet will be progressively retired over the next 15 years (AEMO 2020a).

The new interconnector is scheduled to be in place around the time the coal-fired Liddell power station is due to retire from the market in NSW, providing timely additional transfer capacity to allow for the sharing of reserves between SA, Victoria (due to the Buronga to Red Cliffs augmentation) and NSW. Any earlier retirement of coal generation in NSW would accelerate delivery of these benefits.

Renewable energy zone connection

Project EnergyConnect would enable connection of a significant proportion of the renewable energy resources from the Riverland REZ in SA, Murray River REZ in Victoria and the South West Energy Zone in NSW, providing increased access to the Sydney and Adelaide load centres. This will permit greater exports from existing and new high-quality renewable generation sources in SA and western NSW, enabling supply requirements in NSW to be met at a lower cost than if the state was required to draw on other generation sources, including new gas generation, to fill the gap.

The interconnector will enable new intra-regional transmission costs to be avoided, which would otherwise be required to unlock additional renewable generation resources in the Murray River and Riverland REZs in the absence of a new interconnector. These REZs were identified by AEMO in the 2018 and 2020 ISPs as being priority areas to assist NEM transition (AEMO 2018a, 2020). By opening up these REZ's, new renewable energy projects can be developed to promote economies of scale in high-resource areas and capture geographic and technological diversity in renewable resources,

providing an effective, least-cost way to integrate new generation, storage, and transmission development.

Benefits would commence as soon as the interconnector is energised due to the addition of the Buronga to Red Cliffs augmentation facilitating lower cost connection of renewables under the Victorian Renewable Energy Target (VRET).

Employment

Project EnergyConnect is expected to generate over 800 regional jobs in NSW during construction, and around 700 ongoing regional jobs in NSW in addition to jobs created in SA and Victoria (ElectraNet 2019a). The opening up of REZ's would further boost employment in the regions as renewable energy projects are developed and connected to the NEM.

2.7.5. Benefits for Australia

Market benefits

By augmenting power transfer capability between regions, interconnectors enable the efficient sharing of generation resources between regions and can encourage more efficient investment on low-cost generation sources, enabling overall demand and system reliability requirements to be met at lowest cost.

In the longer term, an enhanced ability to export low-cost renewable power from SA will provide market benefits by enabling supply in other jurisdictions to be met at a lower overall cost, as existing coal-fired plant retires. This is particularly the case for new interconnection between SA and NSW, as NSW is forecast by AEMO to experience the greatest retirement of coal plant after 2030, and which otherwise would rely on higher cost sources of generation to fill the resulting supply gap (ElectraNet 2019a).

The RIT-T assessment undertaken by ElectraNet, found that the increased output from renewable generation that is projected to result from interconnection between SA and NSW, is also expected to deliver the following classes of market benefit:

- further reductions in total dispatch costs, by enabling low-cost renewable generation to displace higher cost conventional generation, including through the ability to harness geographic diversity across different renewable generation sources
- reduced generation investment costs, resulting from more efficient investment and retirement decisions, due to high quality renewables in SA, and diversification in generation leading to reduced need for firming capacity.

Assisting in meeting renewable energy and lower carbon emission targets

Initiatives put in place by the Commonwealth government to meet Australia's Paris Agreement commitment will lead to further replacement of some of Australia's emissions intensive generators with lower emission alternatives, such as renewable energy sources. In particular the progressive retirement of around half of the NSW coal fleet by 2035 (or sooner) means that alternative low emission supply sources will be required to fill this gap whilst meeting Australia's carbon emissions policy commitments.

SA has the highest level of wind energy generation in Australia, as well as a high uptake of rooftop solar PV and more recently grid scale solar installations (refer Figure 2-4) putting it at the forefront of renewable penetration levels in power systems across the world. Interconnection with NSW, as well as the existing Victorian connections, will allow more electricity generated from these renewable sources to be utilised by other states which will assist in Australia meeting carbon emission and renewable energy targets at the lowest long run cost (AEMO 2018a).

Resilience during unexpected events

The 2018 and 2020 ISPs identified that greater interconnection would improve the power system's resilience to be able to manage unplanned events, such as unexpected exits of coal and gas-powered generation.

Greater geographic diversity

The NEM is particularly exposed to climate change impacts. An increase in the frequency and intensity of extreme weather events can increase stress on the power system in several ways (Finkel 2017) including:

- structural vulnerability of transmission and distribution networks and infrastructure to extreme weather events
- reduction in generator efficiency due to high ambient temperatures leading to breakdowns and an increase in maintenance costs
- maximum operating temperatures for many elements in the power system above which they disconnect to avoid damage.

The interconnector will contribute to greater geographic diversity in the overall system and help manage the risk of climatic events, improving resilience and energy security during major weather events.

2.7.6. Ecologically sustainable development (ESD)

The Project also seeks to meet the objectives of ecologically sustainable development (ESD) whilst achieving the economic benefits outlined above. These objectives aim to ensure that individual and community wellbeing and welfare is enhanced through economic development that safeguards the welfare of both current and future generations, whilst protecting biological diversity and maintaining essential ecological processes. The objectives of ESD also underpin a number of the State and national legislative and strategic policy frameworks which are both driving and guiding the Project (refer Chapter 5 Legislative and Planning Framework).

The specialist studies and investigations undertaken for the Project have been designed to conform with accepted scientific and assessment methodologies to ensure their rigour, taking into account relevant statutory and agency requirements. The design and siting of Project infrastructure has evolved and continues to evolve based on the findings of expert investigations and stakeholder engagement to ensure the potential impacts of the Project are understood with a high degree of certainty.

The Project will provide intergenerational benefits by facilitating a more secure electricity supply in the near-term, and the transition of the energy sector across the NEM to low emission energy generation sources in the longer term. The Project will positively benefit economic activity at the local, regional and state level, increasing regional job opportunities and assisting in unlocking the future development of large-scale renewable energy generation within the Riverland, Murray River and South West NSW REZs, all of which are identified as priority areas to assist the NEM transition.

Where impacts to the environment or community from Project construction activities or its operation have been identified, measures to mitigate these impacts have been proposed to ensure that they are minimised or eliminated. No serious or irreversible damage to the environment has been indicated during the assessment of the Project's impacts.

2.8. Consequences of Not Proceeding with the Project

The Finkel Review into the future security of the NEM noted that the national electricity system is at a critical turning point caused by the significant and inevitable industrial, technological and economic changes underway. The review stated that if managed well, Australia will benefit from a secure and

reliable energy future; if managed poorly the nation's energy future will be less secure, more unreliable and potentially very costly.

The report acknowledged that Australia needs to increase system security and ensure future reliability in the NEM. Security and reliability have been compromised by poorly integrated variable renewable electricity generators, including wind and solar which has coincided with the withdrawal of older coal and gas-fired generators. The review recommended better system planning with AEMO having a stronger role in planning the future transmission network, including the development of a NEM-wide integrated grid plan to inform future investment decisions.

It was further recommended that significant investment decisions on interconnection between states should be made from a NEM-wide perspective. The 2018 and 2020 ISPs developed by AEMO identify a list of priority transmission projects for investment, as well as enable efficient development of new REZs across the NEM. The SA-NSW interconnector has been identified by AEMO as one of the immediate priorities that would deliver positive net market benefits as soon as it can be built.

The Project is an integral part of the delivery of the 2018 and 2020 ISPs prepared by AEMO to address the need to meet the national and regional energy reliability and security challenges posed by the transitioning energy sector.

Should the Project not proceed the following consequences could be expected nationally, for the State and the local region:

Table 2-4: Consequences and economic implications of not proceeding with the Project

Area of impact	Consequences and / or economic implications of not proceeding
National	• National policies and targets for emissions reduction may be undermined.
	• Net market benefits and flow-on downward pressure on electricity prices, facilitated by the interconnector, would not be realised.
	• Other potentially more costly solutions will be required to support the NSW energy market once the coal-fired Liddell power station is due to be retired in 2022.
	• The ability of the NEM to transition from traditional energy sources to lower emission alternatives including renewable energy will be weakened.
	• Over 1,000 construction jobs and 950 operations jobs forecast to be generated by the Project would not be created.
	• Opening up of new REZs with access to major load centres, particularly in the Riverland, south-western NSW and north-western Victoria would be jeopardised and risk the stranding of renewable energy assets.
State / Region	• SA and NSW policies and targets for emissions reduction may be undermined.
	• SA would remain vulnerable to widespread outages as the result of extreme weather events coinciding with high energy demand and limited connectivity with the rest of the NEM.
	• The predicted reductions in the wholesale price of electricity in SA as soon as interconnection is established would not be realised.
	• Failure to realise wholesale price reductions could result in the State foregoing benefits to economic output of a contribution to Gross State Product of approximately $1.9 billion to $2.6 billion in present value
	• The reduction in gas consumption for South Australian power generation resulting from the operation of the interconnector and the consequent freeing up gas for other uses will be jeopardised.
	• The predicted 200 construction jobs and 250 ongoing jobs would not be created in SA.
	• New opportunities for regional businesses, landowners and Councils to participate in renewable energy projects and to build the REZs in regional SA would be lost as investors in new energy projects typically will not invest unless they are sure there will be enough transmission capacity to distribute and sell their energy.

In particular delivery of Project Energy Connect is critical for the ongoing secure operation of the power system. As noted in (DEM 2020) AEMO has declared that if Project EnergyConnect (together with new smart standards for rooftop solar) does not proceed "a moratorium on new rooftop solar installations and other expensive interventions will be required to be able to maintain power system security" (DEM 2020).

Should the Project not proceed, the above consequences would be compounded by an energy system which is less able to accommodate future energy usage patterns which will be vastly different to the past, and unable to provide the increased system security and reliability that is imminently required for the South Australian network and the NEM (AEMO 2018a, ElectraNet 2016, AEMO 2020d).

2.9. Conclusion

Project EnergyConnect has been developed in response to the need to improve the reliability, affordability and sustainability of electricity supply in SA and the NEM.

The NEM is currently undergoing a significant period of transition from a largely centralised fossil-fuel generation fleet to a more variable, dispersed energy mix characterised by increased penetration of renewable energy generation, storage technology, wide-scale behind the meter applications and emerging technologies. These changes, particularly the growing market share of intermittent renewable energy generation, makes it increasingly important to ensure the NEM has a reliable and secure energy system which can respond to market needs at all times.

Project EnergyConnect will enable efficient sharing of generation resources between regions in the NEM and encourage more efficient investment in low-cost generation sources, enabling overall demand and system reliability requirements to be met at lowest cost (AEMO 2020a). It will also contribute to the geographic and technical supply diversity across the NEM required to mitigate risks of supply interruption.

Project EnergyConnect will also deliver substantial economic and strategic benefits to SA, NSW, Victoria and the broader Australian energy market as soon as it is operational. Project EnergyConnect is supported by both the SA and NSW governments in relation to priorities for energy security, energy prices for households and business, and support for the development of renewable and low emission energy generation, particularly in regional areas. In particular the economic case for Project EnergyConnect has been supported and strengthened by the recently released NSW Energy Infrastructure Roadmap.

Reliability of supply to SA will be enhanced through connection into NSW energy supplies through access to diversified energy sources (i.e. less reliance on renewable sources) and reducing South Australia's vulnerability to extreme weather events and system disturbances. NSW supply security will also be supported through opening access to South Australian generated energy as the process of the retirement of the NSW coal fleet continues. A new interconnector from SA to NSW will allow renewable energy from SA to assist the transition to lower carbon emissions in meeting national and State carbon emission and renewable energy targets at lowest long run cost.

Project EnergyConnect will allow greater exports from existing and new high-quality renewable generation sources in SA and south-western NSW to enable supply requirements in NSW to be met at a lower cost. As a 'no regret ' actionable project, it will also assist in unlocking additional renewable generation resources in the Murray River, Riverland and South West NSW REZs, which have been identified by AEMO in the 2018 and 2020 ISPs and in the NSW Energy Infrastructure Roadmap as being priority REZ areas. Project Energy Connect will assist NEM transition to lower emission alternatives, and aid the NSW and SA governments in achieving their goal to achieve net zero emissions by 2050.

It will facilitate the delivery of significant net market benefits and creation of downward pressure on wholesale prices which will flow on to electricity prices paid by customers.

Construction of the interconnector will generate in excess of 1,000 regional jobs in SA and NSW, with approximately 950 ongoing jobs to be created during operation of the interconnector.

In summary, there is strong justification for Project EnergyConnect on the basis of energy market needs, technical requirements, network security, economics and environmental outcomes.

EIS Volume 1 Chapter 3

Alternatives to the Project

JBS&G

project energy connect

Contents

3. Alternatives to the Project 3-1

3.1. Introduction 3-1
3.2. EIS Guidelines 3-1
3.2.1. Alternatives considered 3-2
3.3. 'Do Nothing' Alternative 3-2
3.4. Strategic Alternatives 3-3
3.4.1. Demand side management and distributed energy resources 3-3
3.4.2. Upgrades to the existing transmission network 3-5
3.4.3. Additional generation and storage capacity 3-6
3.5. Interconnector Alternatives 3-6
3.5.1. Economic Cost Benefit Assessment – RIT-T Process 3-6
3.5.2. Non-interconnector alternative (Option A) 3-8
3.5.3. Interconnector from South Australia to Queensland (Option B) 3-8
3.5.4. Interconnector with New South Wales (preferred Option C) 3-10
3.5.5. New interconnector to Victoria (Option D) 3-11
3.6. Outcomes of the Assessment of Interconnector Alternatives 3-13

List of Tables

Table 3-1: EIS Guidelines in the Alternatives to the Project chapter 3-1
Table 3-2: Aspects of assessment requirements addressed in other chapters 3-1
Table 3-3: Summary of future electricity market scenarios considered 3-7
Table 3-4: Options included in the PADR which were excluded from the PACR 3-10
Table 3-5: Summary of the credible options considered in the SAET RIT-T 3-13

List of Figures

Figure 3-1: Schematic example of a virtual power plant 3-4
Figure 3-2: Forecast annual operation consumption (sent out) with stacked components (neutral scenario) 3-5
Figure 3-3: Option B – HVDC interconnector between northern South Australia and Queensland 3-9
Figure 3-4: Option D – 275 kV line between central South Australia and Victoria 3-12
Figure 3-5: Summary of the estimated net market benefits under the central scenario in the SAET RIT-T 3-14
Figure 3-6: Options C 3 – 330 kV line between South Australia and New South Wales 3-15
Figure 3-7: Preferred option C.3 – South Australian – New South Wales Interconnector 3-16

3. Alternatives to the Project

3.1. Introduction

Chapter 2 Project Justification describes why the Project is needed and uses expert investigation findings and energy policy directions of key authorities including the Australian Energy Market Operator (AEMO), Australia's Chief Scientist, and Commonwealth and State governments to explain the benefits of the Project and justify its development.

This chapter provides an analysis of alternatives which have been considered by ElectraNet in designing the Project, to achieve the primary objective of delivering a net benefit to consumers and producers of electricity in terms of energy cost and security, and support for energy market transition.

The alternative options considered for an interconnector are discussed in this chapter. Further description of the route selection process through which the proposed route alignment was selected is provided in Chapter 4 Route Selection.

Detail on alternative design and construction techniques are discussed further in Chapter 7 Project Description.

3.2. EIS Guidelines

The EIS Guidelines in relation to the assessment of alternative options and technologies, routes, and design and construction techniques considered for the Project are provided in Table 3-1.

Table 3-1: EIS Guidelines in the Alternatives to the Project chapter

EIS Guidelines and Assessment Requirements	Assessment level
Alternatives *Assessment Requirement 11:* There are a number of alternatives that require exploring	
• 11.1: Provide a brief comparative social, environmental and economic analysis of broader alternatives that could meet the proposed objectives at the State level and in the Riverland region. For example, power supply options and technologies, demand management and upgrades of existing lines.	Medium
• 11.2: Provide a comparative analysis of alternative routes and the short, medium and long term social, environmental and economic advantages and disadvantages of each	Medium
• 11.3 Identify alternative design and construction techniques to meet the proposed objectives (e.g. undergrounding, tower design and placement), with reference to any hazards / risks and the social, environmental and economic advantages and disadvantages of each.	Medium
• 11.4: Assess the 'do nothing' option.	Medium

Aspects of assessment requirements identified in Table 3-1 above which are not addressed in this chapter are listed in Table 3-2 together with the applicable chapter.

Table 3-2: Aspects of assessment requirements addressed in other chapters

Assessment Requirement	Chapter
• 11.3 Identify alternative design and construction techniques to meet the proposed objectives (e.g. undergrounding, tower design and placement), with reference to any hazards / risks and the social, environmental and economic advantages and disadvantages of each.	Chapter 7 Project Description

3.2.1. Alternatives considered

The range of alternatives considered during evaluation of project feasibility which are discussed in this chapter include:

- '**Do nothing'** alternative
- **Strategic alternatives** – including demand / supply management alternatives, network upgrades and additional energy generation / storage capacity
- **Interconnector alternatives** – including potential interconnectors to other states (i.e. NSW, Queensland and Victoria)
- **Design alternatives** – including alternatives for proposed infrastructure design such as towers and their spacing, and transmission and technology alternatives.

3.3. 'Do Nothing' Alternative

The objective of the Project is to improve the affordability, reliability and sustainability of electricity supply in the National Electricity Market (NEM) by improving the transmission network between SA, NSW and Victoria. It is expected that achievement of these objectives will provide a wide range of benefits at a local, state and national level, as discussed in Chapter 2 Project Justification.

The 'Do Nothing' alternative requires an evaluation of whether not proceeding with the proposed Project would have consequences that outweigh the positive and negative impacts of the Project. Under a 'Do Nothing' alternative, the interconnector and its associated infrastructure would not be constructed. The land upon which such construction is proposed to occur (e.g. agricultural land and land reserved or managed for conservation purposes) would remain unaffected (unless developed for some separate purpose). As a consequence, the environmental impacts, identified in this EIS, both positive and negative, would not occur. Similarly the social and economic impacts to the region surrounding the Project, including the benefits of employment and business opportunities, would not eventuate.

However, it has been demonstrated in Chapter 2 that there is a significant need for the Project in order to improve energy security for SA, particularly during periods of high demand. Australia is in the midst of a widely acknowledged energy market transition which will see increased penetration of renewable energy in the NEM, particularly in regional areas, at a time when the network infrastructure available to support this transition is either at, or nearing capacity. The Project will support this transition and deliver net market benefits as described in Chapter 2.

The 'Do Nothing' alternative would have the following negative outcomes:

- Jeopardise the increased uptake of new renewable energy generation, both in SA and NSW, which would otherwise enhance energy trade and in turn lower wholesale energy prices, both of which are desired policy outcomes of the State and Commonwealth governments.
- Forego the economic benefits of the construction and operation of the transmission line that would otherwise flow to a region that is experiencing a reduction in agricultural and other economic activity.
- Compromise the ability of the NEM to accommodate varying energy usage patterns and withstand the problems caused by increased intermittency of renewable energy generation in the NEM.
- Fail to address the primary need for increased system security and reliability that has been identified as a key requirement for the South Australian network to address widespread power outages, such as those which occurred in 2016 (AEMO 2018a).
- Loss of the opportunity to enable supply requirements in NSW to be met at a lower cost.

- Necessitate greater investment in new energy infrastructure, either elsewhere in SA or the NEM more broadly, and at greater cost with lower net market benefits.
- Compromise the opening up of Renewable Energy Zones and uptake of renewable projects which will assist in the transition to lower carbon emissions and meeting national and State carbon emission and renewable energy targets.

The NEM is evolving rapidly with new technologies and varying usage patterns, as discussed in Chapter 2. The needs of the future will be vastly different to the past, and will require a strong network capable of tolerating a range of technologies across wide geographies to enable intermittency in demand and generation to be addressed (AEMO 2020a; ElectraNet 2016).

The 'Do Nothing' alternative is not viable, given the imminent need for improved reliability, affordability and sustainability of electricity supply both in SA and across the NEM.

3.4. Strategic Alternatives

The following strategic alternatives to address South Australia's existing vulnerability under the current NEM arrangements were considered and assessed against the objective of the Project[1]:

1. Increasing demand side management (DSM) measures and distributed energy resources (DER) within the South Australian network
2. Upgrading the existing transmission network
3. Adding generation and storage capacity within the South Australian network, including generation by, and storage of, renewable energy.

These alternatives are discussed in the following sections.

3.4.1. Demand side management and distributed energy resources

Demand side management

Demand side management (DSM) refers to actions taken by electricity supply managers to regulate when and how electricity is used, as an alternative to providing additional power supply to meet demand. During periods of peak electricity demand, electricity supply availability can be lower than that required to meet demand, leading to power outages which are managed by AEMO in consultation with the South Australian government, ElectraNet and SA Power Networks[2].

DSM can be implemented using a range of tools available to the market operator including:

- offering customers incentives to reduce their electricity use during peak times
- developing technology that gives electricity customers the ability to track their electricity use and manage load during peak times
- encouraging electricity customers to self-generate and store energy to relieve local demand pressures; and
- direct load control by turning off appliances or large loads during peak times.

The most widely known DSM measure is 'load shedding' which can affect industrial and residential customers and is considered a last resort during peak demand where other supply and DSM strategies have been exhausted.

[1] Refer Chapter 1 Introduction

[2] South Australia Power Networks (SAPN) is the distribution service provider in South Australia. SAPN are responsible for building, maintaining and operating the distribution network that delivers power to approximately 900,000 homes and businesses.

Distributed energy resources

Distributed energy resources (DER) are small-scale units of local generation connected to the grid at the distribution level. These include rooftop solar PV units, natural gas turbines, microturbines, wind turbines, biomass generators, fuel cells, battery storage, electric vehicles (EV) and EV chargers. Increased use of DERs can help relieve pressure on the power network during peak demand with these separate elements working together to form distributed generation.

South Australian initiatives underway to encourage building and integration of DER include:

- The South Australian government Home Battery Scheme initiative supporting the installation of residential batteries which are capable of enrolling in virtual power plant (VPP) aggregations (refer Figure 3-1).
- The South Australia 's Virtual Power Plant initiative in partnership with major VPP operators for the roll-out of solar and battery storage systems to South Australian homes.

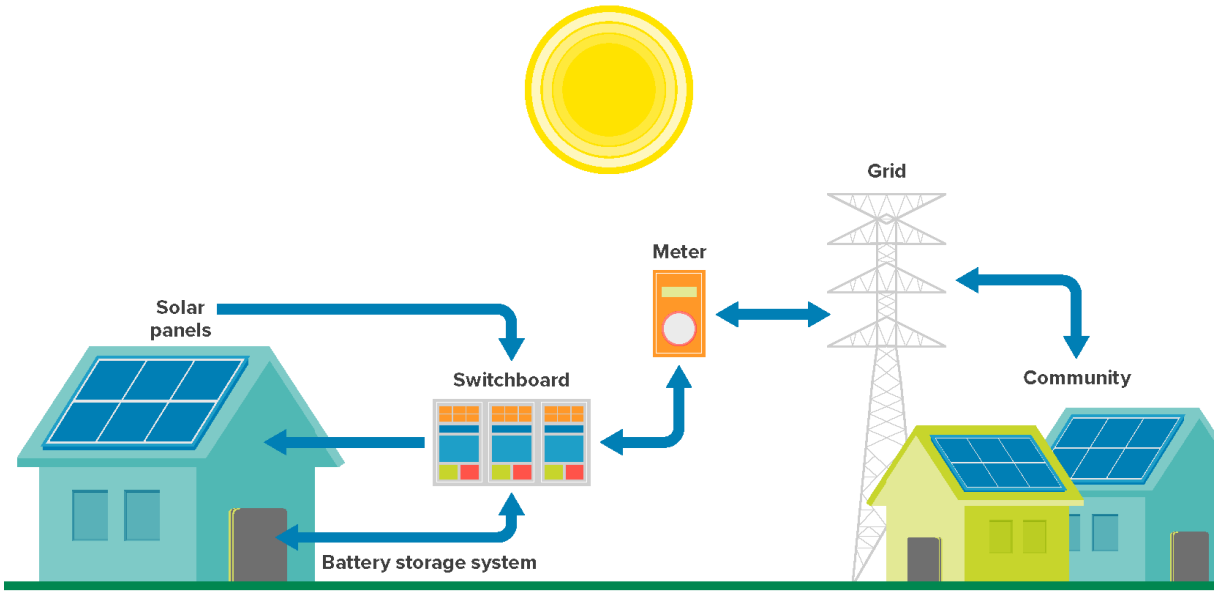


Figure 3-1: Schematic example of a virtual power plant

Interaction of DSM and DER in South Australia

Historically, the trend of wholesale energy consumption in SA has been declining since 2001–2012, as a direct result of DSM, uptake of DER (primarily rooftop PV) and adoption of more energy efficient appliances (AEMO 2018a).

In relation to long term forecast demands, ongoing improvement in energy efficiency of appliances, including air-conditioning, and better insulation of houses is expected to reinforce this trend. Business energy consumption is also forecast to remain relatively flat, as growth in the state economy is offset by the decline in consumption due to commercial rooftop PV installations and business sector energy efficiency programs. Electric vehicle consumption is forecast to rise and largely offset the drop in residential consumption. (AEMO 2020b) (refer Figure 3-2).

Uncertainty in near-term forecast demand has increased substantially due to COVID-19, as the economic and social impact of drivers such as activity and movement restrictions are unprecedented and have dramatically altered the consumption patterns of the population. In 2020–21, the economic effect of COVID-19 is forecast to lower consumption for the business sector. This is partly offset by a

forecast increase in residential consumption, partially as a result of increased daytime residential occupancy resulting from increased work-from-home arrangements.

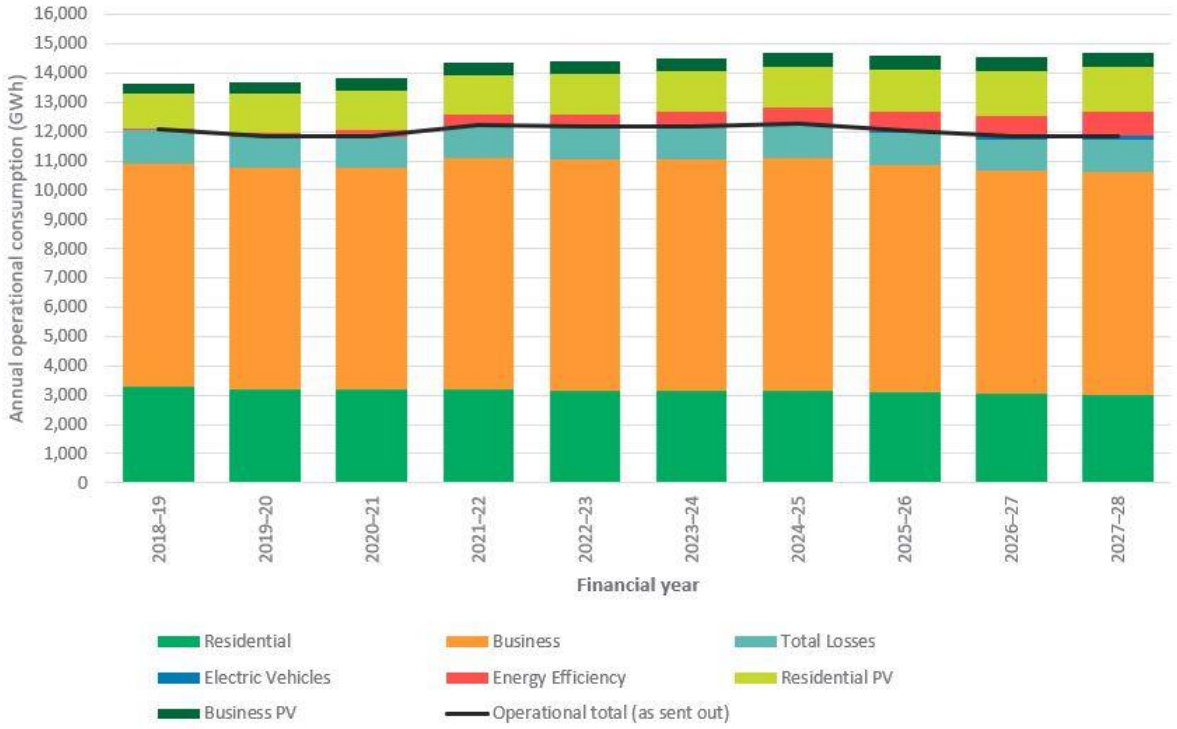


Figure 3-2: Forecast annual operation consumption (sent out) with stacked components (neutral scenario).
Source: AEMO 2020b

DSM in SA is therefore well advanced and is an important contributor to managing periods of high and peak demand to reduce net consumption and minimise risk of energy deficit. DER are also one part of the portfolio for cost-effective replacement of existing thermal energy generation which includes utility-scale renewable generation, energy storage, flexible thermal capacity including gas-powered generation (GPG), and transmission (AEMO 2020a).

Growth of DER is largely consumer driven and until recently unrestricted by policy settings, and to that extent introduces an element of uncertainty to the energy generation mix. AEMO has recently investigated this further which has resulted in recommendations to AEMC in relation to DER performance standards, compliance processes, feed-in management and importantly, the delivery of Project EnergyConnect to address this uncertainty (AEMO 2020c). In December 2020, AEMC released an alternative solution as a draft rule to allow for small DER systems, primarily rooftop PV, to be better managed in the NEM. The rule sets minimum technical standards for newly connected and replacement systems to reduce uncertainty about the performance of DER systems. The current uncertainty undermines the ability of AEMO to manage voltage disturbances and maintain grid stability. AEMC is undertaking stakeholder consultation until early 2021 (AEMC 2020b).

It is considered that increased DER and DSM on their own are not only insufficient to address the need identified in the Integrated Systems Plan (ISP) for SA to have more reliable and secure electricity supply (AEMO 2018a), but are creating weaknesses in the system. DSM strategies alone cannot address the need for increased energy security and affordability, and increased penetration of renewable energy within the NEM, particularly during major system interruption and outages.

3.4.2. Upgrades to the existing transmission network

As discussed in Chapter 2, power in SA is currently imported from, and exported to the rest of the NEM only via the 275 kV Heywood and 150 kV Murraylink interconnectors with Victoria. The Heywood

Interconnector has historically been a significant gross importer of power particularly during peak demand times in SA, whereas Murraylink has 220 MW of capacity which is constrained by the thermal overloads on infrastructure at either end of the transmission line (AEMO 2018b). There is no interconnector between SA and NSW.

Should there be a loss of connection to the Heywood Interconnector, SA can effectively become separated from the rest of the NEM (i.e. 'islanded'). Whilst Murraylink is still capable of power transfers, it does not provide a synchronous connection between South Australia and Victoria. This situation would leave the State's power system vulnerable to system interruption and outages as occurred in September 2016 and the summer of 2020.

Upgrades to the existing transmission network alone, would fail to deliver a key objective of Project EnergyConnect which is to enhance the security of electricity supply in SA by providing a second major interconnector to the rest of the NEM. In contrast, direct interconnection between NSW and SA will provide the opportunity to utilise existing surplus electricity generating capacity in both SA and NSW during peak demand periods in either state (as they tend to have uncorrelated maximum demand conditions), and improve security and reliability of supply in SA.

3.4.3. Additional generation and storage capacity

Additional generation and storage capacity initiatives in SA (predominantly in association with renewable energy) that were committed and publicly announced by mid-November 2020, totalled an increase of more than 10,000 MW from more than 50 projects. Of these, renewable energy sources (wind and solar) comprised the majority of the increase from a capacity perspective. There was also an increase in the amount of new battery, pumped hydro, and gas-fired peaking projects publicly announced compared to the year before (AEMO 2020d).

While it is considered unlikely that all of these projects would proceed to operation, it is anticipated that local supply and storage will continue to increase in SA. However, given the predicted ongoing dominance of renewable energy sources and the resulting issues in relation to system stability caused by the intermittent nature of renewable energy, additional generation and storage capacity would be unlikely to bring the same level of reliability and security to electricity supply when compared to the proposed interconnector. Importantly, it is anticipated that the proposed interconnector will not only support reliability and security, but will also enhance opportunities for new energy projects to be developed and export energy to the rest of the NEM[3].

3.5. Interconnector Alternatives

3.5.1. Economic Cost Benefit Assessment – RIT-T Process

As noted in Chapter 2, the primary examination of alternatives to the Project was undertaken in the SAET RIT-T[4] process by ElectraNet overseen by the Australian Energy Regulator (AER).

The RIT-T is an economic cost benefit test and applies to all major network investments in the NEM. It involves consultation with stakeholders, assessment of the impacts of key variables under a range of future scenarios, consideration of alternatives, and presentation of the findings of the process, the recommended solution and the intended course of action.

The purpose of the RIT-T process is to identify the transmission investment option which will maximise net economic benefits and where applicable, meet the relevant reliability standards. The process

[3] One of the critical factors for selecting the location for the Neoen Goyder South Hybrid Renewable Energy Facility was the site's proximity to the proposed Project EnergyConnect SA-NSW interconnector (GHD 2020)
[4] South Australian Energy Transformation - Regulatory Investment Test for Transmission

ensures that the final recommended solution will have the desired long term economic and social benefits, meet mandated reliability standards and can be scaled with changing electricity demands.

Three future electricity market scenarios were considered in the SAET RIT-T (ElectraNet 2019a). These scenarios reflect different assumptions that affect the relative market benefits of the options being considered, including:

- future market development
- long-term gas prices
- fluctuating electricity demand
- technology uptake and emissions reduction policy targets (at both State and Commonwealth levels).

The assessment was tested to a wide range of sensitivities, including the outcomes of the concurrent Western Victoria RIT-T, the assumed timing of gas generator retirements in SA, differences in assumed future mining load developments in SA and the estimated costs of the various options. (ElectraNet 2019a).

The three future scenarios assessed in the SAET RIT-T are presented in Table 3-3.

Table 3-3: Summary of future electricity market scenarios considered

Low scenario	Central scenario	High scenario
Reflects the state of the world with low gas process, low demand and no emissions reductions targets over and above the existing large-scale renewable energy target (LRET).	Reflects the best estimate of the evolution of the market going forward and is aligned in all material aspects with AEMO's ISP neutral scenario.	Reflects a state of the world with high gas prices ad high demand, alongside aggressive emissions reduction targets.

The SAET RIT-T then considered a range of interconnector alternatives which were evaluated against the scenarios above, consistent with the network planning options identified in the ISP prepared by AEMO in 2018. Four main options were examined:

- network support and non-network options internal to SA (Option A)
- new interconnection with Queensland (Option B)
- new interconnection with NSW (Options C.1, C.2, C.3, C.3ii, C.3iii, C.4 and C.5)
- additional interconnection with Victoria (Option D).

A range of variants to these options were evaluated within the SAET Project Assessment Draft Report (PADR) (ElectraNet 2018) and SAET Project Assessment Conclusions Report (PACR) (ElectraNet 2019a) to assess a range of inputs, address submissions from various stakeholders and test tolerances of assumptions, as discussed below.

The interconnector options discussed in this chapter are shown below in Figure 3-3, Figure 3-4, Figure 3-6 and Figure 3-7.

It should be noted that the RIT-T process operates as a detailed economic assessment of the costs and benefits of alternative interconnector options, undertaken to assess the ability to meet applicable economic benefit and reliability standards objectives. Due to the very high capital cost of this type of infrastructure, these economic and operational aspects are the decisive consideration in whether or not to proceed with a particular option. As a result, social and environmental advantages and disadvantages are explicitly removed from consideration in the RIT-T and have therefore not been analysed in this chapter. These aspects are however, of primary importance in selecting the alignment of the preferred option and are fully explored in the assessment undertaken in this EIS, as detailed in Chapter 4.

3.5.2. Non-interconnector alternative (Option A)

The technical and economic feasibility of non-interconnector solutions was explored by ElectraNet to evaluate whether new generation, storage and DSM could deliver equivalent net market benefits to new transmission interconnection.

Option A was developed as a 'least-cost' option for assessment as part of the PADR, and was designed to prevent a system black event that would likely occur from a loss of the existing Heywood interconnector (ElectraNet 2018). The energy system components in SA that were assumed to be present as part of the assessment of this option included the following:

- pumped storage (Port Augusta)
- Osborne co-generation
- solar thermal at Davenport
- battery energy storage system (BESS) – Tailem Bend
- Murraylink (transfer of Frequency Control Ancillary Services (FCAS))
- an additional BESS (location to be determined)
- minimum load control (to enable control of solar PV installations, which would be directly invested in by ElectraNet).

Although it provided considerable diversity in generation and storage options within SA, the non-interconnector option was estimated to deliver negative to low net market benefits in the scenarios modelled, when compared to the other options considered (refer Table 3-5).

This option also did not materially lower dispatch costs or facilitate the broader market transition to lower carbon emissions compared to the other alternatives considered. It also did not meet the defined minimum system performance levels under all conditions or provide the same system security benefits compared to a new interconnector (ElectraNet 2019a).

3.5.3. Interconnector from South Australia to Queensland (Option B)

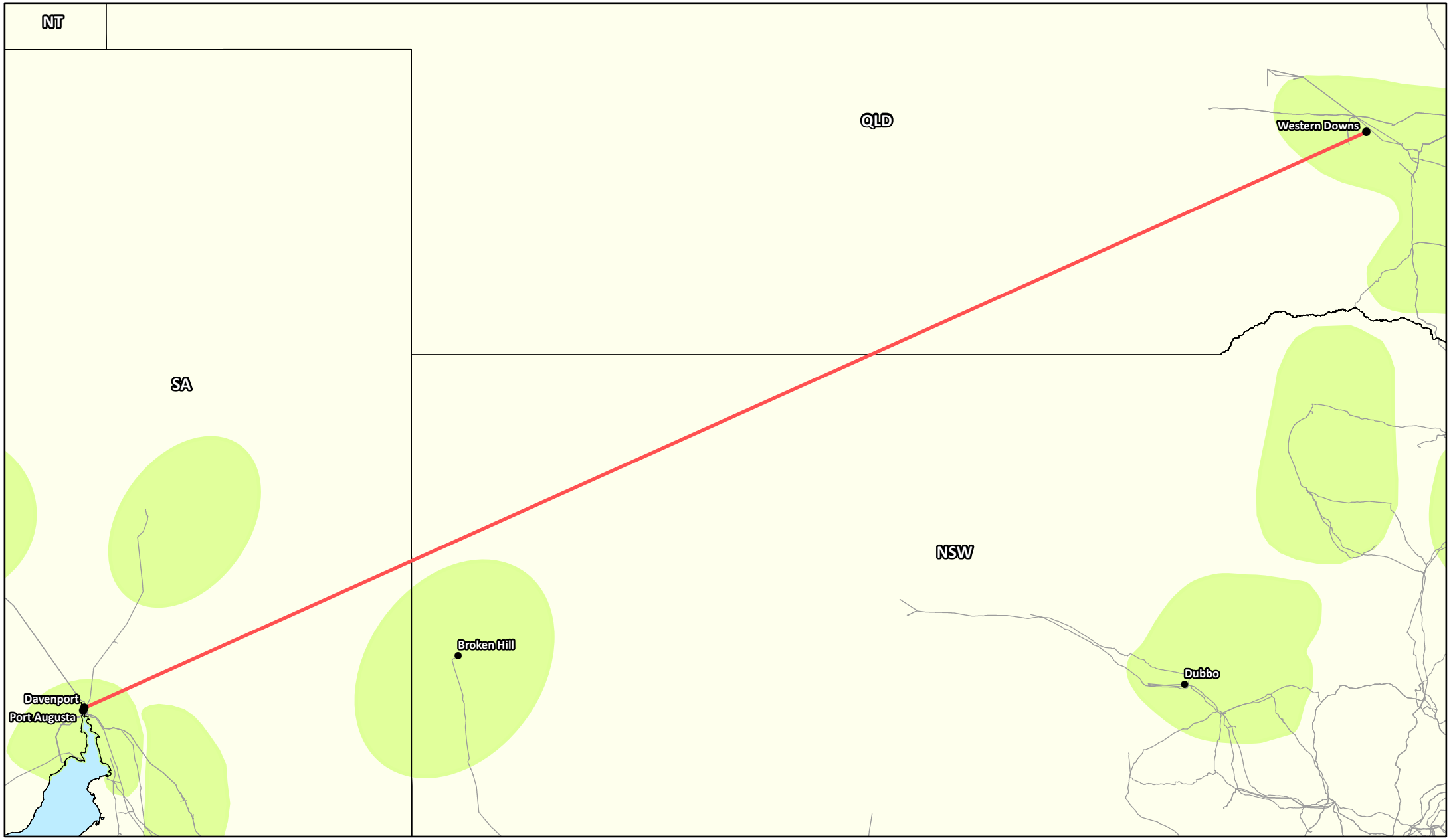
A new interconnector between northern SA and Queensland was assessed as Option B in the SAET PACR (refer Table 3-5 and Figure 3-3).

This proposed alternative comprised a high capacity high-voltage direct current (HVDC) interconnector approximately 1,450 km in length with an assumed capacity of 700 MW and a cost of $1.98 billion. The indicative route assessed for this option was assumed to be between Davenport in SA, traversing the north-west of NSW (linking to the Broken Hill REZ), before connecting into the Queensland network at Western Downs (ElectraNet 2019a).

Transmission costs and losses were forecast to be high due to the length of the line. However strong connection nodes at each end meant that this option had a reduced risk of constraints compared to the NSW interconnector options. Due to its length, this option had the highest forecast capital cost at $1.98 billion, and would traverse significant distances of sparsely populated land with poor infrastructure, low industry penetration and low energy demand (ElectraNet 2018).

A range of assumptions and tolerances were therefore investigated relating to the inclusion of converter stations which would enable renewable generation (wind and solar) within REZs along the route, including Broken Hill. The PACR found that the cost of the converter stations was higher than the benefits expected to be realised by them, and that the net market benefits were negative, but removal of the converter stations did not affect the selection of the preferred option (ElectraNet 2019a).

The net market benefits for Option B were assessed to be lower than the interconnector options between SA and NSW (ElectraNet 2019a).



ElectraNet - Options

- Option B indicative HVDC between northern SA and QLD
- Existing electrical infrastructure
- Renewable Energy Zone (REZ)

Figure 3-3
Option B – HVDC interconnector between northern South Australia and Queensland

0 200
Kilometres

N

ElectraNet
energy connect
JBS&G

3.5.4. Interconnector with New South Wales (preferred Option C)

The PADR identified new interconnection between SA and NSW via Buronga as the option that best satisfied the RIT-T, which reinforces the findings of AEMO in the 2018 ISP.

Five key options were evaluated in the PADR with a range of minor variants (ElectraNet 2018):

- Option C.1 – New DC link from Riverland SA to NSW ('Murraylink 2')
- Option C.2 – 275 kV link from Mid North SA to Wagga Wagga in NSW, via Buronga
- Options C.3 and C.3i – 330 kV line from Mid North SA to Wagga Wagga in NSW
- Option C.4 – 330 kV line from Mid North SA to Wagga Wagga NSW, via Darlington Point
- Option C.5 – 500 kV line from Northern SA to east NSW.

A full and detailed analysis of each of the options above, including some minor variants, is provided by ElectraNet in the PADR (ElectraNet 2018). The PADR highlighted that there were a number of aspects of the options into NSW that required further investigation to refine the scope, including the compatibility of fixed series compensation[5] with the connection of new renewable generation and the potential benefits of strengthening the link between Buronga in NSW and Red Cliffs in Victoria.

Following extensive consultation and feedback on the PADR, these aspects were evaluated for each of the options and ElectraNet concluded that a number of the options were no longer feasible, as shown in Table 3-4 (ElectraNet 2019a).

The subsequent PACR assessment further considered three option variants relating to new interconnection between SA and NSW, via Buronga. Two of these variants were developed in response to submissions on the PADR (C.3ii and C.3iii). The three route alternatives which were considered in detail in the PACR are discussed further in Section 3.6 and shown in Figure 3-6.

Table 3-4: Options included in the PADR which were excluded from the PACR

Description	Reason for exclusion for PACR assessment
Option C.1 New DC link from Riverland SA to NSW ('Murraylink 2')	PADR assessment showed low or negative net market benefit. This option was proposed in a submission to the PSCR[6], but there were no supporting submissions following the PADR assessment.
Option C.2 275 kV line from Robertstown in SA to Wagga Wagga NSW, via Buronga	PADR assessment showed substantially lower net market benefit than for other options. Refinements to the market modelling in the PACR to better capture benefits associated with avoiding transmission investment associated with REZs would not change this outcome. These benefits would not accrue to the 275 kV option as much as the 330 kV option whilst increasing benefits associated with the 330 kV options.
Option C.3i 330 kV line from Robertstown in SA to Wagga Wagga NSW, via Buronga, plus series compensation (or similar)	Further technical assessment confirmed that addition of series compensation may restrict the connection of renewable generation due to technical consideration, reducing benefits associated with renewable energy development. Specifically, the deployment of fixed series compensation on lines posed the risk of sub-synchronous resonance and sub-synchronous control interactions, if new generators are connected in the proximity to the series capacitors. This assessment also identified that series compensation is no longer needed in order to reduce constraints on the combined operation of the Heywood interconnector and a new interconnector, due to changes in proposed network configuration under this option and with reasonable levels of load shedding.

[5] Series compensation techniques are used to modify the natural electrical characteristics of an electric power system. Series compensation modifies the reactance parameter of the transmission system, in other words it reduces voltage drop over long distances.

[6] Project Specification Consultation Report

Description	Reason for exclusion for PACR assessment
	In effect, this option became redundant,
Option C.4 330 kV line from Robertstown in SA to Wagga Wagga NSW, via Darlington Point	Further technical assessment showed that bypassing Buronga en route to Darlington Point would not capture benefits associated with avoided REZ transmission, and would also have a higher cost associated with the requirement to include an additional switching station to manage system technical performance.
Option C.5 500 kV line from Northern SA to east NSW	PADR assessment showed low or negative net market benefit associated with this option, driven by its substantially higher cost. Refinements to the market modelling in the PACR to better capture benefits associated with avoiding transmission investment associated with REZs were not expected to fundamentally alter this outcome, given the magnitude of the option cost.

3.5.5. New interconnector to Victoria (Option D)

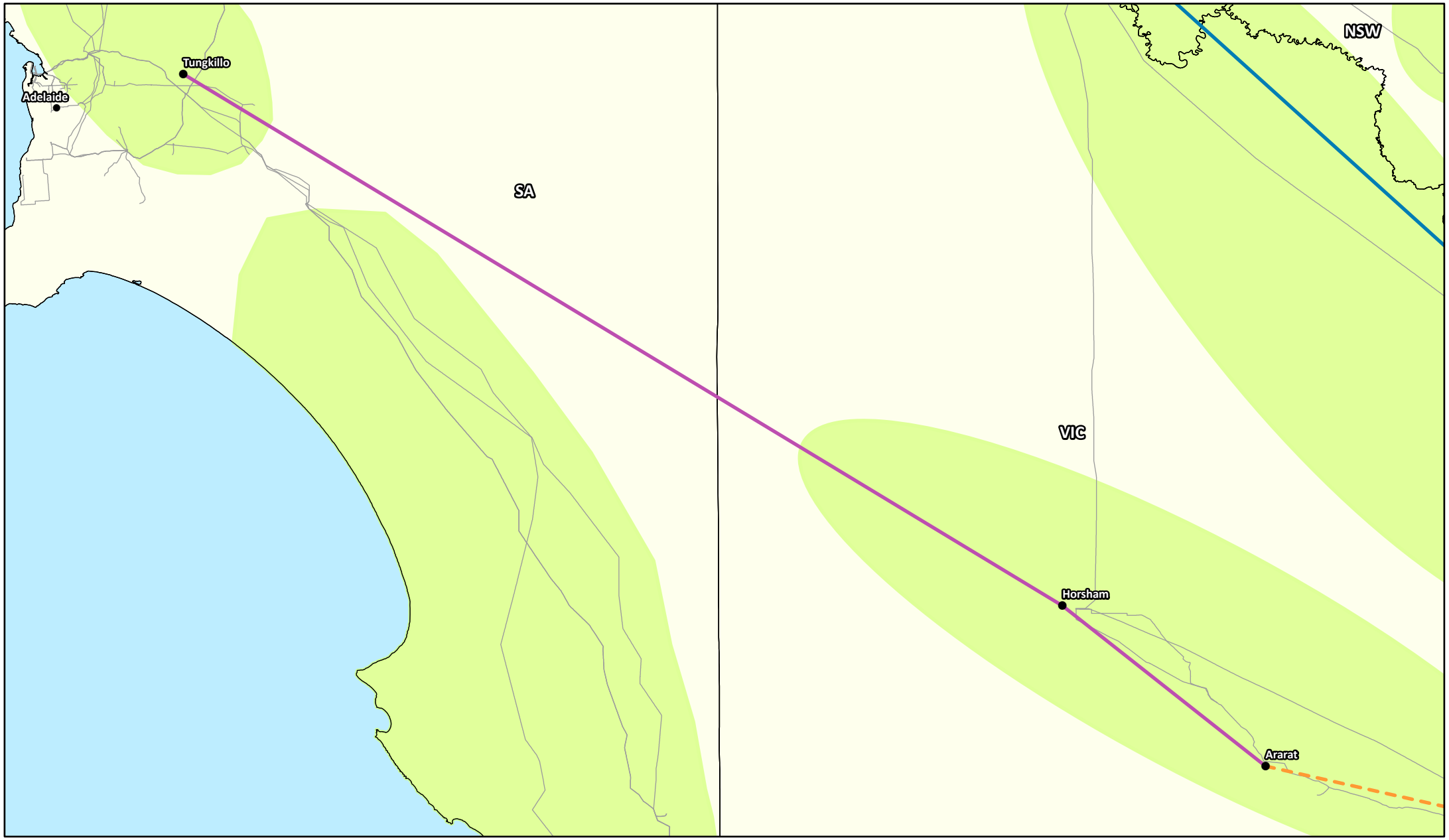
A new 275 kV line interconnector into Victoria from central SA was assessed as Option D (refer Table 3-5 and Figure 3-4).

This option was considered to strengthen South Australia's connection to the east coast by providing an increase in export and import capability. The indicative route investigated was approximately 420 km in length between Tungkillo in SA to Horsham in Victoria, with an additional 90 km between Horsham and Ararat. This option was assessed with a minimum capacity of 650 MW and a capital cost of approximately $1.2 billion.

Option D.i was also considered which included 50% series compensation between Horsham and Tungkillo, to reduce constraints that would otherwise occur on the combined capacity of the existing Heywood interconnector and a new interconnector. This increased the effective capacity across both interconnectors from around 950 MW to 1,100 MW and cost an additional $30 million to Option D (ElectraNet 2018). In the PACR, ElectraNet identified that series compensation was likely to restrict the connection of renewable generation, reducing benefits associated with renewable energy development and that series compensation was no longer needed in order to reduce constraints on the combined operation of the Heywood interconnector and a new interconnector. Option D.i was therefore excluded from further assessment with the benefits being captured directly by Option D (ElectraNet 2019a).

The PACR concluded that Option D was the top ranked non-NSW option under the central scenario (refer Table 3-3) which reflects the best estimate of the evolution of the market going forward (ElectraNet 2019a). However, a material risk of bushfire was associated with this option due to the area traversed and this was also incorporated into the assessment. A severe bushfire could potentially lead to coincident and widespread damage to both the existing Heywood interconnector and a new interconnector, resulting in an extended time period to bring them back into service. Network hardening was also required to be included in the capital costs to ameliorate this bushfire risk, which reduced the net market benefits of this option (ElectraNet 2018).

Although this option is the top ranked non-NSW option considered, all the NSW interconnector alternatives options (Option C.3, C.3ii and C3.iii in Table 3-5) are expected to deliver higher net market benefits than a new interconnector to Victoria, and this finding was found by the RIT-T to be robust across a wide range of future scenarios and sensitivity tests (ElectraNet 2019a).



ElectraNet - Options

- AEMO Western Victoria Renewable interconnector RIT-T
- Option C.3ii indicative HVAC between mid-north SA to western NSW via Kerang, VIC
- Option D indicative 275 kV central SA to VIC interconnector

- Existing electrical infrastructure
- Renewable Energy Zone (REZ)

Figure 3-4
Option D - 275 kV line between central South Australia and Victoria

0 50
Kilometres

N

ElectraNet

energy connect

JBS&G

3.6. Outcomes of the Assessment of Interconnector Alternatives

As described in Section 3.5.4, an interconnector between SA and NSW was considered the preferred option in the SAET PACR.

Three interconnector options between the two states were considered to be viable alternatives for delivering net market benefits within the RIT-T process (refer Figure 3-6):

- Option C.3 – 330 kV line between Robertstown in Mid North SA and Wagga Wagga in NSW, via Buronga, plus Buronga-Red Cliffs 220 kV
- Option C.3ii – 330 kV line between Robertstown in Mid North SA and Wagga Wagga in NSW, via Buronga, Red Cliffs, Kerang and Darlington Point
- Option C.3iii –HVDC transmission between Robertstown in Mid North SA and Darlington Point via Buronga; high-voltage alternating current (HVAC) line between Darlington Point and Wagga Wagga in NSW, plus Buronga-Red Cliffs 220 kV.

Of these interconnector options, Option C.3 (refer Figure 3-7) was found by the RIT-T to deliver the highest net market benefits, and across all reasonable future scenarios and sensitivities. The relative costs and capabilities of the credible options considered are summarised in Table 3-5 and Figure 3-5 (ElectraNet 2019a).

Table 3-5: Summary of the credible options considered in the SAET RIT-T

Overview[7]	Capital cost	Annual contract cost	Notional Maximum Capability (MW)[10]	
			Heywood	New interconnector
'Non-interconnector' option				
Option A – Least cost non-interconnector option in SA	$3 m	$110 m[11]	650	-
An interconnector to Queensland				
Option B – 400 kV HVDC between north SA and Queensland	$1.98 b	-	750	700
NSW interconnector options				
Option C.3 – 330 kV line between Robertstown in Mid North SA and Wagga Wagga in NSW, via Buronga, plus Buronga-Red Cliffs 220 kV	$1.53 b	-	750	800
Option C.3ii – 330 kV line between Robertstown in Mid North SA and Wagga Wagga in NSW, via Buronga, Red Cliffs, Kerang and Darlington Point	$1.73 b	-	750	800
Option C.3iii – HVDC transmission between Robertstown in Mid North SA and Darlington Point via Buronga; HVAC line between Darlington Point and Wagga Wagga in NSW, plus Buronga-Red Cliffs 220 kV.	$1.64 b	-	750	800
A new interconnector to Victoria				
Option D – 275 kV line from Tungkillo in SA to Horsham and Ararat in Victoria	$1.15 b	-	750	650

[10] *The notional maximum capabilities are not to be treated as additive due to network interactions. For example, the preferred option is modelled to deliver approximately 1,300 MW of combined transfer capacity.*

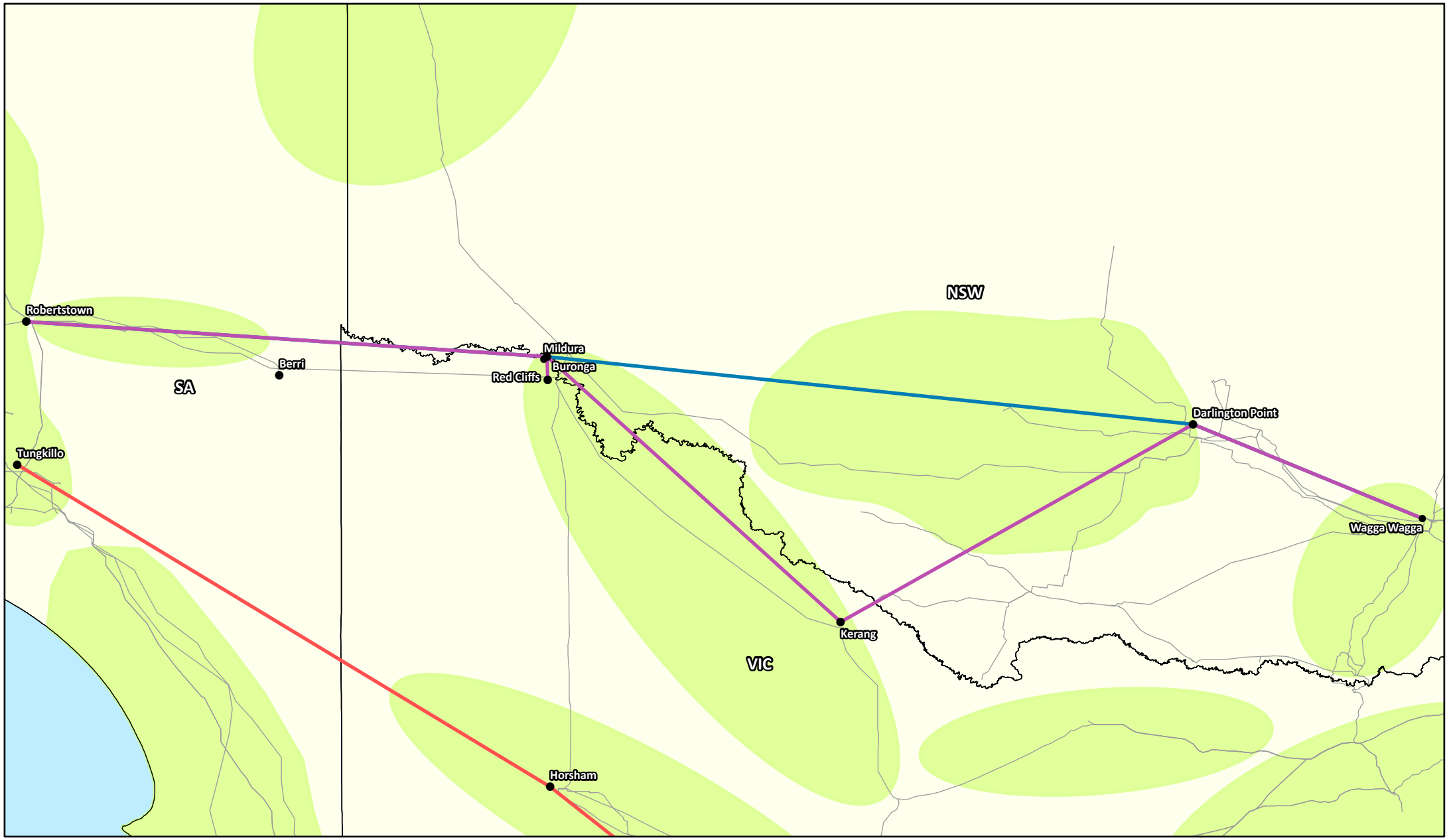
[11] *This figure is for the central scenario and is the average over each year of the assessment period*

[7] For the purposes of this chapter the assessment of options discussed in Table 3-5 refers to the central scenario described in Table 3-2 which is consistent with the neutral scenario identified in the ISP.

Figure 3-5: Summary of the estimated net market benefits under the central scenario in the SAET RIT-T
(Source: ElectraNet 2019a)

Following the selection of Option C.3 as the preferred option, a rigorous route selection process was undertaken to evaluate a range of route alternatives using a multi-criteria analysis (MCA). The MCA process covers the full ambit of environmental, economic, social and technical issues to identify a preferred corridor which was subsequently refined to include a proposed alignment that minimises impacts. A description of the route selection and route alternatives process leading to the identification of the proposed route alignment for the transmission line is provided in Chapter 4 Route Selection.

The 'Do Nothing' alternative has been excluded for the reasons described in Section 3.3.



ElectraNet - Options

- Option D indicative 275 kV central SA to VIC interconnector
- Option C.3 and C.3iii 330 kV indicative HVAC or 400 kV indicative HVDC between mid-north SA and western NSW
- Option C.3ii indicative HVAC between mid-north SA to western NSW via Kerang, VIC
- Existing electrical infrastructure
- Renewable Energy Zone (REZ)

Figure 3-6
Options C 3 – 330 kV line between South Australia and New South Wales

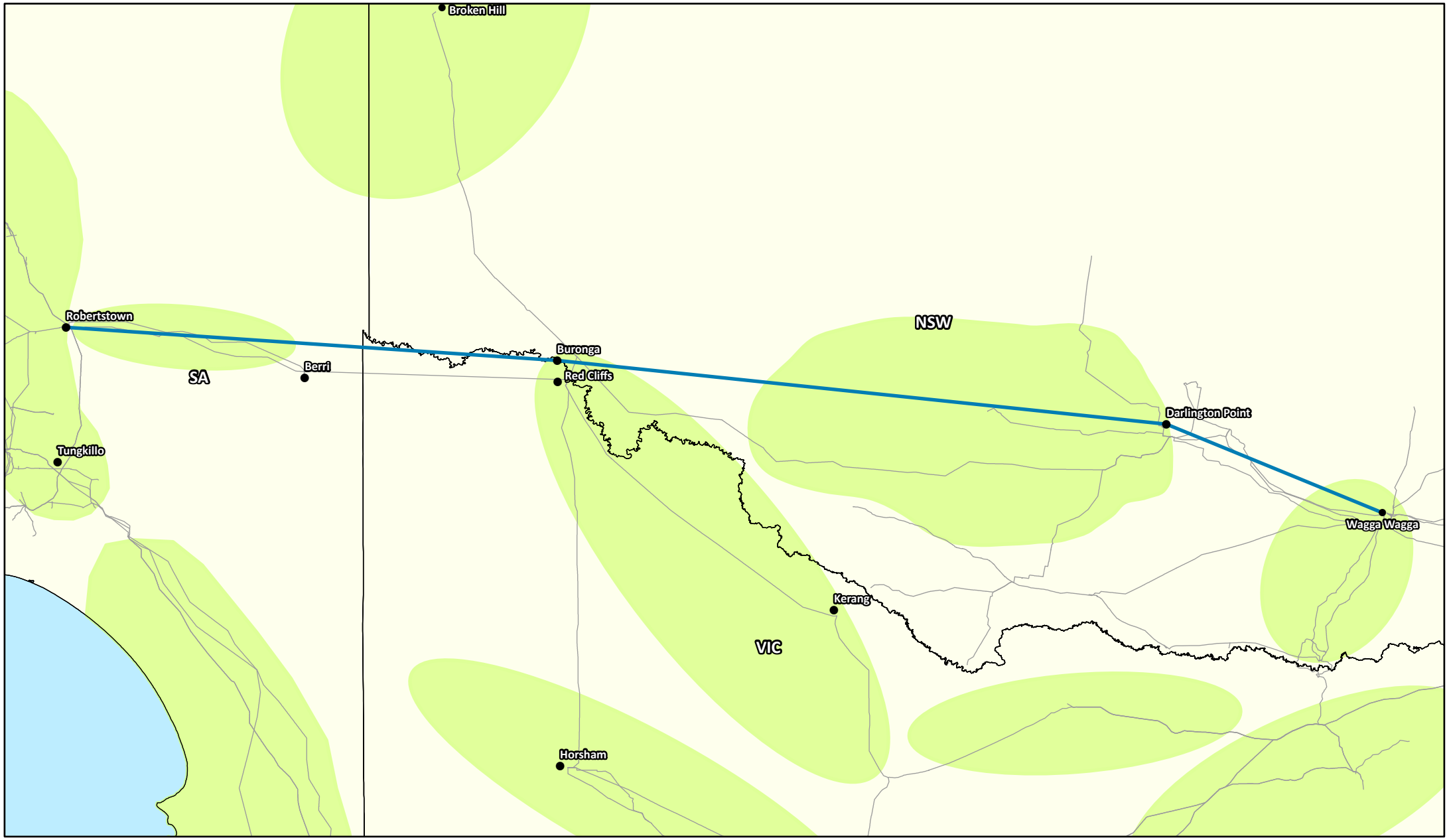
0 100
Kilometres

N

ElectraNet

energy connect

JBS&G



ElectraNet - Options

Option C.3 and C.3iii 330 kV indicative HVAC or 400 kV indicative HVDC between mid-north SA and western NSW

Existing electrical infrastructure

Renewable Energy Zone (REZ)

Figure 3-7
Preferred option C.3 – South Australian – New South Wales Interconnector

0 100
Kilometres

N

ElectraNet

energy connect

JBS&G

EIS Volume 1 Chapter 4

Route Selection

JBS&G

project energy connect

Contents

4. Route Selection 4-1

4.1. Overview 4-1
4.1.1. Objectives 4-2
4.2. EIS Guidelines 4-2
4.3. Route Selection Methodology 4-3
4.3.1. Route selection study inputs 4-3
4.4. Project Requirements 4-6
4.5. Investigation Corridor and Initial Nominal Route Selection 4-8
4.5.1. Constraints identification 4-8
4.5.2. Opportunities identification 4-14
4.6. Stakeholder Feedback and Comparative Evaluation 4-18
4.7. Refining the Route: Micro-routes and Multi-Criteria Analyses 4-22
4.7.1. Multi-criteria analysis methodology 4-23
4.7.2. Micro-route options results 4-25
4.7.3. Multi-criteria analysis outcomes 4-29
4.7.4. Preferred alignment to January 2021 4-29
4.7.5. Cultural Heritage Avoidance Alignment – Hawks Nest Station 4-30
4.8. Ongoing Refinement of the Proposed Alignment and Transmission Line Corridor 4-34
4.9. Conclusion 4-36

List of Tables

Table 4-1: EIS Guidelines addressed in the Route Selection chapter 4-2
Table 4-2: Aspects of assessment requirements addressed in other chapters 4-3
Table 4-3: Tier 1 constraints and justifications 4-9
Table 4-4: Tier 2 constraints and justifications 4-10
Table 4-5: Opportunities and justifications 4-15
Table 4-6: Validated inputs into the nine main criteria 4-24
Table 4-7 Criteria used for the MCA process 4-26
Table 4-8: Summary of potential impacts of cultural heritage avoidance alignment 4-30

List of Figures

Figure 4-1: Route selection process overview 4-6
Figure 4-2: Project EnergyConnect route selection methodology 4-7
Figure 4-3: Preferred Option C.3, substation locations and REZs 4-9
Figure 4-4: Hierarchy of constraints 4-10
Figure 4-5: Tier 1 constraints on development 4-14
Figure 4-6: Tier 2 constraints on development 4-15
Figure 4-7: Opportunities to minimise impacts of the Project 4-18
Figure 4-8: Refined 15 km investigation corridor and nominal route alignment 4-19
Figure 4-9: Options around Taylorville and Calperum Stations 4-22
Figure 4-10: Comparisons of proposed route with 2002 SNI 4-23
Figure 4-11: Iterative progression of multi-criteria analysis 4-24
Figure 4-12: Overview of multi-criteria analysis process 4-25

Figure 4-13: Ranking and scoring of identified micro-route options 4-29
Figure 4-14: Evaluation of feasible routes (MCA outcomes) 4-30
Figure 4-15: Micro-route options by section 4-34
Figure 4-16: Evolution of the route alignment 4-35
Figure 4-17: Proposed Project EnergyConnect alignment and transmission line corridor 4-37

4. Route Selection

This chapter presents the process followed by ElectraNet to select the proposed alignment for the South Australian portion of Project EnergyConnect. It presents the methodology used by both ElectraNet and TransGrid to identify the initial investigation corridor for Project EnergyConnect and the initial nominal route alignment, the subsequent use of a multi-criteria analysis (MCA) to assess additional constraints and opportunities for a variety of route options, and the selection of a proposed alignment and associated transmission line corridor for the Project.

Although this chapter provides details on the overarching 'whole of project' corridor selection methodology, it primarily focuses on the works undertaken in South Australia.

For the purposes of this chapter:

- **Investigation corridor** refers to the initial 20 km wide investigation corridor and subsequent refined 15 km investigation corridor encompassing all route options assessed in this EIS.
- **Nominal route alignment** refers to the initially identified potential alignment based on initial constraints and opportunities mapping, preliminary environmental studies and early stakeholder consultation.
- **Proposed alignment** refers to the alignment of the transmission line identified through the route selection process described in this chapter.
- **Transmission line corridor** refers to a nominal 1 km wide corridor (500 m buffer either side of the proposed alignment as at January 2021) used as a guide for the assessment of impacts. The final alignment of the transmission line is expected to remain largely within the transmission line corridor.

4.1. Overview

As a 900 km (approximate) proposed transmission line traversing west-east across south-eastern Australia, Project EnergyConnect represents a critical piece of nationally important electricity infrastructure which poses inherent challenges.

Whilst the most cost-effective approach for the Project would be to adopt a straight-line approach from point to point, this option is not viable due to a range of environmental, social, land use and engineering constraints. Many of these constraints alone can impede a linear infrastructure project from progressing or cause realignments which can trigger other impacts. An extensive assessment process has been followed to better understand and evaluate the constraints and opportunities which influence the Project, the results of which were ultimately used to inform the selection of the proposed alignment assessed in this EIS.

ElectraNet undertook high level electrical system studies and connection options assessments which identified four credible options as follows:

- South Australia – Queensland (Davenport to Western Downs)
- South Australia – New South Wales (Robertstown–Buronga–Wagga Wagga)
- South Australia – New South Wales (Davenport to Mount Piper)
- South Australia – Victoria (Tailem Bend to Horsham).

These options were all considered as part of the Regulatory Investment Test for Transmission (RIT-T) process which concluded that an interconnector between Robertstown in SA and Wagga Wagga in NSW (Option C3) was the most feasible alternative (refer Chapter 3 Alternatives to the Project).

ElectraNet, together with TransGrid, commenced studies in mid-2018 to identify an initial investigation corridor between Robertstown and Wagga Wagga. These studies involved a range of technical, engineering, environmental, social and land access investigations to identify potential constraints, as well as opportunities to inform investigation corridor options.

4.1.1. Objectives

The following objectives were established by ElectraNet and TransGrid to inform the route selection methodology for the Project and to ensure that a structured approach was followed when selecting the investigation corridor, route options and proposed alignment. The overall objective of the assessment is to develop a balanced approach to defining the proposed alignment, including due consideration of environmental, social, engineering, schedule and cost factors. This will ensure that the proposed alignment:

- considers and adheres to all relevant regulatory requirements (international, Commonwealth and State)
- is broadly supported by and acceptable to stakeholders
- avoids areas of significant environmental sensitivity or restricted access and reduces environmental disturbance as far as practical
- avoids (if reasonable) or minimises impacts on areas of particular environmental or social (including cultural heritage) sensitivity or where environmental planning approvals are considered complex
- preferentially follows areas of existing disturbance (e.g. roads and tracks, utility easements, fence lines and cadastral boundaries)
- is suitable from an engineering and construction perspective
- maximises buffer distances to residences and other sensitive land uses
- will allow the transmission line to be accessible for ongoing maintenance requirements.

4.2. EIS Guidelines

The EIS Guidelines require an assessment of the alternative routes investigated as set out in Table 4-1.

Table 4-1: EIS Guidelines addressed in the Route Selection chapter

EIS Guidelines and Assessment Requirements	Assessment level
Route Selection *Assessment Requirement 7*: The proposed route alignment is anticipated to be a 60 m to 75 m wide corridor[1] within a wider 15 km assessment corridor.	
• 7.1: With regard to the Assessment Requirements required by this document (such as native fauna, vegetation, conservation values, cultural heritage and hazard risk) provide details, including a multi-criteria analysis, on the alternate routes investigated and rationale as to why the final route was chosen.	Critical
Visual Impacts / Interface with adjacent land users *Assessment requirement 8*: The effect of large number of lattice towers (i.e. approximately 475 towers – typically 50 m in height and spaced 450 – 600 m apart) along an approximately 190 km alignment, which would represent a significant visual element in the landscape.	
• 8.2: Describe alternative measures for minimising potential loss of visual amenity (e.g. structural design and placement, screening) and detail any compensatory and site	Medium

[1] The EIS Guidelines note that the proposed route was originally intended to be a 60 m – 75 m wide easement within a wider 15 km investigation corridor. Following preliminary tower design, ElectraNet has since determined that an 80 m wide easement will be required to adequately incorporate safety clearance margins for the Project.

EIS Guidelines and Assessment Requirements	Assessment level
rehabilitation measures that will be undertaken to minimise visual impacts as a result of vegetation clearance.	

Aspects of assessment requirements identified in Table 4-1 which are not addressed in this chapter are listed in Table 4-2 together with the applicable chapter.

Table 4-2: Aspects of assessment requirements addressed in other chapters

Assessment requirement	Chapter
8.2 Site rehabilitation measures to minimise visual impacts	Chapter 13 Visual Amenity

4.3. Route Selection Methodology

The route selection methodology was developed by ElectraNet and TransGrid, together with a number of specialists. It is aligned with route selection methodologies that have been successfully utilised on many linear infrastructure projects around the world. This methodology was reviewed and endorsed by the Project's steering committee, which includes representatives from the following government departments: SA Department for Energy and Mining (DEM), SA Environment Protection Authority (EPA SA), SA Department of Infrastructure and Transport (DIT), SA Planning and Land Use Services (PLUS-AGD), SA Department for Environment and Water (DEW), NSW Department of Planning, Industry and Environment (DPIE), Commonwealth Department of Agriculture, Water and the Environment (DAWE). It was also presented to key stakeholders for feedback.

A typical route selection methodology for a linear infrastructure project is described in Figure 4-1. The route selection methodology followed by Project EnergyConnect can broadly be summarised into the steps illustrated in Figure 4-2.

4.3.1. Route selection study inputs

The approach used to select a preferred investigation corridor and refine the route options involved a detailed review of the following datasets and reports, which were ultimately used to inform the route selection process:

- SA and NSW geospatial datasets sourced from federal, state and local authorities representing the assessment criteria
- Commonwealth EPBC Protected Matters Search Tool
- SA Aboriginal Affairs and Reconciliation (AAR) and NSW Aboriginal Heritage Information Management System (AHIMS) datasets
- qualitative feedback received from landholders and stakeholders during ongoing in-region engagement undertaken by ElectraNet between November 2018 and November 2020
- existing environmental impact assessment reports undertaken in the area (including the 2002 SNI EIS)
- Project specialist studies, including flora, fauna, avifauna and cultural heritage surveys to inform local site constraints and opportunities
- formal feedback provided by the Project EnergyConnect Steering Committee and working group
- stakeholder and community feedback and social analysis via primary and secondary resources which include: stakeholder surveys, individual and small group meetings, community drop-in sessions, one-on-one meetings with landholders, Traditional Owner groups workshops, engagement with other directly affected parties, and feedback collected through the Project EnergyConnect website and public facing interactive mapping and feedback collection tool.

Using the inputs listed above, a digital spatial assessment platform was developed to evaluate potential constraints and opportunities and allow them to be weighted and applied throughout the route selection process.

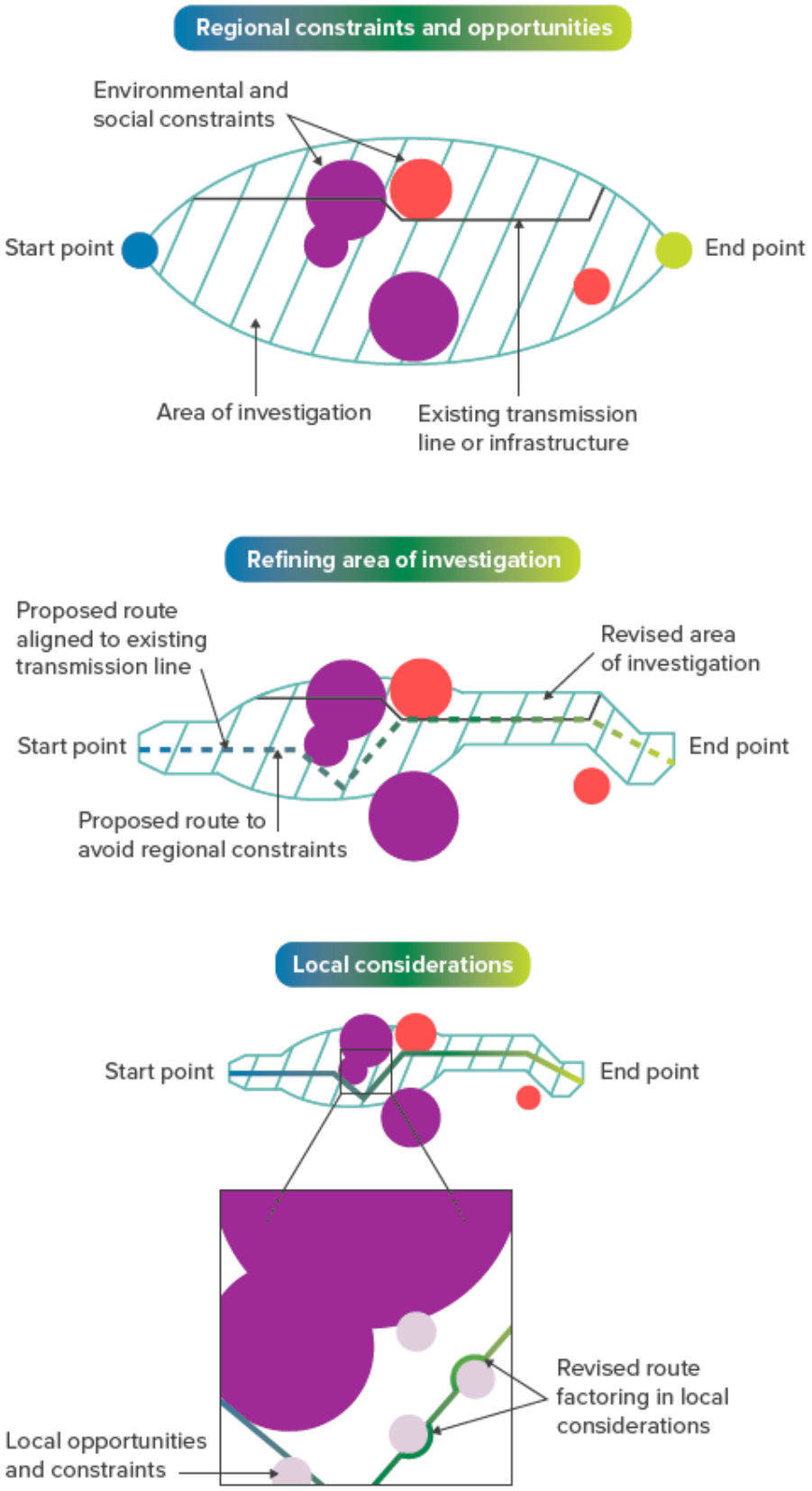


Figure 4-1: Route selection process overview

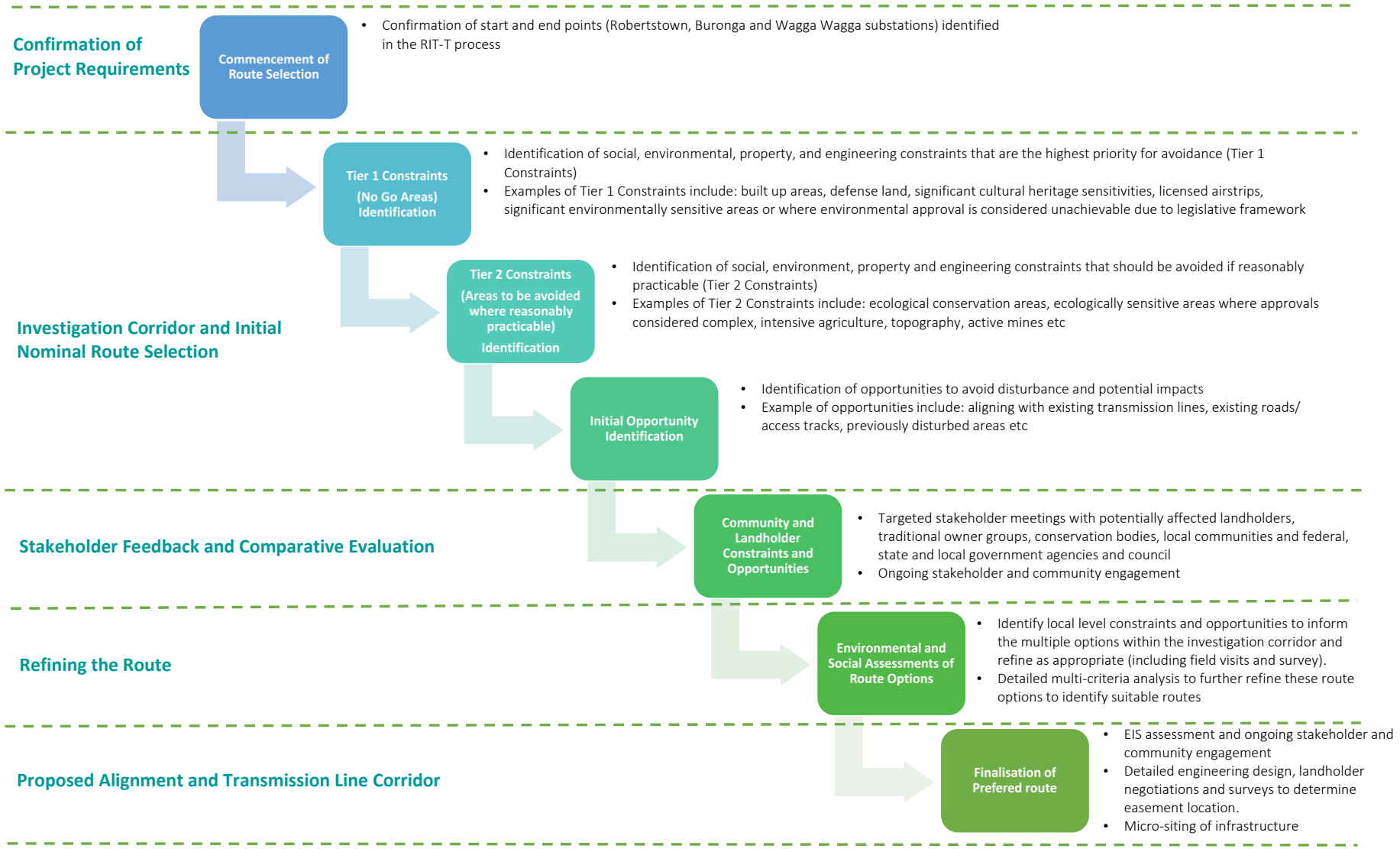


Figure 4-2: Project EnergyConnect route selection methodology

4.4. Project Requirements

As discussed in Chapter 3 Alternatives to the Project (and concluded in ElectraNet's RIT-T Project Assessment Conclusions Report (PACR)), there are a number of Project requirements that need to be met that influenced the selection of a route.

Of all options considered, interconnection of the NEM through the Robertstown (SA), Buronga (NSW) and Wagga Wagga (NSW) substations with an added connection to Red Cliffs (Vic) is expected to deliver the highest net market benefits (Option C.3). The start and end points (i.e. the substations) for the Project are therefore considered fixed, as shown in Figure 4-3.

In addition to the fixed start and end points a key ambition for Project EnergyConnect is to facilitate connections into the national electricity grid for existing, proposed and future renewable energy projects. The primary focus has been those renewable projects that exist within the Renewable Energy Zones (REZs) identified by the Australian Renewable Energy Agency (ARENA) and illustrated in Figure 4-3. The Project's role in supporting the development and growth of renewable energy in Australia is further described in Chapter 2 Project Justification.

In order to meet the required capacity to deliver the maximum benefits of Project EnergyConnect, the proposed Project components described in Chapter 1 Introduction were developed through a joint engineering planning process involving ElectraNet and TransGrid.

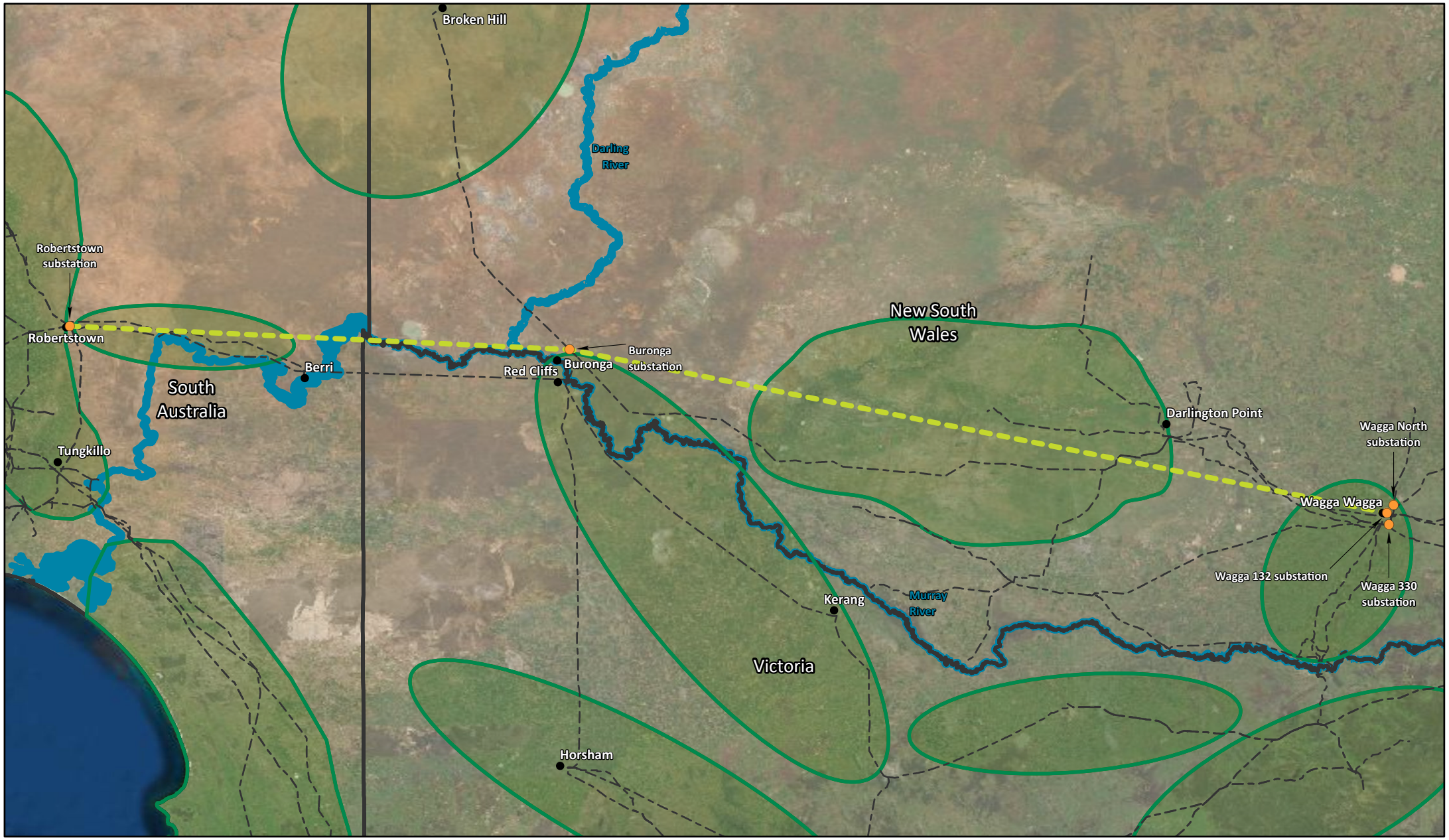


Figure 4-3
Preferred Option C.3 substation locations and REZs

4.5. Investigation Corridor and Initial Nominal Route Selection

The route selection process commenced with a series of comprehensive multi-disciplinary planning workshops with ElectraNet, TransGrid and engineering, land access, environmental and social specialists. The objective of these workshops was to establish a broad investigation corridor, evaluate route options and select an initial nominal route centreline for the transmission line that would connect the fixed-point substations.

Definition of the investigation corridor and nominal route initially identified a broad area of investigation between the known substation start and end points which was further refined by identifying regional constraints and opportunities.

4.5.1. Constraints identification

Constraints for development were identified through the multi-disciplinary workshops and ranked as shown in Table 4-3 and Table 4-4.

Constraints were identified based on environmental, social, land use and engineering aspects. Using Geographic Information Systems (GIS) and trusted existing databases, these constraints were then mapped and classified using a hierarchy of constraints as illustrated in Figure 4-4.

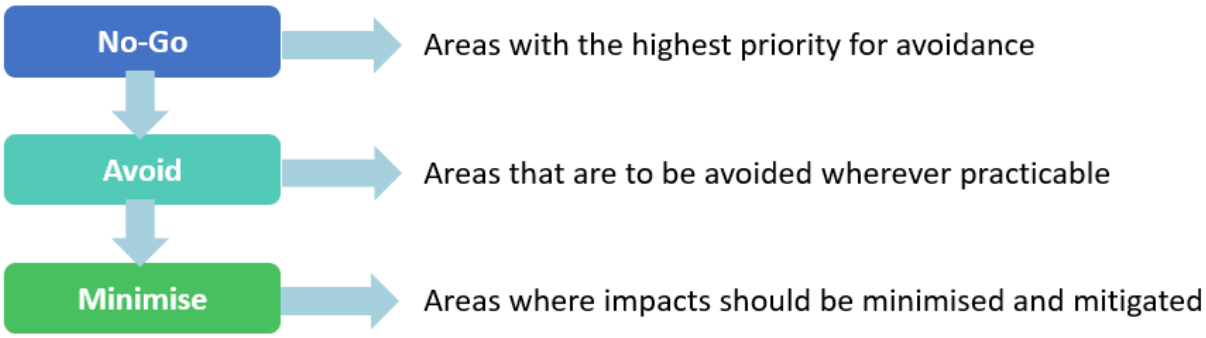


Figure 4-4: Hierarchy of constraints

Constraints were separated into Tier 1 and Tier 2 constraints. Tier 1 constraints were assigned the highest priority for avoidance. Examples of Tier 1 constraints include built up areas, Department of Defence land, licensed airstrips, areas of known significant cultural heritage sensitivities, large water crossings, known significant environmentally sensitive areas or where approvals are considered unachievable due to legislative frameworks. Tier 1 constraints have been summarised in Table 4-3 and illustrated in Figure 4-5.

Tier 2 constraints were classified as areas to avoid as far as practicable whilst recognising that provisions of the *Electricity Act 1996* in South Australia allows for installation of electricity infrastructure on public land. Examples of Tier 2 constraints include ecological conservation areas such as national parks, state reserves and parks, intensive agricultural areas, areas with steep topography and active mines. These areas were identified as potentially sensitive and where approvals are considered likely to be complex. Tier 2 constraints have been summarised in Table 4-4 and illustrated in Figure 4-6.

Using these identified constraints and extensive existing geospatial datasets, ElectraNet and TransGrid mapped an initial 20 km wide investigation corridor for the Project between Robertstown and Buronga. The South Australian portion of this 20 km investigation corridor has been illustrated in Figure 4-5 and Figure 4-6.

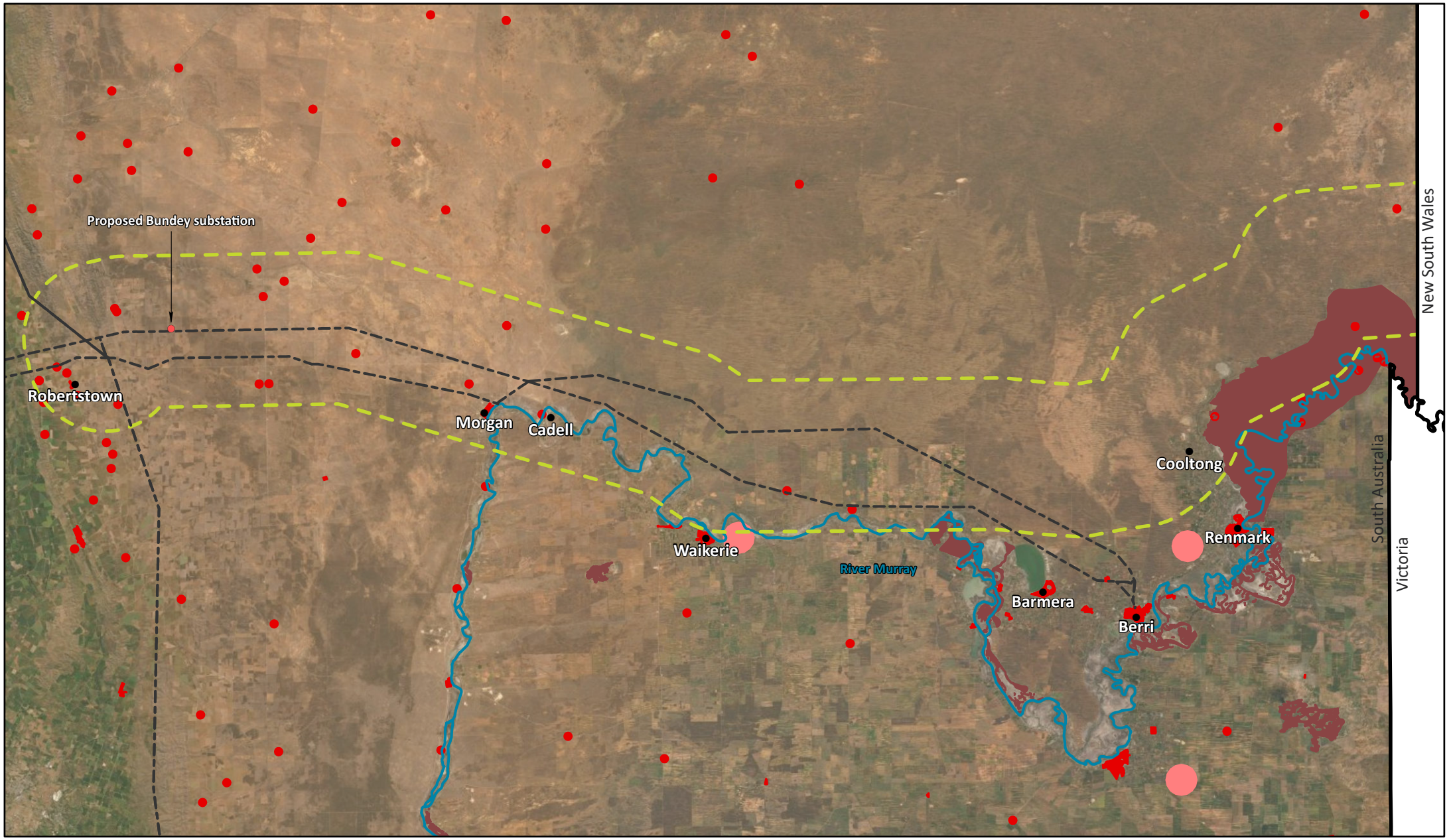
Table 4-3: Tier 1 constraints and justifications

Criteria		Tier 1 / No go areas		
		Aspect	**Reason**	**Comment**
Environment	**Ecology**	Ramsar Wetlands	*Environmental sensitivity – Environmental approval considered unachievable due to legislative framework –*	Due to legislative frameworks for Ramsar Wetlands and associated migratory birds protected by international agreements etc. these areas were considered as high priority for avoidance. Note: may fall within investigation corridor but nominal alignment of corridor avoids.
		Water sources for migratory birds protected by international agreements	*Environmental sensitivity – Environmental approval considered unachievable due to legislative framework–*	Major wetlands and water sources in the SA and NSW study area are associated with the Murray and Darling Rivers and Darling Anabranch. Many of these water sources support wetlands and habitat for species listed under international convention agreements between Australia and Japan (JAMBA), China (CAMBA) and the Republic of Korea (ROKAMBA).
	Cultural Heritage	In NSW, Lake Victoria and the surrounding lunettes (sand dunes) (with 6 km buffer)	*Indigenous heritage sensitivity around Lake Victoria – Environmental approval and land access considered unachievable–*	Studies conducted for the SNI project identified Lake Victoria (NSW) as a particularly sensitive areas with many previously recorded heritage sites and places.
Property	**Land Tenure**	Defence land	*Safety and security concerns – land access considered unachievable–*	Commonwealth Defence lands and areas with the potential to contain unexploded ordinance (UXO) carry significant safety concerns for infrastructure development projects. Access is generally considered difficult and security of tenure for transmission assets is not guaranteed.
	Land Use	Built up areas (townships and residential concentrations)	*Significant public safety and amenity concerns – environmental approvals and land access considered unachievable*	Built up areas and residential concentrations in NSW (such as Buronga, Dareton, Wentworth and at various locations along the Darling River and Anabranch) and in SA (such as Morgan, Renmark, Cooltong and settlements north and south of the River Murray) as they generally pose public safety and amenity concerns to residents
		Licensed airstrips	*Significant safety risk – environmental approvals and land access considered unachievable*	Due to nature of their operations, registered aerodromes and licensed airstrips are generally considered incompatible with high voltage transmission lines.
Technical	**Engineering**	Crossings (e.g. water bodies) greater than 800 m	*Not constructible – Exceeds engineering design limitations*	Large water bodies that exceed the design and engineering capabilities of high voltage transmission lines to span distances of greater than 800 metres. Avoid high-risk flood potential areas due to inaccessibility for construction and maintenance and design cost.

Table 4-4: Tier 2 constraints and justifications

Criteria		Tier 2 / Areas to be avoided		
		Aspect	**Reason**	**Comment**
Environment	**Ecology**	Other wetlands not listed as Tier 1	*Environmental sensitivity – Environmental approvals considered complex*	Wetlands are important habitat for a diverse range of animals including waterbirds, amphibians, invertebrates and fish species as well as aquatic and water loving plants such as sedges and rushes. Tree species such as River Red Gum also rely on these environments. Wetlands are important provide strategic refuge during drought and frequently support threatened species.
		National Parks, ecological conversation areas (including flora reserves, state conservation areas, biosphere; wilderness protection areas)	*Environmental sensitivity – Environmental approvals and land access considered complex*	National Parks are primarily set aside for plant and animal conservation, fire management, sustainable tourism and visitation, research, education. Ecological conservation areas are set aside primarily to conserve threatened species, endangered ecological communities and large, intact areas of habitat. assemblages of flora and fauna
	Cultural Heritage	Listed heritage areas and places Areas of known likely cultural heritage value, particularly along the River Murray riparian zones	*Cultural Heritage Sensitivity – Environmental approvals and land access considered complex*	Listed or defined heritage areas and places are recognised for noteworthy historical or aesthetic character and value. They may be particularly susceptible to impact via visual amenity or character changes in the area.
Property	**Land Tenure**	Commonwealth land	*Environmental approvals and land access considered complex*	Commonwealth land generally constitutes land containing matters of national environmental significance (MNES).
		Areas subject to exclusive Native Title Determinations	*Land access considered complex*	Exclusive Determination grants the rights and interest to the use of the land to the exclusion of all others.
		Freehold land granted under NSW Aboriginal Land Rights Act	*Land access considered complex*	Freehold Aboriginal Land is generally reserved to encourage the commercial value and development by traditional owners and are not compatible with easements.
	Land Use	Intensive agricultural activities and horticultural use (e.g. travelling and pivot irrigation)	*Incompatible activity – land access considered difficult*	Constitutes a significantly higher economic and disturbance impact to landholders and / or significant cost to the Project.
		Active mining	*Incompatible activity – land access considered difficult*	Constitutes a higher risk to security of tenure, risks to infrastructure and personnel, as well as a higher obtrusiveness during construction and maintenance.
		Areas subject to non-exclusive Native Title determinations	*Land access considered difficult*	Native Title may contain significantly higher cultural heritage value, and as such may be more acutely impacted by potential risk factors.

	Criteria	Tier 2 / Areas to be avoided		
		Aspect	**Reason**	**Comment**
Technical	**Engineering**	Slope greater than 15 degrees (considering the placement of structures and whether spans can skip over steep areas) Crossings at water bodies that require spans of greater than 800 m	*Difficult construction (including for associated access tracks) – Increase time and cost*	Represents a higher engineering difficulty and cost to construct the transmission line.



Tier 1 - Airport
Tier 1 - Built up areas
Tier 1 - Wetland
20 km investigation corridor
Existing ElectraNet transmission line
River Murray
Proposed Bundey substation

Figure 4-5
Tier 1 constraints on development

0 20
Kilometres

N

ElectraNet
energy connect
JBS&G

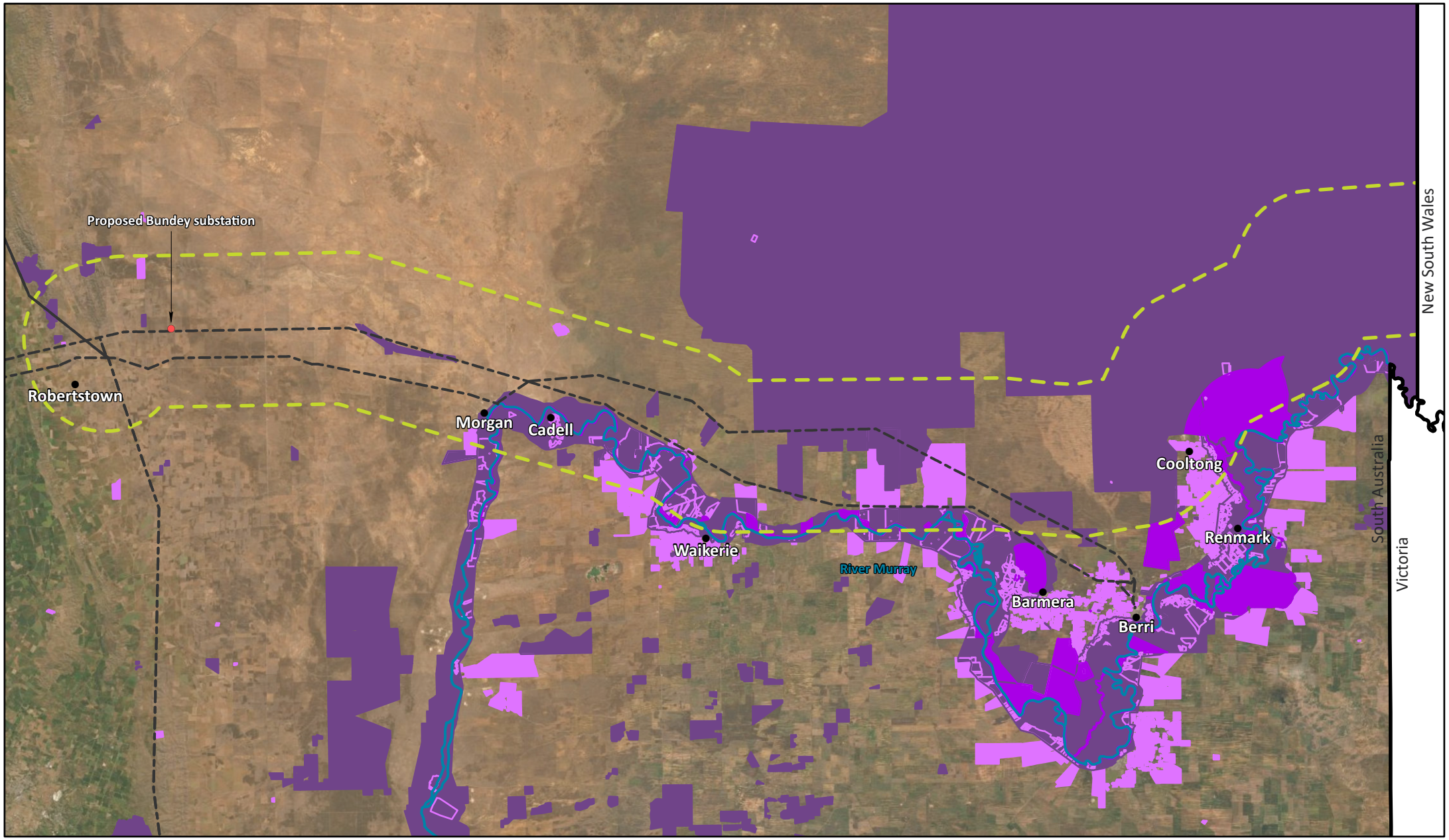


Figure 4-6
Tier 2 constraints on development

ElectraNet
energy connect
JBS&G

4.5.2. Opportunities identification

Following the identification of key Project constraints, and particularly given the significant geographic extent of Tier 2 constraints, opportunities to minimise potential impacts in these areas and improve or benefit the Project outcomes and objectives were identified and assessed. Examples of some of these Project opportunities include, aligning with existing disturbance, which may include:

- existing transmission lines
- existing roads or access tracks
- existing fire breaks
- previously disturbed areas
- fence lines.

The opportunities identified in South Australia have been summarised in Table 4-5 and illustrated in Figure 4-7. By identifying these opportunities, multiple route options were considered in order to avoid Tier 1 constraints and minimise potential impacts to Tier 2 constraints.

Following the identification of the broad opportunities within the 20 km investigation corridor, the Project was able to refine the 20 km investigation corridor to 15 km and allow for more focussed geographic assessment for the route selection process going forward.

In addition to the refinement of the investigation corridor to 15 km, the Project identified an initial nominal route alignment based on a combination of constraint avoidance and utilising identified opportunities or areas of existing disturbance. The 15 km investigation corridor and initial nominal route alignment have been illustrated in Figure 4-8.

Table 4-5: Opportunities and justifications

South Australia Opportunities	
Opportunity	**Reason**
Alignment with existing transmission lines, established tracks, roads and fence lines	• There is an existing ElectraNet 132 kV transmission line which runs from Robertstown to the southern boundary of Taylorville Station, before deviating to the Monash substation. • A route option exists to align with this existing 132 kV transmission line and picking up the existing Powerline Road, Taylorville Station southern boundary track and the Pooginook track. This means that existing access tracks and roads may be utilised for a large portion of the alignment thus significantly reducing greenfield disturbance and potential impacts. • This area also largely comprises of open and cleared paddocks with limited social and environmental receptors present.
Alignment with proposed firebreak / fire access track through Hawks Nest Station	• Fire is a major hazard for the broader Project area. A potential fire break or additional firefighting access has been raised as a potential project benefit through Hawks Nest Station and alignment with existing fire management tracks within Calperum Station. • A route option opportunity exists that may double up as an easement and a fire break / fire access. This would reduce the required clearance for the proposed transmission line by utilising the proposed easement for a dual purpose. Hawks Nest is a pastoral property, primarily used for grazing and feral animal hunting. • Engagement with County Fire Service (CFS), DEW and the landholder is ongoing as this route option is being further evaluated.
Alignment with / utilising existing seismic track, quarry haul road or property boundaries on Calperum Station to reduce disturbance	• There are a number of existing disturbed tracks that traverse Calperum Station, these include a historical seismic shotline / track, a Quarry Road that has been extensively used until 2018, fence lines and existing firebreaks and access roads / tracks. • These areas provide for a number of route option opportunities to traverse from Hawks Nest Station through Calperum Station to the Wentworth Road. Although it is noted that these areas are within the property boundary of Calperum Station, which is considered Critical Habitat for the Black-eared Miner, the opportunity to follow an existing straight cleared track was initially evaluated as being more beneficial than creating new disturbance and tracks for a longer distance in an identical habitat on Calperum or off the property. These options are currently subject to ongoing evaluation, intensive study and engagement with the Australian Landscape Trust, relevant state agencies and other relevant stakeholders. A significant opportunity through Calperum Station was the seismic shotline, as shown in Figure 4-7
Alignment with the existing Wentworth-Renmark Road	• Although the Ramsar wetlands and Calperum Station were identified as Tier 1 and Tier 2 constraints respectively, complete avoidance of Calperum was not feasible from an environmental, social, engineering or cost perspective. • A route option opportunity was identified running alongside the existing Wentworth-Renmark Road that traverses the boundaries of both Calperum Station and the Ramsar wetland. Alignment with the existing Wentworth-Renmark Road allows this area to be traversed whilst minimising potential disturbance and the introduction of new impacts in non-disturbed areas. In addition, this alignment is on the southern-most extent of the designated Critical Habitat area and will allow the Wentworth Road to be used for primary access, significantly reducing the need for additional primary access.

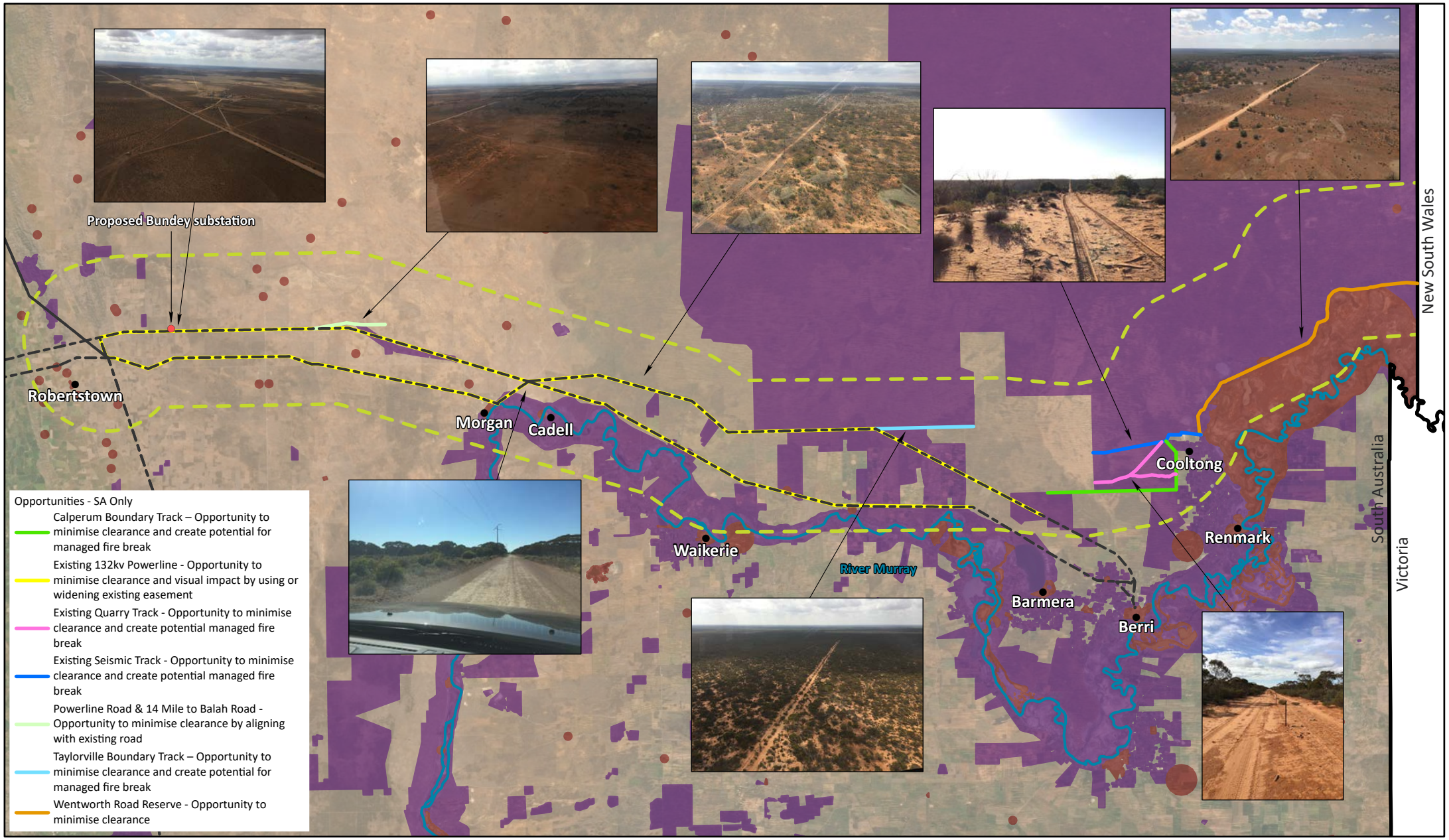
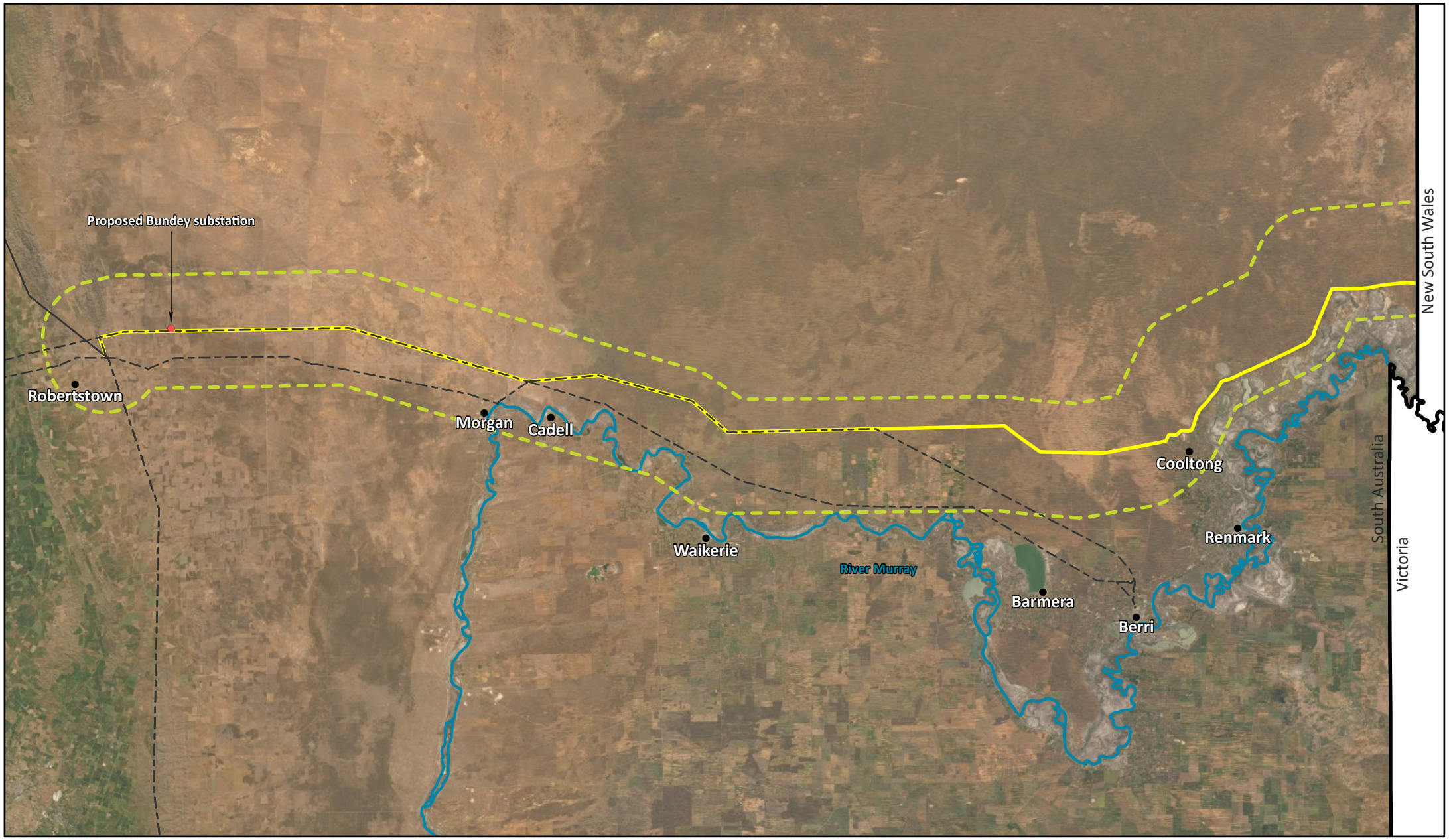


Figure 4-7
Opportunities to minimise impacts of the Project

ElectraNet
energy connect
JBS&G



15 km investigation corridor
Nominal route alignment
Existing ElectraNet transmission line
River Murray
Proposed Bundey substation

Figure 4-8
Refined 15 km investigation corridor and nominal route alignment

0 20
Kilometres

N

ElectraNet
energy connect
JBS&G

4.6. Stakeholder Feedback and Comparative Evaluation

Early in the route selection process, the initial 20 km wide investigation corridor was used to commence targeted stakeholder engagement with potentially affected landholders, Traditional Owner groups, conservation bodies, and state and local government agencies. The primary objective of this initial engagement was to obtain stakeholder feedback on the route selection methodology, validation of constraints and opportunities identified at a landscape level, broad investigation corridor and to assist in the identification of any local level constraints and opportunities. A summary of the stakeholder and community engagement process undertaken for route selection is contained in Chapter 6 Stakeholder Engagement.

Through the early stakeholder engagement process, concern was raised in relation to the ecological sensitivity of a number of Tier 2 constraints as illustrated in Figure 4-6, particularly where Calperum and Taylorville Stations were traversed by the investigation corridor. The Project subsequently further assessed potential alternative route options outside of the initial 20 km investigation corridor that would avoid these conservation areas. These have been illustrated in Figure 4-9. This assessment included further detailed GIS mapping, ecology surveys, internal workshops with technical experts, consultation with Commonwealth and State governments, stakeholder engagement and further review of secondary sources. The assessment concluded the following:

- A northern alignment outside of the investigation corridor would increase the need for greenfield disturbance, as it traverses large continuous areas of intact native vegetation (including old-growth Mallee and Black-oak woodland) for more than 300 km. In addition, this alternative alignment would increase potential Project costs by approximately $95 million due to the increased length, engineering requirements, access and construction constraints as well its associated maintenance challenges.
- A southern alignment outside of the investigation corridor would involve multiple crossings of the River Murray, traversing high value intensive agricultural lands, and would introduce numerous environmental, cultural heritage, social and economic impacts. This option was not supported by Traditional Owner groups, local councils, the general community and agricultural bodies south of the River Murray. In addition, this alternative alignment would increase route distance by approximately 60 km and potential Project costs by approximately $85 million due to increased line length, engineering requirements, compensation, access and construction constraints.

Based on additional studies and stakeholder engagement both these alternative alignment options outside of the initial 20 km investigation corridor were deemed not suitable on environmental, economic and technical feasibility grounds. Given the findings of this analysis, ElectraNet, with endorsement of the Project EnergyConnect Steering Committee, retained the initial 20 km and subsequent 15 km investigation corridor as the preferred investigation corridor and continued to progress route options within this investigation area.

As part of the stakeholder feedback and comparative evaluation, further opportunities were also identified, presenting multiple route options within the investigation corridor. In order to refine these route options further, the Project undertook a detailed MCA described in detail further in this chapter. The aim of the MCA was to further evaluate route options to identify the most suitable options for further intensive study and to ultimately identify the preferred proposed alignment.

Following the identification of an initial 20 km investigation corridor and refinement to 15 km based on opportunity identification as shown in Figure 4-8, the Project reviewed further available secondary data and undertook targeted site visits and surveys to validate the constraints and opportunities assessed in developing the investigation corridor. One of the major sources of secondary information

was the previous SA – NSW Interconnector (SNI) EIS, which was subject to extensive environmental study and assessment (SKM 2002).

Although the route selection process for Project EnergyConnect was undertaken independently of the previously proposed SNI, the extensive data collected for the 2002 EIS provided a breadth of detailed information to assist in informing route options within the investigation corridor.

The Project's initial nominal route alignment aligns very closely with the SNI alignment, which provided a level of validation around the process followed to this point.

Figure 4-10 shows the 15 km investigation corridor, an initial preferred nominal route alignment based on opportunities, in relation to the previously proposed SNI route. A significant difference between the SNI alignment and the Project's nominal route alignment is the requirement of the SNI project to connect to the Monash substation. Bypassing this area allows the Project to avoid intensive agriculture areas around Monash, as well as significant ecological and cultural areas such as Lake Bonney and Murray River National Park.

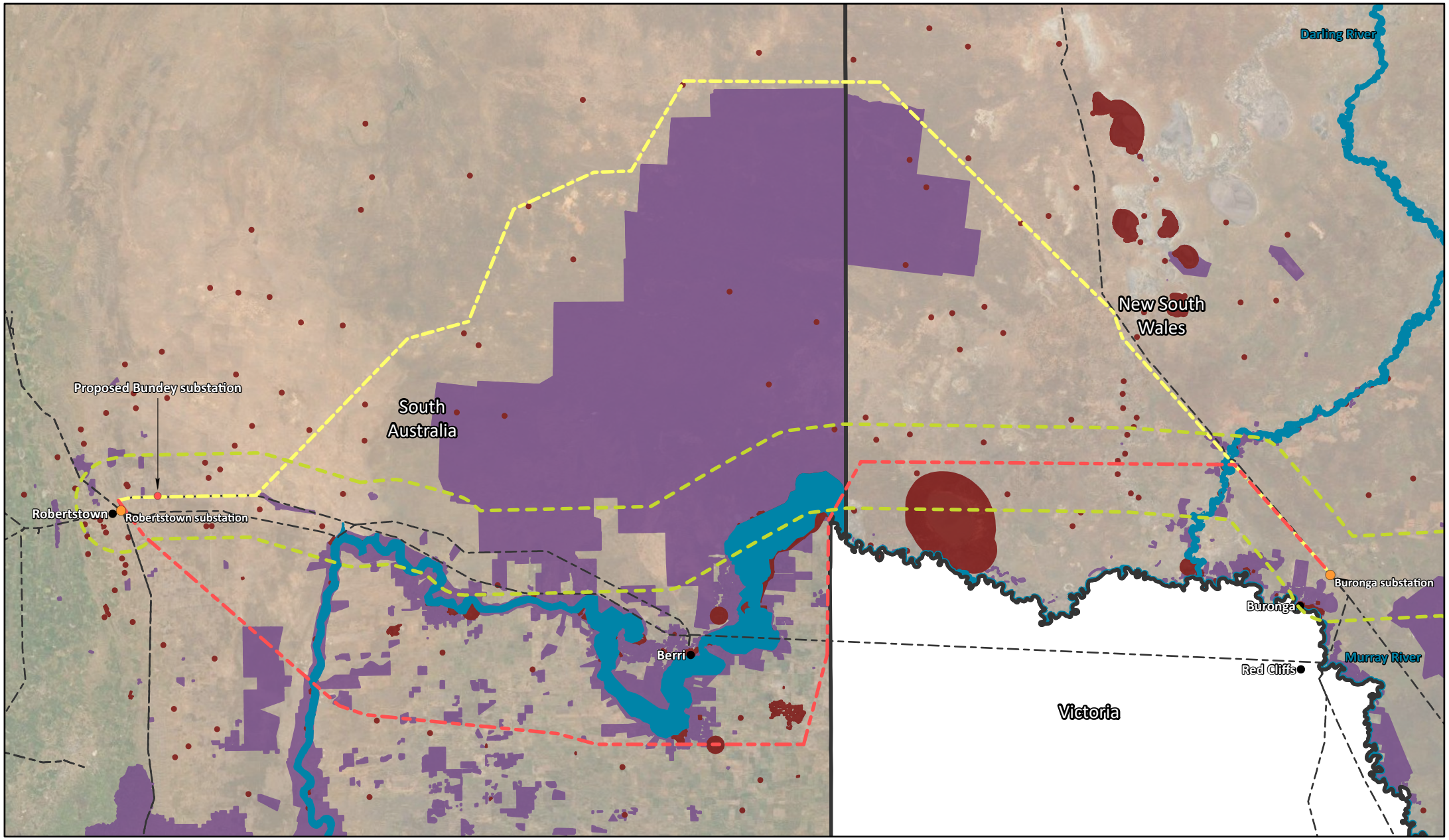


Figure 4-9
Options around Taylorville and Calperum Stations

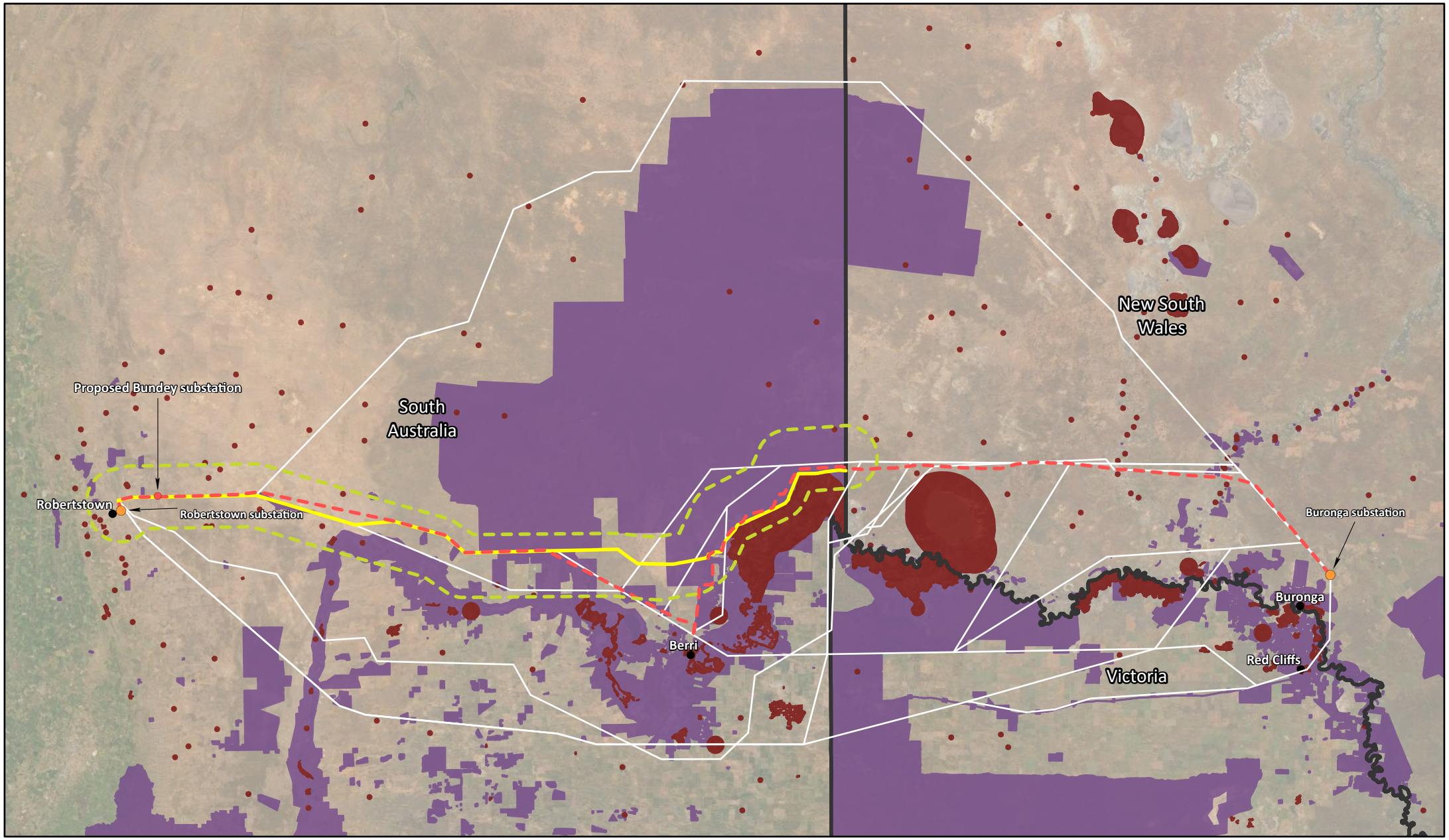


Figure 4-10
Comparisons of proposed route with 2002 SNI

4.7. Refining the Route: Micro-routes and Multi-Criteria Analyses

After identifying the initial investigation corridor, refining this to a 15 km corridor, assessing various route options and following feedback from stakeholders during extensive consultation, ElectraNet opted to investigate detailed alternative route options within the refined investigation corridor. These were particularly relevant with regard to traversing Taylorville and Calperum Stations after taking into account key stakeholder feedback and concerns. Multiple route options were identified based on local constraints and opportunities, and evaluated using MCA methodology. The MCA drew on data collected during on-ground site visits / surveys as well as specialist input with regard to engineering, ecology, cultural heritage, visual, land access and compensation, stakeholder concerns, Project cost and schedule impacts.

The process was iterative as shown in Figure 4-11 and involved:

- structured, facilitated specialist workshops to identify alternatives
- utilisation of data from specialist studies (desktop and field studies) for relevant technical disciplines
- consultation with landholders, government and other stakeholders (Australian Landscape Trust, DEW, Country Fire Services, Birdlife Australia, DiT, local councils, conservation bodies etc.)
- analysis and re-evaluation of multiple alignment opportunities to narrow the alternatives and identify micro-route options.

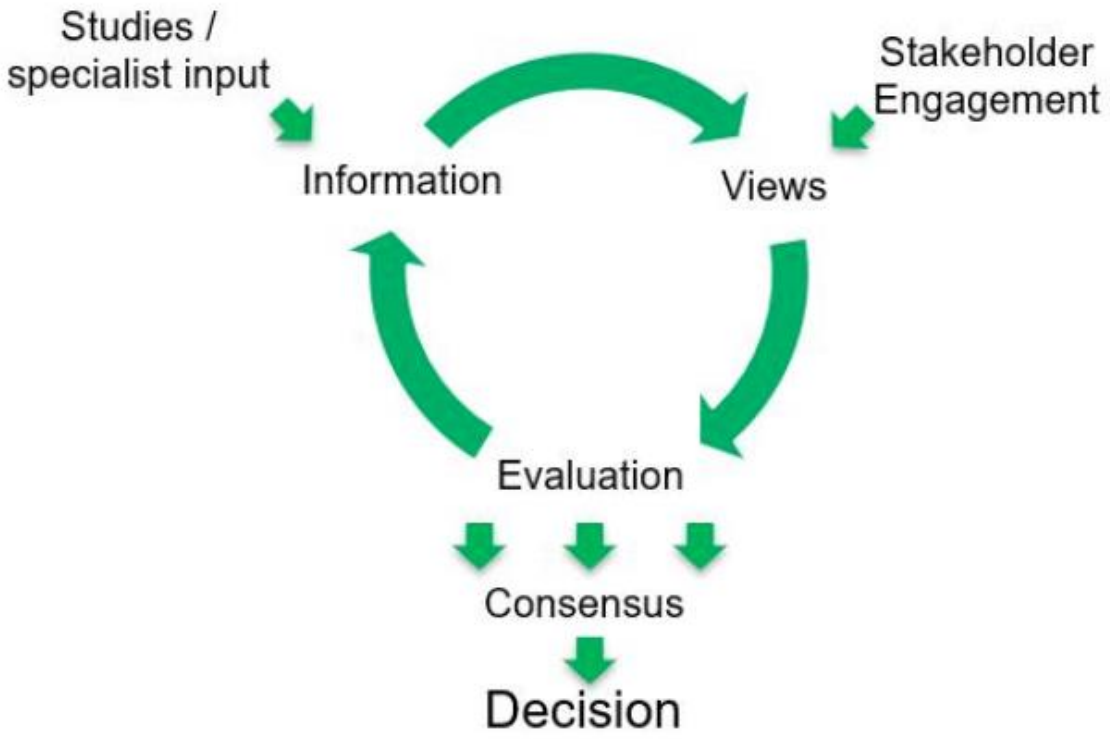


Figure 4-11: Iterative progression of multi-criteria analysis

4.7.1. Multi-criteria analysis methodology

Route option identification

Alternative route options were identified by first breaking the investigation corridor into four sections (from west to east) according to broad terrain and overarching land use, as well as 'pinch-points' where alternative route options were not considered practical. Within the four corridor sections multiple potential micro-route options were identified based on local opportunities such as existing tracks, roads, transmission lines, fire breaks and previously disturbed areas following consultation with specialists and local landholders.

Site inspections were undertaken to ground truth the identified micro-route options and each of the options was tested for feasibility at a high level with specialists. Non-feasible options were ruled out and not considered further. Viable micro-route options for the four corridor sections were then joined to form route options for inclusion and further evaluation in the MCA. Twenty-four combinations of the micro-routes (i.e. 24 route options) were identified.

For the purpose of this section:

- **Corridor sections** are used to describe manageable portions of the investigation corridor separated according to broad terrain and overarching land use. Four corridor sections were identified (refer Figure 4-15)
- **Micro-route options** are the multiple potential routes per corridor section identified based on local opportunities identified during the initial investigations and stakeholder engagement activities. The route options were tested and evaluated in the MCA
- **Route options** refer to the feasible micro-routes joined together across the four corridor sections.

The MCA process is summarised in Figure 4-12.

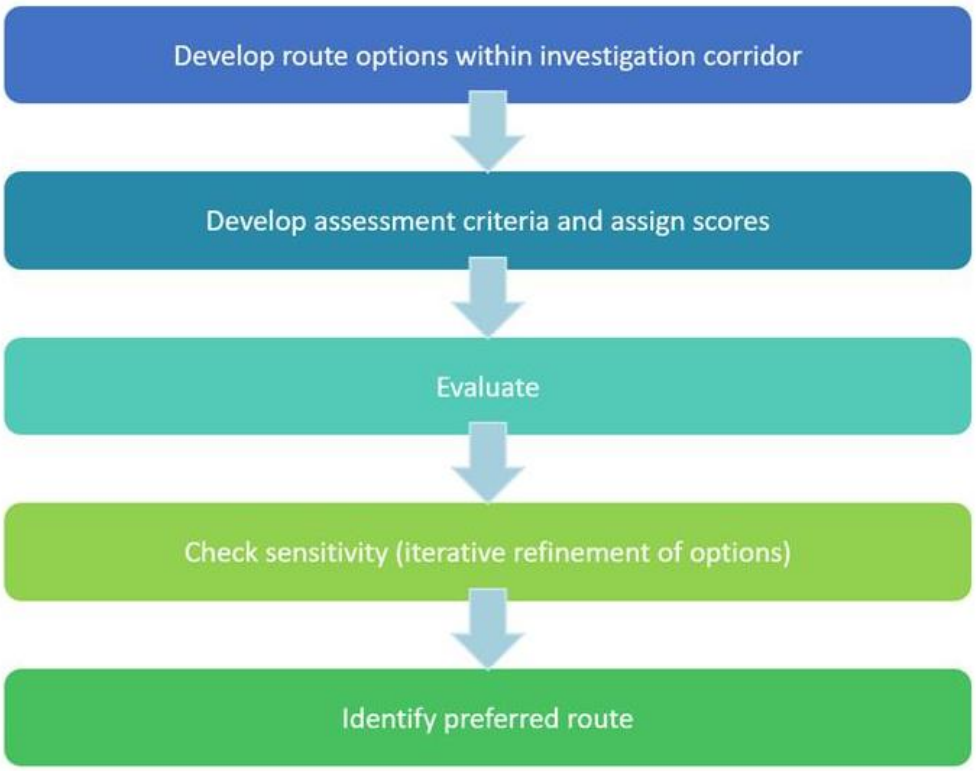


Figure 4-12: Overview of multi-criteria analysis process

Assessment criteria, evaluation and ranking

Criteria and attributes for inclusion in the analysis were identified and assigned at a granular level[2] for each micro-route option by technical specialists in engineering, ecology, cultural heritage, visual impact, land access and compensation, significant environmental benefit (SEB) obligations, stakeholder concerns, project cost and schedule. A range of validated inputs were incorporated into these nine main criteria as summarised in Table 4-6.

Table 4-6: Validated inputs into the nine main criteria

Criteria	Validated inputs
Ecological	Includes consideration of[3]: • number and length of areas managed under Native Vegetation Heritage Agreements and *National Parks and Wildlife Act 1972* (NPW Act) traversed • distance traversed through the EPBC Act protected matter 'Black-eared Miner Critical Habitat' (km) • number of fauna species with a National (EPBC Act) and State (NPW Act) conservation rating recorded within 500 m of each segment • unit Biodiversity Score[4]. Based on field survey data (extrapolated from 49 sites surveyed) and desktop study. The potential of each site to provide suitable habitat for both EPBC and State listed fauna is assessed and incorporated into the score.
Cultural heritage	Sensitivity of the various landscapes was rated by specialist based on: • results of prior surveys and expert knowledge of the area • Native Title determinations, applications or Indigenous Land Use Agreements intersected • presence and nature of water features and whether associated heritage sites could be readily avoided • heritage sites – nature of known sites and the ability to avoid them given the scale and nature of the site descriptions • aesthetic impacts in a heritage context.
Visual impact	Rated by specialist based on: • distance to sensitive receptors • extent of visual shielding • extent mitigated by adjacent existing linear infrastructure
Stakeholder concerns	Rated by specialist based on: • stakeholder feedback and understanding of the social landscape. • consideration of conservation issues such as conservation of mallee bird habitat (i.e. Black-eared Miner)
Engineering and construction cost	• $ value estimate
SEB calculation value	• $ value estimate • based on field survey data (extrapolated) and desktop data. • SEB also acts as an additional proxy for ecological sensitivity.
Land access compensation	• $ value to obtaining easement estimated by specialist
Time to construct	• Project schedule
Schedule risk	• Additional number of months

[2] Granular level - meaning data was assigned to small contiguous segments of each micro-route
[3] These ecological inputs were combined then assigned a rank of 1-6
[4] Unit Biodiversity Score derived for granular segments of potential routes via extrapolating data from 49 sites surveyed using the Bushland Assessment Method (BAM), (approved assessment method for use in study area, under the *Native Vegetation Act 1991*)

Rankings were then allocated against each criterion, for each micro-route option. This allowed both quantitative and qualitative data sets to be analysed equally. Criteria were ranked between 1 and 6 as to how favourable a micro-route option was considered to be in terms of that particular criterion, aspect or attribute. The criteria used to evaluate and rank each of the micro-route options is presented in Table 4-7.

Micro-routes were then scored using the sum of the 9 criterion rankings (out of a total 54) and workshopped with specialists. The evaluation of micro-route options enabled some options to be ruled out and not considered further, often as the result of land access constraints, stakeholder feedback or technical fatal flaws. Only viable micro-route options were then carried through to analysis of the full length of the route.

To enable detailed route comparisons across multiple criteria, scores for each criterion were summed across the four corridor sections (i.e. each possible combination of micro-routes to provide a score out of a possible 24 for the criterion).

The total score for each route option was then calculated as the sum of the scores for the 9 criteria for the route option (out of a possible score of 216).

The route options identified by the MCA as the most suitable (i.e. lowest scores) were then subject to further review and evaluation with stakeholders to identify the preferred route.

Stakeholder consultation

A micro-route selection workshop was held with Working Group representatives from various agencies including PLUS-AGD, DEW and EPA SA. The MCA process was endorsed by the working group.

Micro-routes were tested with landholders and government and workshopped with the Working Group. Refinements were made to the alignment based on ecological and cultural heritage inputs which are discussed further in Section 4.7.3.

This iterative progression enabled the options to be refined and optimised as part of a robust route selection process.

4.7.2. Micro-route options results

The rankings and scores tallied for each of the micro-route options are shown in Figure 4-13 with the total scoring for each of the feasible route options shown in Figure 4-14.

Approximately half of the 24 route options scored very poorly (i.e. high scores) in the MCA and were not considered further in the evaluation (refer Figure 4-14).

.

Table 4-7 Criteria used for the MCA process

Consequence		Assessment Criteria				
Rank	Options/Alternative Analysis Outcome/Consequence	Cost/Financial/ Feasibility	Social/landuse/ Cultural Heritage	Stakeholder Response/Reputation	Ecological/Environment	Schedule
6	**Unacceptabale outcome/fatal flaw:** The option does not achieve minimal impact with regard to the assessment criteria, impacts are unlikely to be able to be mitigated and there is potential for significant impact to result.	Very high cost variation from basecase, Unfeasible	Very significant challenges in securing an easement, fatal flaws related to land use and associated impacts	Long term, significant stakeholder outrage, permanent reputational damage, shareholders dissociate themselves with Electranet, international media converage.	Very high long-term environmental impact	Major schedule delays
	Detail of numerical ranking criteria	Engineering/Construction Cost > $91M			SEB cost >$1.5M	More than 6 months
5	**Largely unacceptable/ Very poor outcome::** The option does not achieve minimal impact with regard to the assessment criteria, impacts are likely, but should be able to be mitigated.	High cost variation from basecase, Significant feasibility constraints	Significant challenges in securing an easement, potential fatal flaws related to land use and associated impacts	Medium term, moderate stakeholder outrage, government, shareholders and board involvement, national media coverage.	High medium-term environmental impacts	Significant schedule delays
	Detail of numerical ranking criteria	Engineering/Construction Cost $85-91M			SEB cost >$1.11M	3-6 months
4	**Possibly unacceptable, Poor outcome.** with regard to the assessment criteria, however, impacts are considered easily mitigated.	Moderate cost variation from basecase, Some feasibility constraints	Moderate challenges in securing an easement, possible challenges related to land use and associated impacts	Some stakeholder dissatisfaction, state media coverage for several days, involvement by regulator and shareholders.	Moderate short-term environmental impacts	Some schedule delays
	Detail of numerical ranking criteria	Engineering/Construction Cost $80-85M			SEB cost $1-1.11M	2-3 months
3	**Moderately acceptable outcome:** The option primarily achieves minimal impact with regard to the assessment criteria, resulting in minimal impact to the particular aspect.	Low cost variation from basecase, Minor feasibility constraints	Minor challenges in securing an easement, some minor challanges related to land use and associated impacts	Stakeholder ambivalence, state and local media coverage, regulator involvement	Low short-term environmental impcts	Minor schedule delays
	Detail of numerical ranking criteria	Engineering/Construction Cost $60-80M			SEB cost $900,000-1M	1-2 months
2	**Acceptable, Good outcome:** The option achieves the minimal impact with regard to the assessment criteria by resulting in very low impact to the particular aspect.	Very low cost variation from basecase, Very minor feasibility constraints	Very minor challenges in securing an easement, very minor challenges related to land use and associated impacts	Stakeholder satisfaction, local media coverage only	Very low environmental impact	Very minor schedule delays
	Detail of numerical ranking criteria	Engineering/Construction Cost $50-60M			SEB cost $400,000-$900,000	Less than 1 month
1	**Optimal, Very good:** The option achieves the least negative impact, with optimal positive outcomes with regard to the assessment criteria by resulting in no impact to the particular aspect.	No cost impact variation from basecase, No feasibility constraints	Negligible challenges in securing an easement, negligible, or no challanges related to land use and associated impacts	Stakeholder support, no negative media coverage	Negligible environmental impact	No impact to schedule
	Detail of numerical ranking criteria	Engineering/Construction Cost <$50M			SEB cost < $400,000	None

Section	Micro-route	Ranking (1-6)									
		Visual impact	Cultural heritage	Ecology	Engineering and Construction	SEB	Land Access Compensation	Schedule Impact (approvals, land access)	Stakeholder Outrage/ Reputational Risk	Time to construct	Micro-route SCORE
Section 1	1	3	2	2	1	1	4	1	1	1	16
Section 2	2.1(a)	4	3	3	3	2	3	1	3	2	23
	2.2(b)	3	3	4	2	2	4	2	4	2	25
Section 3	3.1.1	3	1	5	3	3	1	3	6	3	28
	3.1.2	3	2	5	4	4	2	3	5	4	31
	3.1.3	3	1	5	4	5	2	2	3	5	30
	3.2.1	3	1	5	3	2	2	5	6	3	30
	3.2.2	3	2	5	4	3	2	5	5	4	33
	3.2.3	3	1	5	4	4	3	4	4	5	33
	3.3.1	4	1	5	5	5	4	5	5	3	37
	3.3.2	4	1	5	6	4	4	6	6	3	38
	3.4	5	2	4	4	3	6	6	6	5	41
Section 4	4.a	4	5	3	4	3	2	6	6	2	35
	4.b	4	4	4	4	4	2	6	6	2	36

Figure 4-13: Ranking and scoring of identified micro-route options

Routes	Sections	Criterion Score out of 24 - (sum of section averages)									TOTAL SCORE
		Visual impact	Cultural heritage	Ecology	Engineering and Construction	SEB	Land Access	Schedule Impact	Stakeholder Views	Time to construct	
R1	1+2.1+3.1.1+4a	14	11	13	11	9	10	11	16	8	
R2	1+2.1+3.1.1+4b	14	10	14	11	10	10	11	16	8	
R3	1+2.1+3.1.3+4a	14	11	13	12	11	11	10	13	10	
R4	1+2.1+3.1.3+4b	14	10	14	12	12	11	10	13	10	
R5	1+2.1+3.2.1+4a	14	11	13	11	8	11	13	16	8	
R6	1+2.1+3.2.1+4b	14	10	14	11	9	11	13	16	8	
R7	1+2.1+3.3.1+4a	15	11	13	13	11	13	13	15	8	
R8	1+2.1+3.3.1+4b	15	10	14	13	12	13	13	15	8	
R9	1+2.1+3.3.2+4a	15	11	13	14	10	13	14	16	8	
R10	1+2.1+3.3.2+4b	15	10	14	14	11	13	14	16	8	
R11	1+2.1+3.4+4a	16	11	12	12	8	15	14	16	10	
R12	1+2.1+3.4+4b	16	10	13	12	9	15	14	16	10	
R13	1+2.2+3.1.1+4a	13	11	13	10	9	11	12	17	8	
R14	1+2.2+3.1.1+4b	12	10	14	10	10	11	12	17	8	
R15	1+2.2+3.1.3+4a	13	11	14	11	11	12	11	14	10	
R16	1+2.2+3.1.3+4b	12	10	15	11	12	12	11	14	10	
R17	1+2.2+3.2.1+4a	13	11	14	10	8	12	14	17	8	
R18	1+2.2+3.2.1+4b	12	10	15	10	9	12	14	17	8	
R19	1+2.2+3.3.1+4a	14	11	14	12	11	14	14	16	8	
R20	1+2.2+3.3.1+4b	14	10	15	12	12	14	14	16	8	
R21	1+2.2+3.3.2+4a	14	11	14	13	10	14	15	17	8	
R22	1+2.2+3.3.2+4b	14	10	15	13	11	14	15	17	8	
R23	1+2.2+3.4+4a	15	11	13	11	8	16	15	17	10	
R24	1+2.2+3.4+4b	15	10	14	11	9	16	15	17	10	

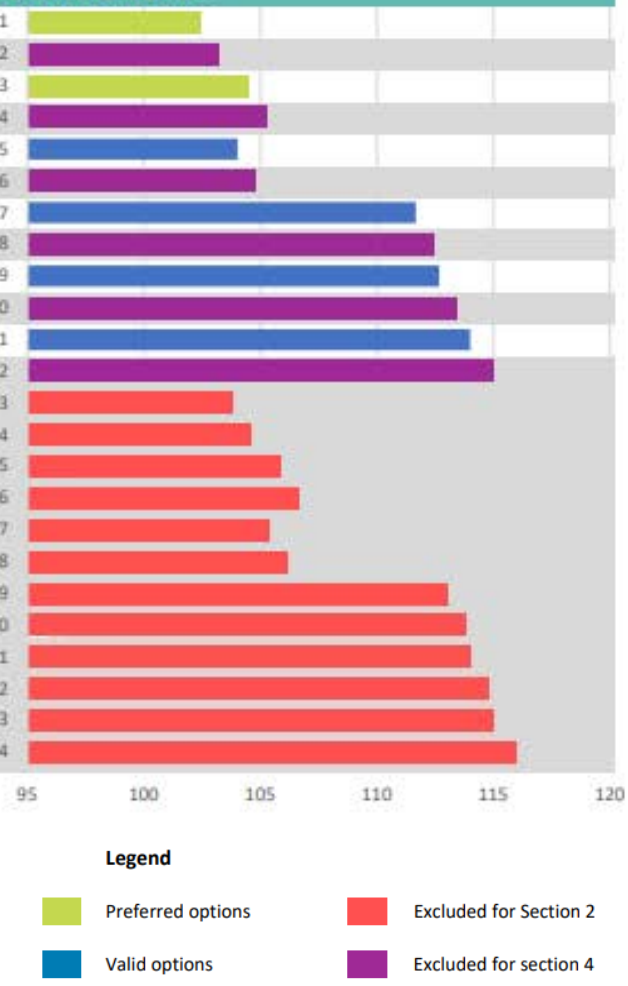


Figure 4-14: Evaluation of feasible routes (MCA outcomes)

4.7.3. Multi-criteria analysis outcomes

The MCA process yielded the following outcomes:

- Corridor Section 1: The micro-route within this section was confirmed, to align with the existing 132kV transmission easement to minimise additional disturbance.
- Corridor Section 2: An optimal micro-route through this section was identified by shifting the nominal alignment further north to bypass North-west Bend substation, reducing route length and minimising impacts (see Figure 4-16 – November 2019 alignment).
- Corridor Section 3: Several options were evaluated within this section (as shown in Figure 4-15) which involved consultation with Birdlife Australia, Australian Landscape Trust (ALT), government agencies and other landowners to develop a least impact solution. Significant constraints in this area included intensive horticultural activities, intact native vegetation, an unregistered airstrip and native vegetation heritage agreements. Evolution of the alignment particularly through this section is shown in Figure 4-16 and discussed further below.
- Corridor Section 4: A preferred route through this section was identified by the MCA, which evolved further following consultation with DEW in addition to inputs from the outcomes of cultural heritage survey (incorporated into the proposed alignment Figure 4-16).

Preferred alignments through corridor sections 1, 2 and 4 were identified as a result of the MCA. This excluded several route options from further assessment (Figure 4-14 identifies the remaining options).

The results of the initial MCA on the remaining routes indicated that two route options (route options 1 and 3) scored best (i.e. lowest scores) in terms of preference from a combination of environmental, social, technical and economic perspectives. The primary difference between these routes is the option through or around Calperum Station (shown as micro-routes 3.1.1 and 3.1.3 in Figure 4-15). The next lowest-scoring remaining route (Route 5), also traversed Calperum Station, therefore was not considered a viable option.

Although the route through Calperum Station for this section was the preferred option from an overall economic and technical perspective (i.e. had lowest MCA score - refer Route Option 1 in Figure 4-13), further stakeholder consultation revealed this option was not preferred by ALT, the primary stakeholder affected by this alignment. For this reason, ALT was consulted further on possible options and an alternative preferred route was selected which aligned with existing access tracks and fire breaks and skirted the southern and eastern boundaries of Calperum Station. This Route Option 3 route is shown in Figure 4-16 and the MCA score shown in Figure 4-14.

The Route Option 3 increased the length of the transmission line through habitat with no existing access track or other linear disturbance within Hawks Nest Station, and incurred additional cost. However, this route was considered the most feasible alternative of the 24 combinations of micro-route options considered within the MCA, predominantly owing to the overall low relative cost of each option and the stakeholder support provided for this route option over the others considered.

4.7.4. Preferred alignment to January 2021

The preferred November 2019 alignment (Route Option 3) was tested with landholders and government and workshopped with the working group. Subsequent refinements were made to this alignment based on ecological and cultural heritage inputs throughout 2020.

The evolution of the alignment refinement to January 2021 is presented in Figure 4-16 and includes:

- shifting the alignment within Hawks Nest Station slightly west to maximise use of the southern boundary and further minimise traversing higher quality Black-eared Miner habitat within the station that was identified by DEW and further ecological surveys

- a small northward deviation of the alignment where it follows Wentworth -Renmark Road near the border with NSW which seeks to avoid the potential for cultural heritage impacts and a DEW revegetation trial area.

The January 2021 proposed alignment and 1 km transmission line corridor were used for the assessment in this EIS unless otherwise noted. Section 4.7.5 provides detail on the recent adjustment to the alignment that has occurred since January 2021 in response to the results of Aboriginal cultural heritage surveys.

4.7.5. Cultural Heritage Avoidance Alignment – Hawks Nest Station

Cultural heritage surveys were undertaken with the First Peoples of the River Murray and Mallee (First Peoples) in February 2021 as part of the alignment refinement process. These surveys resulted in the identification of several sites of cultural significance within the January 2021 1 km transmission line corridor on Hawks Nest Station.

To avoid disturbance to these sites, ElectraNet has moved the proposed alignment in this area further to the west to follow the fenceline on the western boundary of the Hawks Nest Station pastoral lease to its intersection with the existing 132 kV transmission line easement (refer Figure 4-17). The adjusted alignment will follow the easement for approximately 5km before turning east along the Hawks Nest Station southern boundary.

Specialist studies have been reviewed in light of this change to the alignment to determine whether material changes to the impact assessment would be required. Table 4-8 provides summary of this review.

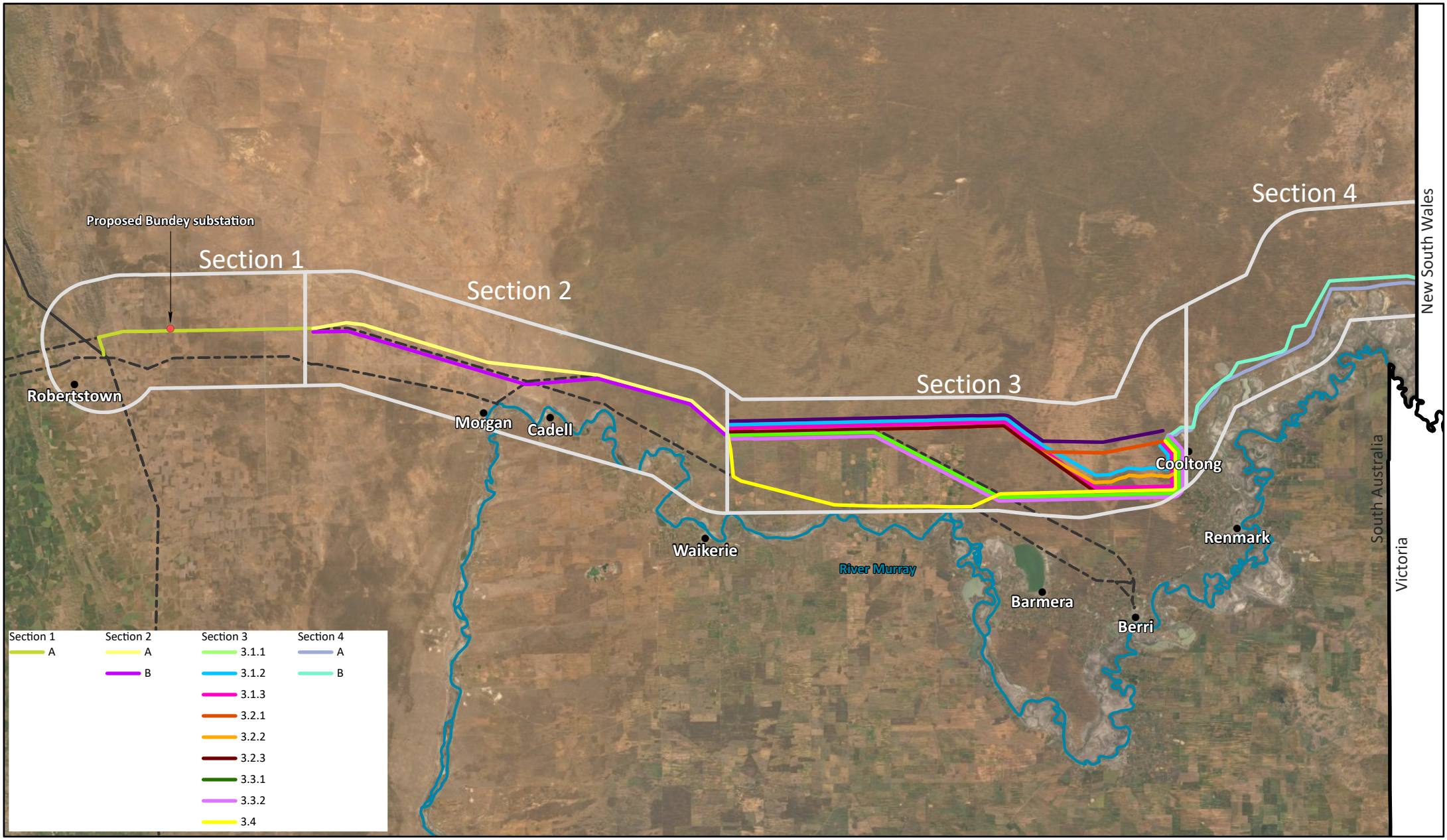
This alignment is the proposed alignment for the purposes of the EIS and will be subject to ongoing refinement at the local level as the design phase progresses and engagement continues with landholders, Traditional Owners and other stakeholders. Ongoing refinement of the alignment is discussed further in Section 4.8

Table 4-8: Summary of potential impacts of cultural heritage avoidance alignment

Environmental aspect	Impact of adjustment to the proposed alignment	Chapter / Section
Land use and tenure	The adjustment will maximise the use of disturbed areas on the Hawks Nest station western boundary and existing 132kV transmission line, minimising impacts to areas of higher quality habitat on the property identified in ecological surveys for the Project. It is noted that there is an unregistered airstrip on the property west of Hawks Nest Station. ElectraNet have engaged with the landholder are working to ensure potential impacts on the airstrip are suitably managed	Section 9.3.2 Section 9.4.2
Physical environment	The adjusted alignment is within the 10 km wide corridor centred on the January 2021 alignment that was used for the assessment of impacts to soil and water. The physical environment is consistent with the transmission line corridor and the proximity to significant features (e.g. the River Murray) is not materially altered. No changes to the impact assessment are required.	N /A
Flora and fauna	The adjusted alignment traverses the same vegetation communities as the transmission line corridor. It is slightly longer (approx. 1.3 km), however as it follows existing disturbance to a greater extent (along the boundary fence and the ElectraNet transmission line), the overall level of impact to vegetation and habitats is expected to be lower. The adjusted alignment is within the Ecological Study Area used for the assessment. A desktop review of database records has indicated that the adjusted alignment does not increase the likelihood of presence of any listed species and Appendix I-1 remains unchanged.	Section 11.3.2 Section 11.4.1 Section 11.4.2 Section 11.4.7 Section 11.4.8 Appendix I-6

Environmental aspect	Impact of adjustment to the proposed alignment	Chapter / Section
	As the adjusted alignment is further from the core areas of mallee habitat and further reduces the potential for impact on habitat for threatened mallee birds (e.g. Black-eared Miner) the specialist assessment (Appendix I-4) and its conclusions remain valid. Similarly, the significant impact assessments (Appendix I-3) also remain valid. The native vegetation clearance data report has been updated to account for the adjusted alignment (refer Appendix I-6).	
Cultural heritage	Potential impacts to sites of Aboriginal cultural significance on the January 2021 transmission line corridor will be avoided by moving the alignment west to follow the Hawks Nest pastoral lease boundary and the existing 132kV transmission line. The cultural heritage avoidance alignment has been fully surveyed and agreed with the First Peoples.	Section 12.4
Visual amenity	The visual impact assessment established the Project theoretical zone of visual influence (TZVI) as a 6.2 km radius from each nominal tower location on the January 2021 alignment. The TZVI was adjusted to accommodate the cultural heritage avoidance alignment. The small number of additional social receptors were identified as experiencing Negligible Visibility (refer Appendix L-2).	Section 13.4
Air quality	No additional receptors due to the realignment to avoid Aboriginal cultural heritage have been identified. No changes to the impact assessment are required.	N / A
Noise	No additional noise receptors due to the realignment to avoid Aboriginal cultural heritage have been identified. No changes to the impact assessment are required.	N / A
Traffic and transport	The adjusted alignment is within the 10 km wide corridor buffering the January 2021 alignment used for the assessment of impacts to traffic and transport. No changes to the assessment are required.	N / A
Socio-economic environment	The adjusted alignment is within the 10 km wide corridor buffering the January 2021 alignment used as the local Project context for the assessment of impacts to the socio-economic environment. No changes to the assessment are required.	N / A
Hazards and risk	The adjusted alignment does not introduce any additional hazards that have not been addressed in the assessment. No changes to the assessment are required.	N / A
Waste	The adjusted alignment does not introduce any additional issues of waste management that have not been addressed in the chapter. No changes to the assessment are required.	N / A

.



Corridor section
River Murray
Proposed Bundey substation

Figure 4-15
Micro-routes per section

0 20
Kilometres

N

ElectraNet
energy connect
JBS&G

Note: graphic offsets applied to section data for visualisation purposes. Therefore, this figure is for illustrative purposes only.

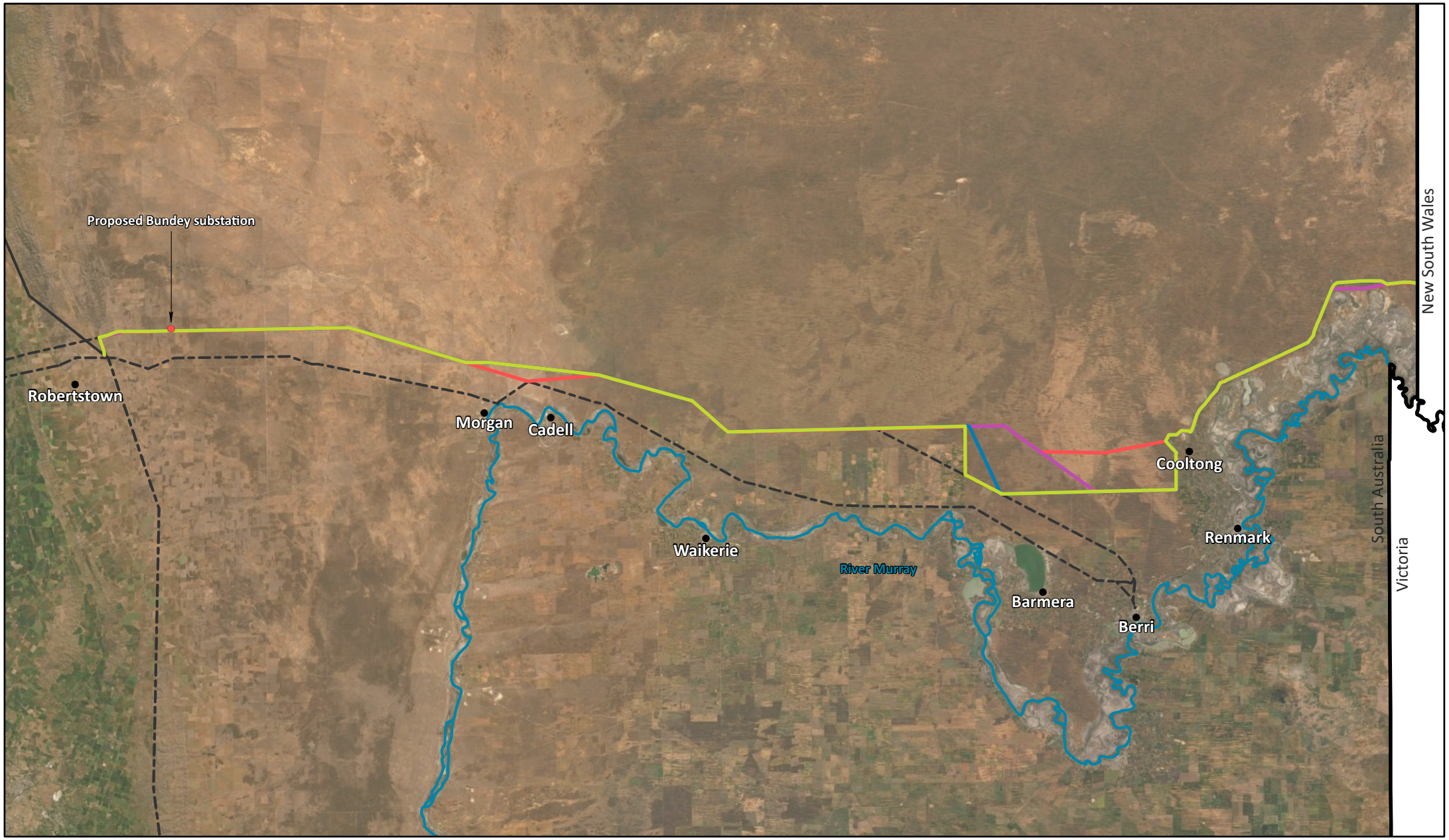


Figure 4-16
Evolution of the route alignment

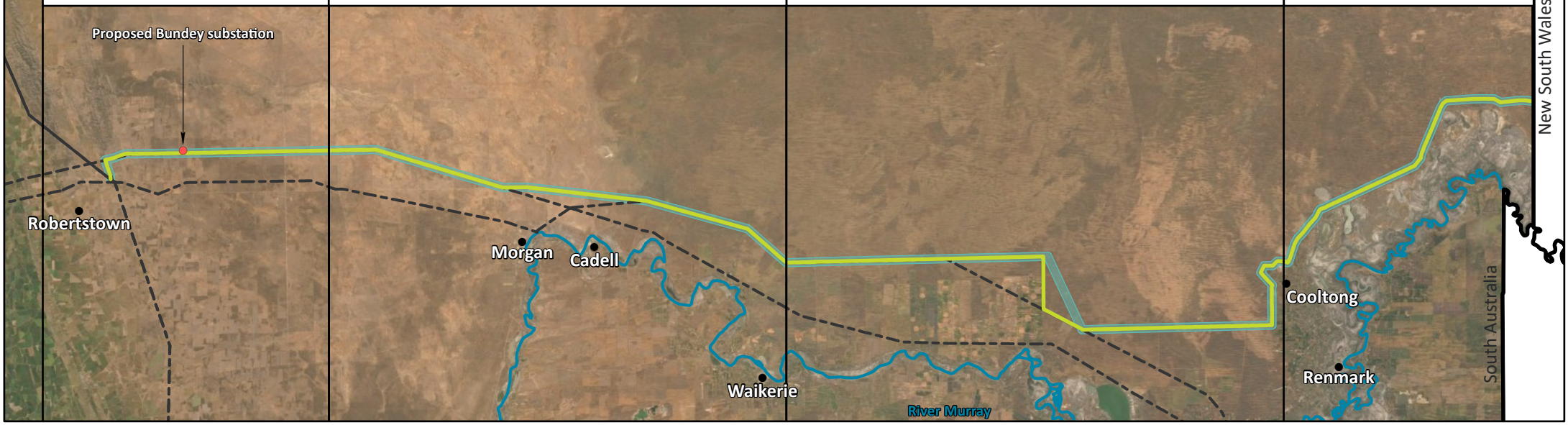
4.8. Ongoing Refinement of the Proposed Alignment and Transmission Line Corridor

The rigorous route selection process described in this chapter demonstrates how all options to develop a proposed alignment have been considered and assessed against a combination of technical, engineering, environmental, social, land access, and economic factors.

The proposed alignment will be subject to ongoing refinement at the local level as the design phase progresses and engagement continues with landholders, Traditional Owners and other stakeholders on the location of transmission line infrastructure (e.g. towers), areas required for construction facilities (e.g. temporary camps and staging areas) and access to construction sites.

Minor realignment outside the 1 km transmission line corridor is possible as part of the Project design and stakeholder engagement process that will be ongoing during the consultation phase of the EIS, however significant changes are not expected. These adjustments to the alignment would generally be to reduce or avoid impacts that have been identified as a result of stakeholder engagement, evolution of Project design and delivery options and in response to findings of on-ground surveys and assessments. Any potential impacts of any future refinements would be confirmed by additional study or assessment as required.

Section 1: Roberstown substation - Powerline Road to Goyder	Section 2: Goyder Highway to Taylorville Station	Section 3: Taylorville Station to Wentworth-Renmark Road	Section 4: Wentworth-Renmark Road to SA-NSW
• Largely traverses open and cleared paddocks following existing 132kV ElectraNet transmission line along Powerline Road. • This portion of the alignment has limited social and environmental receptors.	• Traverses White Dam Conservation Park • Alignment follows existing 132kV transmission line • The alignment deviates north from the existing 132kV line as there is no requirement to connect to the North-west Bend substation. • This will also optimise the crossing of Burra Creek. • Alignment then follows existing 132kV transmission line easement to the south east corner of Taylorville Station • This portion of the alignment has limited social and environmental receptors.	• Alignment follows existing track and 132kV transmission line easement along southern boundary of Taylorville Station • Halfway along the southern boundary of Taylorville, the existing ElectraNet easement diverts to head south-east and the proposed alignment continues east along the existing Taylorville boundary track • At the intersection of the southern boundary of Taylorville and the western boundary of Hawks Nest Station, the proposed alignment turns south to follow the Hawks Nest property boundary until it intersects with the existing 132 kV transmission line easement. The alignment continues south-east along the easement before turning east along the southern boundary of Hawks Nest Station to reach the southern boundary of Calperum Station. • The alignment skirts the southern boundary of Calperum Station to avoid critical habitat of the Black-eared Miner and remains to the west of the community of Cooltong.	• Alignment follows Wentworth- Renmark Road to the SA-NSW border, through Chowilla Game Reserve. • Alignment runs adjacent to Wentworth Road, avoiding the introduction of new impacts in non-disturbed areas. • Alignment diverts from Wentworth-Renmark Road to avoid the potential for cultural heritage impacts and a DEW revegetation trial area.



Transmission line corridor
Proposed alignment
Existing ElectraNet transmission line
River Murray
Proposed Bundey substation

Figure 4-17
Proposed Project EnergyConnect alignment and transmission line corridor

0 20
Kilometres

N

ElectraNet
energy connect
JBS&G

4.9. Conclusion

Building on the extensive network planning process undertaken in the Integrated System Plans prepared by AEMO (AEMO 2018a and 2020a) and the alternatives evaluated in detail in the SAET RIT-T process, ElectraNet has undertaken a detailed evaluation of the investigation corridor and multiple route options, to achieve the objectives of Project EnergyConnect.

Recognising the complexity of a nationally significant infrastructure project traversing east-west across approximately more than 200 km of South Australia, a robust route selection methodology has been followed to ensure that technical, engineering, environmental, social, land access, and economic factors have been appropriately considered when determining the optimal alignment for the proposed transmission line that has been assessed in this EIS.

The assessment, as described in this chapter, involved detailed consultation with local landholders, Traditional Owners, government, special interest groups and potentially affected individuals along the route options that were evaluated. The Project Steering Committee, working group and technical specialists have been actively engaged when evaluating the various route alternatives.

The MCA involved extensive study and consultation to ensure the ultimate route is selected based on a balanced approach, is broadly supported by stakeholders and reduces, as far as possible any potential environmental and social impacts.

Subject to receiving the required Project approvals, detailed design will be undertaken on the basis of the technical studies to select, refine and micro-site Project infrastructure to further minimise impacts on environmental and social receptors. The detailed design process will be iterative and continually informed through the ongoing landholder negotiations, stakeholder engagement and environmental management planning.

EIS Volume 1 Chapter 5

Legislative and Planning Framework

JBS&G

project energy connect

Contents

5. Legislative and Planning Framework 5-1

5.1. Introduction 5-1
5.2. EIS Guidelines 5-1
5.3. State Environmental Assessment and Approval Process 5-2
5.3.1. Major Development Status – *Development Act 1993* 5-2
5.3.2. Transition to the Planning, Development and Infrastructure Act 2016 5-2
5.3.3. Development Application and EIS Guidelines 5-2
5.3.4. Commonwealth assessment 5-4
5.4. Consistency of the Project with State Government Policy 5-4
5.4.1. Planning policies 5-4
5.4.2. Environment protection 5-4
5.4.3. River Murray protection 5-6
5.5. Other relevant South Australian legislation and approvals 5-9
5.6. Commonwealth Environmental Assessment and Approval 5-16
5.6.1. *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) 5-16
5.6.2. Other Commonwealth legislation 5-17
5.6.3. International Conventions and Agreements 5-21
5.6.4. Principles of ecologically sustainable development 5-22
5.6.5. Greenhouse gas emission policies 5-23
5.7. Planning Assessment 5-23
5.7.1. Assessment conclusions 5-23
5.7.2. Assessment against State Planning Policies 5-24
5.7.3. Assessment against the State Planning Strategy and Region Plans 5-26
5.7.4. Assessment against the Planning and Design Code 5-30

List of Tables

Table 5-1: EIS Guidelines addressed in the Legislative and Planning Framework chapter 5-1
Table 5-2: Aspects of assessment requirements addressed in other chapters 5-1
Table 5-3: Potential prescribed activities of environmental significance 5-6
Table 5-4: Summary of other relevant South Australian legislation 5-10
Table 5-5: Relevant State Codes of Practice and Guidelines and other regulatory instruments referred to in the EIS 5-14
Table 5-6: Relevant Commonwealth legislation and approvals requirements 5-18
Table 5-7: Relevant Commonwealth Standards, Codes of Practice and Guidelines and other regulatory instruments referred to in the EIS 5-19
Table 5-8: NSESD core objectives and guiding principles 5-22
Table 5-9: Assessment of the Project against relevant State Planning Policies 5-24
Table 5-10: Local Government Areas and applicable Region Plans 5-26
Table 5-11: Assessment of the Project against applicable Region Plans 5-26
Table 5-12: Summary of Zones, Overlays and Policies applicable to the Project 5-30
Table 5-13: Assessment against Planning and Design Code – Zones 5-32
Table 5-14: Assessment against the Planning and Design Code – Overlays and General Policies 5-34

List of Figures

Figure 5-1: River Murray Protection Area 5-8
Figure 5-2: LGAs and Out of Council Areas in the region of the Project 5-29
Figure 5-3: PDI Code Zones on the transmission line corridor 5-40

5. Legislative and Planning Framework

5.1. Introduction

This chapter addresses the main legislative requirements for the Project, including Project approvals and permits / licences for specific activities. It describes the key legislation relevant to the Project and identifies the relevant policies, standards and Codes of Practice that will be applied to Project activities.

The chapter also provides an assessment of the Project against the Planning and Design Code, the Planning Strategy and State Planning Policies.

5.2. EIS Guidelines

The EIS Guidelines require an assessment of the planning, environmental and energy-related statutory requirements as set out in Table 5-1.

Table 5-1: EIS Guidelines addressed in the Legislative and Planning Framework chapter

EIS Guidelines and Assessment Requirements	Assessment level
Planning and Environmental Legislation and Policies *Assessment requirement 16:* A range of planning, environmental and energy related statutory requirements would need to be met for the construction and operation of the proposed development.	
• 16.1: Describe the proposed transmission line in terms of its consistency with the relevant Development Plans, Planning and Design Code, the Planning Strategy and the State Planning Policies.	Standard
• 16.2: Describe the proposed transmission line in terms of its consistency with relevant State and Commonwealth legislation.	Standard
• 16.3**:** Outline any other Commonwealth or State Government initiatives that may relate to the proposed transmission line, including greenhouse issues, principles of ecologically sustainable development, power generation, and the conservation or protection of the biological environment. Describe the proposal in terms of its consistency with these initiatives.	Standard
• 16.4**:** Identify any potential implications of the proposed transmission line for International Conventions and Agreements to which the Commonwealth of Australia is a party.	Standard
Consistency with Government Policy The *Development Act 1993* requires the EIS to state consistency with the expected effect of the proposed development: • with the relevant Development Plan, Planning and Design Code and Planning Strategy • with the objects of the *Environment Protection Act 1993*, the general environmental duty and relevant environment protection policies; and • with the objects of the *River Murray Act 2003*, the Objectives for a healthy River Murray and the general duty of care	

Aspects of assessment requirements identified in Table 5-1 above which are not addressed in this chapter are listed in Table 5-2 together with the applicable chapter.

Table 5-2: Aspects of assessment requirements addressed in other chapters

Assessment Requirement	Chapter
16.3 Commonwealth or State Government initiatives that may relate to the proposed transmission line including power generation.	Chapter 2 Project Justification
16.3 Commonwealth or State Government initiatives that may relate to the proposed transmission line including the conservation or protection of the biological environment.	Chapter 11 Flora and Fauna

5.3. State Environmental Assessment and Approval Process

5.3.1. Major Development Status – *Development Act 1993*

The assessment status of the Project as a major development was determined by the Minister for Planning under the *Development Act 1993.* ElectraNet applied to the Minister for the Project to be declared a major development on 5 February 2019. Major development status was granted by the Minister and gazetted on 27 June 2019.

Under Part 4 Division 2 of the Development Act, if a development is considered to be of economic, social or environmental importance to the State, the Minister can declare a proposed development or land use to be a 'major development'. The Minister may make this declaration if they believe it is appropriate or necessary for proper assessment of the proposed development. The major development declaration triggers a thorough State-run assessment process with opportunity for public comment, before any decision is made on whether the proposal warrants an approval.

ElectraNet sought a declaration of major development status for the Project as it was considered that:

- This was the best assessment process to ensure a single, integrated and streamlined assessment of the development by all relevant authorities, agencies and stakeholders.
- The significant level of public interest expected required a broader consideration of issues, concerns and impacts and potentially a more rigorous process than that provided by alternative approval pathways.
- A major development declaration would provide certainty for ElectraNet about the process to be undertaken and the timing, which would be a benefit to planning and construction schedules.

5.3.2. Transition to the Planning, Development and Infrastructure Act 2016

The Development Act has been in the process of being replaced over time by the *Planning, Development and Infrastructure Act 2016* (PDI Act) which was fully implemented on 19 March 2021. The *Planning, Development and Infrastructure (Transitional Provisions) Regulations 2017* (the transitional provisions) provide guidance for how major developments declared under the Development Act will be managed through the transition phase.

The transitional provisions provide that the Development Act will continue to apply to major developments where the major development declaration has been made prior to the operational commencement of the PDI Act (i.e. prior to 1 July 2019). As the Project was declared a major development on 27 June 2019, the provisions of the Development Act will continue to be relevant to the assessment of the Project EIS.

5.3.3. Development Application and EIS Guidelines

Following the declaration of major development status, a Development Application (DA) for the Project was formally submitted to the Minister for Planning by ElectraNet on 18 July 2019.

The purpose of the DA was to assist with scoping potential impacts and provide information which would enable a decision on the appropriate level of assessment required for the Project. The DA included a description of the Project, its location, and a preliminary assessment of the potential environmental, social or economic effects and how those effects could be managed. The DA was referred to the State Planning Commission (SPC) to assist them in the formulation of guidelines for the preparation of the major development assessment. Liaison on development of the guidelines was also undertaken with the Commonwealth government in relation to EPBC Act matters.

The SPC determined that the appropriate level of detailed assessment was an EIS. This is the level of assessment generally required for more complex proposals, where there is a wide range of issues requiring in-depth investigation.

The formal assessment Guidelines for the preparation of the EIS were released by the Minister on 20 November 2019. The Guidelines set out the major issues associated with the proposal, the degree of their significance and outline the way in which these issues should be dealt with in the EIS.

This EIS has been prepared in accordance with the EIS Guidelines (refer Appendix B).

EIS Assessment Process

The Development Act and EIS Guidelines ensure that proponents of developments prepare an EIS which provides a clear, detailed and comprehensive analysis of the proposed development, the environment (physical, biological and socio-economic), in which it will be located, the likely impacts of the development and how those impacts will be addressed. An overview of the assessment and approval process is shown in Chapter 1 Introduction at Figure 1-4.

The South Australian Government's assessment process commenced upon ElectraNet's submission of this EIS for the Project to the Minister for Planning and Local Government in March 2021. The EIS will be placed on exhibition for public comment for a period of at least six weeks (30 business days). The EIS is also being referred to local councils and other relevant government agencies (e.g. the Environment Protection Authority SA (EPA SA), Department of Environment and Water (DEW)) during this period.

Public meeting(s) chaired by a person appointed by the Minister and attended by ElectraNet will be held in a location(s) in the vicinity of the Project to assist interested parties in preparing a submission and to inform them about the proposal and assessment process[1]. The public meeting(s) will include presentations from ElectraNet and provide attendees with the opportunity to ask questions on the Project and the EIS consultation process. Further detail on stakeholder engagement undertaken for the Project is provided in Chapter 6 Stakeholder Engagement.

Written submissions from the community are invited during the EIS consultation process. All written submissions received will be made available for public inspection, and will be referred by SA Government to ElectraNet at the end of the public exhibition period for formal response. A Response Document prepared by ElectraNet will address the submissions received and provide any relevant additional or updated information in response to the issues raised in submissions. The Response Document may include amendment to the EIS as a result of consultation, or indicate changes to the original proposal in response to issues raised. Further public consultation may be required if substantial changes are proposed.

The EIS (including the Response Document) will then be assessed by State Planning Commission and an Assessment Report provided to the Minister for Planning and Local Government for a decision. The Assessment Report and the Response Document will also be made publicly available (including to councils) for a period to be determined by the Minister.

From 1 July 2019, under the PDI Act transitional provisions, the SA Minister for Planning makes the final decision on whether to approve the Project under section 48 of the Development Act having regard to Regulation 11(3). As outlined in the EIS Guidelines, when making the final determination of whether to approve the Project and any conditions that will apply, the Minister must have regard to:

- provisions of appropriate Development Plans or Planning and Design Code
- Development Act and Regulations

[1] The final number of meetings to be held will be determined in accordance with PLUS-AGD requirements.

- the Building Code of Australia (if relevant)
- the South Australian Planning Strategy (including the Integrated Land Use and Transport Plan)
- the EIS, Response Document and Assessment Report
- the *Environment Protection Act 1993* (if relevant)
- any other relevant government policy and / or legislation.

5.3.4. Commonwealth assessment

The Project has also been declared a controlled action under the Commonwealth *Environment Protection and Biodiversity Act 1999*, and therefore comes within the ambit of the EPBC Act Bilateral Agreement for Environmental Assessment agreed between the Commonwealth and SA. The effect of this agreement is to allow a single set of impact assessment documents to be prepared. Accordingly the South Australian Government Assessment Report for the EIS will be provided to the Commonwealth Minister for the Environment, who will make a separate decision under Part 9 of the EPBC Act in relation to the controlled action (refer Section 5.6.1 for further detail).

5.4. Consistency of the Project with State Government Policy

The EIS guidelines require that the EIS assess the consistency of the expected effects of the proposed Project with the:

- relevant Council Development Plan, Planning and Design Code and Planning Strategy
- objects of the *Environment Protection Act 1993,* the general environmental duty and relevant environment protection policies
- objects of the *River Murray Act 2003*, the Objectives of a Healthy River Murray and the general duty of care.

5.4.1. Planning policies

An assessment of the consistency of the Project with the State Planning Policies, State Planning Strategy and Region Plans, the Planning and Design Code is provided in the planning assessment at Section 5.7. Due to implementation of Phase 3 of the Code on 19 March 2021 there are no relevant Council Development Plans to consider.

5.4.2. Environment protection

The *Environment Protection Act 1993* (EP Act) provides the regulatory framework for the management of pollution and general environmental protection in SA. The object of the EP Act is to protect the environment, promote the principles of ecologically sustainable development (ESD) and ensure that all reasonable and practicable measures are taken to protect, restore and enhance the quality of the environment, having regard to ESD principles.

The EP Act provides for a general environmental duty, sets out activities of environmental significance which require licencing and environment protection policies developed for specific issues.

Duty of environmental care

The Act establishes a general duty of environmental care in relation to development activities requiring that all reasonable and practicable measures are taken to prevent or minimise environmental harm if potentially polluting activities are undertaken.

Environment Protection Policies

A number of Environment Protection Policies (EPPs) are also established under the EP Act setting out requirements, standards, goals and guidelines matters such as air and water quality, and noise. These EPPs and their relevance to the Project are discussed below.

Environment Protection (Water Quality) Policy 2015

The Water Quality EPP aims to achieve the sustainable management of waters, by protecting or enhancing water quality while allowing economic and social development.

Construction activities have the potential to affect to surface water flows and water quality (refer Chapter 10 Physical Environment). ElectraNet will undertake activities in accordance with the EPP, as outlined in Chapter 10 Physical Environment. ElectraNet will abide by the general environmental duty of care by taking appropriate measures in relation to activities that may impact on water quality.

Environment Protection (Air Quality) Policy 2016

The main objective of the Air Quality EPP is to protect air quality and reduce the emission of air pollutants.

This EPP is relevant to several aspects of the Project particularly in relation to the generation of dust from construction activities (refer Chapter 13 Air Quality). ElectraNet will undertake activities in accordance with relevant requirements of the Air Quality EPP and conform to general duty of environmental care obligations regarding emissions of air pollutants.

Environment Protection (Noise) Policy 2007

The Noise EPP provides a legal framework for the assessment of a wide range of noise issues, balancing social, economic and environmental considerations in the management of noise.

Several aspects of the Project relating to construction activities are expected to generate noise (refer Chapter 14 Noise and Vibration). While the Noise EPP does not apply to construction activities related to public infrastructure, the EPP will be used as a guide to ensuring impacts from noise are minimised, in line with the general environmental duty of care.

Environment Protection (Waste to Resources) Policy 2010

The main objective of the Waste to Resources EPP is to achieve sustainable waste management by applying the waste management hierarchy consistently with the principles of ecologically sustainable development.

This EPP is relevant to waste management aspects of the Project (refer Chapter 19 Waste Management). ElectraNet will undertake the Project in accordance with the EPP, including implementation of the waste hierarchy and appropriate management and transport of waste.

Activities of environmental significance

Schedule 1 of the EP Act prescribes particular activities as being of environmental significance which require licensing under the EP Act[2]. The potential prescribed activities for the Project are listed in Table 5-3 and are further discussed in Chapter 7 Project Description, Chapter 10 Physical Environment, Chapter 14 Air Quality and Chapter 15 Noise and Vibration. A licence under the EP Act will be obtained for such activities, if required.

[2] EP Act Schedule 1 activities are also reflected in the provisions requiring referral of proposals to agencies under Schedules 8 and 22 of the *Development Regulations 2008*, Schedule 9 of the *Planning, Development and Infrastructure Regulations 2017* and Part 9.1 of the Code.

Table 5-3: Potential prescribed activities of environmental significance

EP Act Schedule 1	Activity	Project activity / comment
2 Manufacturing and Mineral Processing	*(5) Concrete batching works* - the conduct of works for the production of concrete or concrete products that are manufactured or are capable of being manufactured by the mixing of cement, sand, rock, aggregate or other similar materials, being works with a total capacity for production of such products exceeding 0.5 cubic metres per production cycle.	Up to 3 concrete batching plants may be required to provide concrete for tower foundations.
3 Resource recovery, waste	*(5) Activities involving listed wastes* (a) an activity producing listed waste—the conduct of an activity in which a listed waste is produced as waste or becomes waste	Small quantities of listed wastes (e.g. waste oil from equipment maintenance) may be produced during construction activities
8 Other	*(2) Fuel burning* - the conduct of works or facilities involving the use of fuel burning equipment, including flaring (other than flaring at petroleum production, storage or processing works or facilities that do not have a total storage capacity or total production rate exceeding the levels respectively specified in clause 1(5)) or incineration, where the equipment alone or in aggregate is capable of burning combustible matter— (a) at a rate of heat release exceeding 5 megawatts	Temporary construction camps may require generators (however it is unlikely the fuel burning capacity would exceed 5 MW)
	(3) Helicopter Landing Facilities - the conduct of facilities designed for the arrival and departure of helicopters, but excluding— (a) facilities at an aerodrome licensed under Part 6; or (b) facilities at which helicopter arrivals or departures take place on not more than 10 days per year; or (c) facilities that are situated more than 1 kilometre from residential premises not associated with the facilities; or (d) facilities at the site of an activity authorised under the *Mining Act 1971*, the *Petroleum Act 2000*, *the Petroleum (Submerged Lands) Act 1982* or the *Roxby Downs (Indenture Ratification) Act 1982*.	The Project may utilise helicopters during both construction and operation. The number and location of helicopter landing facilities (if utilised) are to be determined, however they will not be located less than 1 km from residential premises.

5.4.3. River Murray protection

The *River Murray Act 1993* aims to protect, restore and enhance the River Murray and its natural resources (including water, soil, ecosystems and heritage associated with the River) and imposes a duty of care on all people to ensure that their actions do not cause harm to the River.

The Act also establishes a list of Objectives for a Healthy River Murray (the ORMs) which set out the desired outcomes for improved river health, environmental flows, water quality and the human dimension (encompassing a broad range of River Murray values of importance to the community).

The *River Murray Regulations 2017* establish River Murray Protection Areas which designate the areas in which applications for certain types of licences and permits must be referred to the Minister for the River Murray before being granted.

The transmission line corridor is located 5 km north of the main channel of the River Murray and its immediate environs will be unaffected by Project related activities. The eastern end of the corridor is located within the upper extent of the River Murray Protection Area established under the Act (refer Figure 5-1), however there are no current requirements for approvals under the legislation which are applicable to the Project.

The application of *State Planning Policy 17: Special Legislative Scheme River Murray Act 2003* to Project activities is discussed further in Table 5-9.

The applicable River Murray protection overlays in the Planning and Design Code are discussed in the planning assessment in Section 5.7.4.

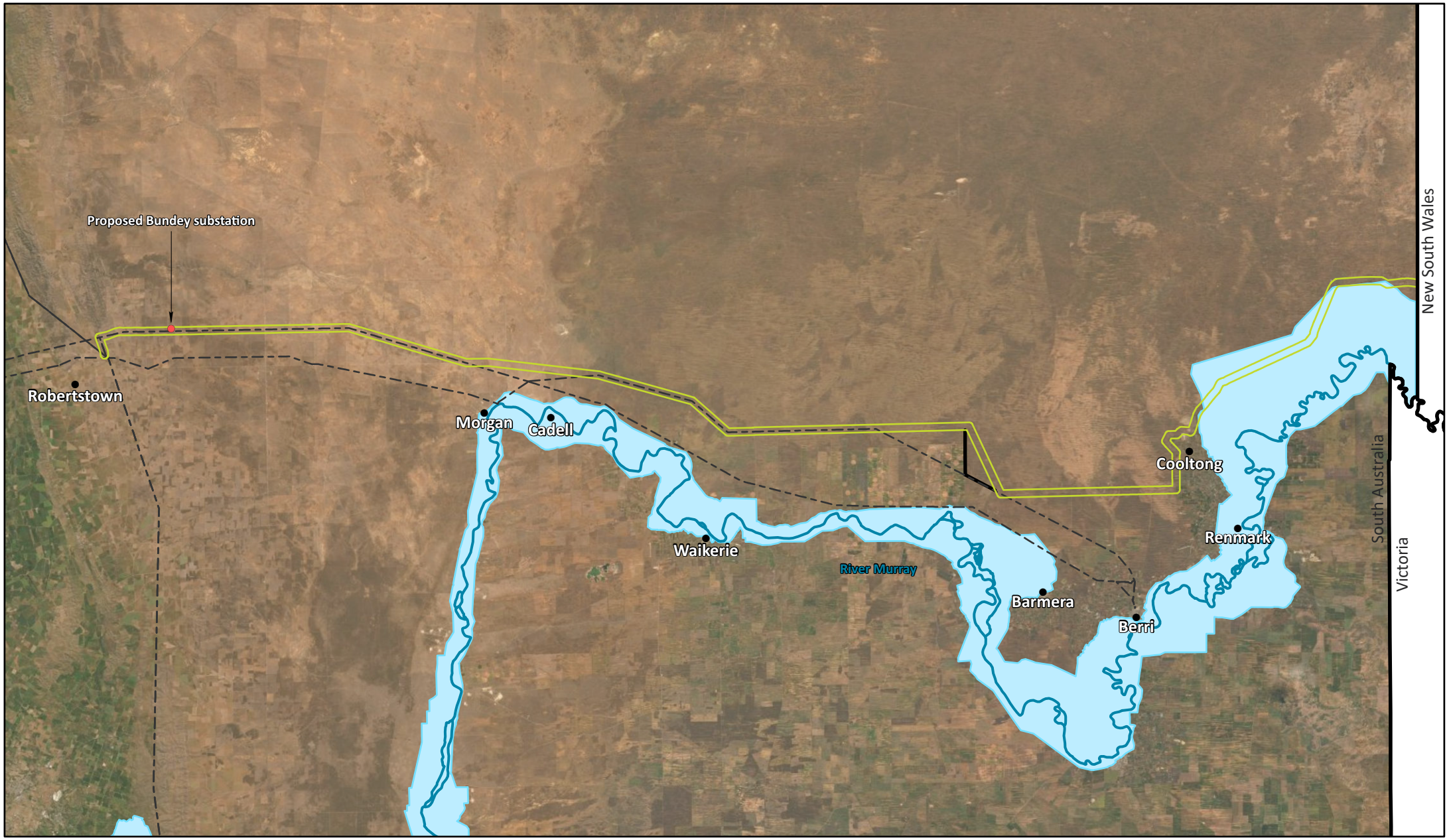


Figure 5-1
River Murray Protection Area

5.5. Other relevant South Australian legislation and approvals

In addition to the legislation discussed in Section 5.4, the Project will require a range of approvals under other relevant legislation. A description of the processes for activity approvals has not been included as in most cases the process generally requires an application to be lodged for assessment and decision, leading to a permit or licence.

The list of approvals and legislative requirements identified in Table 5-4 is indicative of the types of approvals that may be required but is not a conclusive or exhaustive list.

Table 5-5 lists relevant State Codes of Practice and Guidelines which have been referred to and / or considered in the EIS to guide the assessment of Project activities.

Table 5-4: Summary of other relevant South Australian legislation

Legislation	Objective	Relevance to the Project	Approvals / legislative requirements	Administering agency	EIS chapter
Aboriginal Heritage Act 1988	Provides protection for any Aboriginal sites, objects or remains (whether previously recorded or not).	The area of the Project includes items and places of Aboriginal heritage (see Chapter 12, Cultural Heritage).	No Aboriginal site, object or remains may be damaged, disturbed or interfered with unless prior approval has been obtained from the Minister for Aboriginal Affairs and Reconciliation. Cultural heritage surveys are being undertaken with the Traditional Owners and ElectraNet will continue to work with these groups to ensure that Project activities comply with the Act.	Department of the Premier and Cabinet	Chapter 9 Land Use and Tenure Chapter 12 Cultural Heritage
Agricultural and Veterinary Products (Control of Use) Act 2002 *Agricultural and Veterinary Products (Control of Use) Regulations 2017*	Imposes a general duty of care on a person who uses or disposes of agricultural and certain veterinary chemical products and fertilisers.	Weed and pest plant control will be required to ensure horticultural and agricultural practices are not disrupted as a result of Project activities.	Compliance with regulations No specific approvals required	Primary Industries and Regions South Australia (PIRSA)	Chapter 9 Land Use and Tenure Chapter 11 Flora and Fauna Draft Construction Environment Management Plan
Climate Change and Greenhouse Emissions Reduction Act 2007 (Also see National Greenhouse and Energy Reporting Scheme (NGERS) in Table 5-6)	To assist in achieving ecologically sustainable development in the State by addressing issues associated with climate change, in particular through the reduction of greenhouse gas emissions and an increase in renewable energy.	Provides emissions reduction targets for the State. Achievement of the Act's objectives includes assessment of emissions related to the export and import of electricity via interconnectors. Emissions will arise from combustion of fuel by Project vehicles, plant and equipment and land clearing.	Policy context No specific approvals required	Department for Environment and Water	Chapter 2 Project Justification Chapter 14 Air Quality

Legislation	Objective	Relevance to the Project	Approvals / legislative requirements	Administering agency	EIS chapter
Crown Land Management Act 2009	To manage and regulate Crown lands.	The Project traverses areas of Crown land or land held under licence from the Crown.	Approval is required to surrender or transfer a Crown lease, or to grant an easement over Crown land or land held under licence from the Crown. Consent of all parties is required for grant of an easement over Crown land e.g. native title and pastoral lessees	Department for Environment and Water	Chapter 9 Land Use and Tenure
Dangerous Substances Act 1979 *Dangerous Substances (General) Regulations 2017*	To regulate the keeping, handling, transporting and the conveyance, use, disposal and quality of dangerous substances.	There is a wide variety of circumstances in which dangerous substances (such as diesel, fuel, oil and LPG) would be used during the Project.	Licences may be required to keep or transport dangerous substances.	Department of Treasury and Finance	Chapter 7 Project Description Draft Construction Environment Management Plan
Electricity Act 1996 *Electricity (General) Regulations 2012* *Electricity (Principles of Vegetation Clearance) Regulations 2010*	To regulate the electricity supply industry and to provide for the development of safety and technical standards for electrical installations. Specify the requirements for vegetation clearance around transmission lines.	Clearance distances between vegetation and powerlines must be maintained in accordance with the *Electricity (Principles of Vegetation Clearance) Regulations 2010*.	New licences, or a variation of an existing licence, may be required to carry out work near electrical infrastructure. Amendments to the vegetation clearance regulations will be required to account for 330 kV transmission lines as these are not currently part of the South Australian electricity network.	Department for Energy and Mining Essential Service Commission of South Australia (ESCOSA) Office of the Technical Regulator) (DEM-OTR)	Chapter 7 Project Description Chapter 11 Flora and Fauna
Fire and Emergency Services Act 2005 *Fire and Emergency Services Regulations 2005*	Provides for the prevention, control and suppression of fires and for the handling of certain emergency situations	There is a duty to prevent or inhibit the outbreak of fire on land, create and maintain firebreaks, trim vegetation	Permits may be required in relation to fire bans and hot work.	South Australian Country Fire Service	Chapter 18 Hazards and Risk Management
Heavy Vehicle National Law (South Australia) Act 2013	Implements a national scheme for facilitating and regulating the use of heavy vehicles on roads	National regulations prescribe mandatory standards for heavy vehicles using public roads	Compliance with regulations Regulations applies to all heavy vehicles over 4.5 tonnes.	National Heavy Vehicle Regulator (NHVR)	Chapter 16 Traffic and Transport
Heritage Places Act 1993	Provides for the identification and conservation of places and objects of non-Aboriginal heritage significance.	An assessment for potential sites of non-Aboriginal heritage has been undertaken to determine potential impacts.	Permit may be required to recover archaeological heritage objects if they are discovered during activities.	Department for Environment and Water	Chapter 12 Cultural Heritage

Legislation	Objective	Relevance to the Project	Approvals / legislative requirements	Administering agency	EIS chapter
	Establishes the South Australian Heritage Council.				
Land Acquisition Act 1969	Provide for the acquisition of land on just terms allowing an authority to acquire land or the right to place any easement, right of way or other licence on the land.	The Act allows ElectraNet to acquire land, either by mutual agreement or by compulsory acquisition. Note: ElectraNet's position is that compulsory acquisition is a last resort and all available options need to be identified, explored and ruled out before it should be considered.	Determination of compensation for landholders to be undertaken consistent with the principles of compensation under the Act. Note: under the *Electricity Act 1996*, the Minister responsible for that Act must first authorise the acquisition in writing.	Attorney-General's Department	Chapter 9 Land Use and Tenure
Landscape South Australia Act 2019	Promote sustainable and integrated management of the State's landscapes and make provision for the protection of the State's natural resources	Provisions of relevance to the Project are those addressing land management, water resource management and pest plant and animal control.	Permits may be required to undertake a water affecting activity e.g. drilling wells. Owners of land are obliged to control or destroy certain pest plants and animals declared under the Act.	Department for Environment and Water Northern and Yorke Landscape Board Murraylands and Riverland Landscape Board	Chapter 7 Project Description Chapter 10 Physical Environment Chapter 11 Flora and Fauna.
Local Government Act 1999	Provide Councils with broad powers to make decisions and deliver services.	Councils have responsibility for ensuring appropriate maintenance and repair of public roads.	Councils may make agreement to recover costs for roadwork to repair damage to a road.	Local Councils	Chapter 16 Traffic and Transport
Mining Act 1971	Provides for licensing of exploration for and extraction of minerals.	There are several Exploration Licences and other mining tenements issued under the within 10 km of the proposed corridor	No specific approval required ElectraNet will consult with holders of relevant tenements prior to the commencement of construction activities.	Department for Energy and Mining	Chapter 9 Land Use and Tenure
National Electricity (South Australia) Act 1996	Makes provision for the operation of the national electricity market. Applies the National Electricity Law (NEL) (refer Table 5-7). The NEL is the schedule to the Act which establishes the	Construction of an electricity transmission line	No specific approval required	Australian Energy Market Commission (AEMC)	Chapter 2 Project Justification

Legislation	Objective	Relevance to the Project	Approvals / legislative requirements	Administering agency	EIS chapter
	governance and enforcement framework and key obligations surrounding the NEM and the regulation of access to electricity networks.				
National Parks and Wildlife Act 1972	Establishes the system of conservation reserves in South Australia and provides protection for native plants and animals.	National parks and conservation reserves exist within the EIS Project Area.	Licence, lease or agreement may be required through areas controlled by the Minister under the Act.	Department for Environment and Water	Chapter 9 Land Use and Tenure Chapter 11 Flora and Fauna
Native Title (South Australia) Act 1994. (Also see Commonwealth native title legislation in Table 5-6)	To recognise and protect native title.	There are determined areas of native title and native title claims over the area of the Project. A registered Indigenous Land Use Agreement is also in place.	ElectraNet is in the process of negotiating appropriate agreements with the relevant native title groups and Traditional Owners that will be impacted by the Project.	Attorney-General	Chapter 9 Land Use and Tenure
Native Vegetation Act 1991 *Native Vegetation Regulations 2017*	Applies to the management and clearance of native vegetation on private and public land in South Australia. Establishes the Native Vegetation Council (NVC) and Native Vegetation Fund. Provides for native vegetation heritage agreements (VHA) between the State and land owners	The Project will require the clearing of native vegetation. Significant environmental benefit (SEB) measures are proposed for this clearance. There are VHAs in place along sections of the transmission line alignment.	Consent is required under the Act to clear native vegetation unless the clearing activity meets circumstances prescribed under the Regulations. Under Regulations 12 and 13, vegetation clearance for major developments that are approved under an EIS (that was referred to the NVC for comment) is permitted, provided that it is undertaken in accordance with the development consent and an approved management plan (or a payment into the Native Vegetation Fund) which results in a significant environmental benefit.	Department for Environment and Water Native Vegetation Council	Chapter 11 Flora and Fauna Chapter 9 Land Use and Tenure

Legislation	Objective	Relevance to the Project	Approvals / legislative requirements	Administering agency	EIS chapter
			Registered VHAs will require variation to remove the area required for the proposed transmission line easement		
Pastoral Land Management and Conservation Act 1989	To provide for the management and conservation of pastoral land, including the monitoring, prevention of harm and rehabilitation of this land.	The Project will require the use of pastoral land for linear infrastructure.	ElectraNet may need approval to use pastoral land for other than pastoral purposes.	Department of Primary Industries and Regions	Chapter 9 Land Use and Tenure
Plant Health Act 2009	Protects plants from pests and regulates their movement into and within South Australia:	Project vehicles and equipment will be moving through the Riverland which may be subject to plant disease quarantine restrictions (e.g. fruit fly)	The Minister may declare quarantine areas that restrict movement of persons, vehicles, machinery or equipment.	Department of Primary Industries and Regions	Chapter 9 Land Use and Tenure
Road Traffic Act 1961	To consolidate and amend certain enactments relating to road traffic; and for other purposes	The Project is expected to require the transport of over-dimensional loads (e.g. to the Bundey substation site)	ElectraNet may require an oversize or over-mass vehicle exemption and / or restricted access approval in respect to heavy vehicles and over-sized loads being delivered to site.	Department for Infrastructure and Transport	Chapter 16 Traffic and Transport
Work Health and Safety Act 2012 *Work Health and Safety Regulations 2012*	To provide for the health, safety and welfare of persons at work and eliminate risks	Health and safety management aspects of the Project are discussed in Chapter 21 Environmental Management.	ElectraNet have a duty to ensure that the workplace is safe and that employees and the public are safe from injury and risks to health.	SafeWork SA	Chapter 21 Environmental Management

Table 5-5: Relevant State Codes of Practice and Guidelines and other regulatory instruments referred to in the EIS

Document	Purpose	EIS Chapter
Air and Water Quality Guideline – concrete batching guideline (EP ASA 2016) (EPA 427/16)	Provides information to those involved in the management and operation of concrete batching plants, to assist with compliance with the *Environment Protection Act 1993*	Chapter 10 Physical Environment Chapter 14 Air Quality
Bunding and spill management guideline (EPA 080/16)	Provides guidance on the use of bunds and spill containment systems for storage of liquids above ground	Chapter 10 Physical Environment

Document	Purpose	EIS Chapter
Code of Practice for Fire Management on Public Land in South Australia	Establishes the performance measures for fire management on public land in South Australia	Chapter 18 Hazards and Risk Management
Discovery of Aboriginal Sites and Objects (Fact sheet)	Provides guidance on management of discovery of Aboriginal sites or objects during project works	Chapter 12 Cultural Heritage
Environmental management of dewatering during construction activities (EPA 1093/18)	Provides guidance on the environmental management of dewatering during construction activities	Chapter 10 Physical Environment
Evaluation distances of effective air quality and noise management (EPA 2019)	Provides recommended evaluation distances from polluting activities, within which potential adverse impacts on sensitive receivers need to be assessed:	Chapter 14 Air Quality
Guidelines for the Assessment and Remediation of Site Contamination (EPA 2019)	Provides information to ensure the assessment and remediation of site contamination is conducted to an appropriate standard in South Australia.	Chapter 10 Physical Environment
Guideline for the Use of the Environment Protection (Noise) Policy 2007 (EPA 2009)	Provides a clause-by-clause explanation, and include examples to assist in understanding and using the Noise EPP	Chapter 15 Noise and Vibration
Industry Guideline – Construction environmental management plan guidelines (EPA 1095/19)	Describes the impacts of construction activities and the information that should be included in a construction environmental management plan (CEMP) to ensure activities will be managed to avoid or mitigate environmental or nuisance impacts.	Chapter 10 Physical Environment Chapter 21 Environmental Management Framework
Project Planning and Aboriginal Heritage (Fact sheet)	Provides guidance on planning processes to manage the potential for impact on Aboriginal heritage during project works.	Chapter 12 Cultural Heritage
South Australian Firebreaks, Fire Access Tracks and Sign Standards Guidelines	Provide a consistent approach in the establishment and maintenance of firebreaks and tracks used for fire access for government agencies and private landholders	Chapter 18 Hazards and Risk Management
Stormwater Management for Wash Bays (EPA 517/16)	Provides guidance on the management of potential stormwater pollution associated with the operation of permanent or temporary wash bay facilities	Chapter 10 Physical Environment
Stormwater Pollution Prevention Codes of Practice: Building and Construction Industry (1999)	Addresses a range of potential pollution sources from a variety of building and construction industry practices, and issues related to construction activities that are subject to the approval of relevant authorities.	Chapter 10 Physical Environment

5.6. Commonwealth Environmental Assessment and Approval

5.6.1. *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)

The EPBC Act is the primary Commonwealth legislation regulating environmental matters. Under the EPBC Act, any action that is likely to have a significant impact on a 'matter of national environmental significance' (MNES) requires approval from the Commonwealth Minister for the Environment (i.e. a 'controlled action'). MNES defined in the EPBC Act which are potentially relevant to the Project include:

- Ramsar wetlands of international importance
- listed threatened species and communities
- listed migratory species.

If a proponent believes that there is a possibility that a proposed project may result in a significant impact to a MNES, they must refer the project to the Commonwealth Department of Agriculture, Water and the Environment (DAWE) to determine whether a proposed action will need formal assessment and approval under the EPBC Act. The referral document is the principal basis for informing the Commonwealth Minister's decision as to whether approval is necessary and, if so, the type and level of assessment that will be undertaken. The referral is then released to the public, as well as relevant State, Territory and Commonwealth ministers, for comment on whether the project is likely to have a significant impact on a MNES.

ElectraNet submitted a referral for the Project to DAWE for assessment on 17 June 2019. On 17 July, the South Australian component of the Project was declared to be a 'controlled action' and therefore subject to assessment under the EPBC Act. The relevant MNES identified for the controlled action was 'Listed threatened species and communities.

Bilateral Agreements under the EPBC Act

The EPBC Act provides for bilateral agreements between the Commonwealth and the states in relation to environmental assessment and approvals processes, which allow state processes to be accredited for assessments or approvals required under the EPBC Act. Pursuant to this, the Commonwealth and South Australian governments signed a Bilateral Agreement on environmental assessment in 2014 which allows the Commonwealth Minister for the Environment to rely on specified South Australian environmental assessment processes when assessing controlled actions under the EPBC Act.

The Major Development / EIS process under the South Australian Development Act (outlined at Section 5.3.3) is a specified process under the Bilateral Agreement, meaning that this EIS and the Assessment Report will be used by the Commonwealth Minister to make a decision on the project against the requirements of the EPBC Act.

The effect of the Bilateral Agreement is that the Project will undergo a thorough but streamlined assessment process in co-ordination with DAWE. One environmental impact assessment document (EIS) will be prepared, one period of public consultation will be undertaken and one Response / Supplementary document prepared to satisfy the legislative requirements of each jurisdiction.

Following the State assessment processes (described in Section 5.3.3) the South Australian government will provide an Assessment Report to the Commonwealth Minister, who will then make a (separate) decision whether or not to approve the proposed action under Part 9 of the EPBC Act.

DAWE has provided input into the preparation of the Guidelines formulated by the SPC in regard to issues related to the EPBC Act and MNES (refer Chapter 11 Flora and Fauna).

5.6.2. Other Commonwealth legislation

The purpose and objectives of other relevant Commonwealth Government legislation are identified in Table 5-6, and the implications of these Acts for the Project are addressed where relevant throughout the EIS.

Table 5-7 lists relevant Commonwealth Standards, Codes of Practice and Guidelines which have been referred to and / or considered in the EIS to guide the assessment of Project activities.

Table 5-6: Relevant Commonwealth legislation and approvals requirements

Act	Objective	Relevance to the Project	Approvals / legislative requirements	Administering agency	EIS Chapter
Aboriginal and Torres Strait Islander Heritage Protection Act 1984	To preserve areas and objects under threat, which are of particular significance to, or in accordance with, Aboriginal tradition	The area of the Project includes items and places of Aboriginal significance.	No approvals required. However, there is a general duty to comply with the requirements of the Act	Department of the Environment and Energy	Chapter 12 Cultural Heritage
Airspace Act 2007 *Airspace Regulations 2007* *Civil Aviation Act 1988* *Civil Aviation Regulations 1988* *Civil Aviation Safety Regulations 1998*	The Civil Aviation Act and the Airspace Act outline the Commonwealth Government's policy with respect to classification, designation, administration and management of Australian-administered airspace, including aviation safety.	Effects of the Project (presence of transmission towers and powerlines) on aircraft safety and airfield operations.	Ongoing consultation with CASA to ensure that the relevant authorities are aware of the construction works and the final alignment of the transmission line	Civil Aviation Safety Authority (CASA)	Chapter 9 Land Use and Tenure
Foreign Acquisitions and Takeovers Act 1975 *Foreign Investment Policy 2013*	To regulate all foreign investment with respect to the acquisition of rural land; to ensure the Commonwealth Government is notified of any rural land being acquired by 'foreign government investors'.	All land located within the area of the Project is rural land. ElectraNet is considered a Foreign Owned Entity and must comply with this Act and Policy.	Foreign Investment Review Board Approval (FIRB)	Foreign Investment Review Board	Not included in the scope of the EIS
National Greenhouse and Energy Reporting Act 2007 *National Greenhouse and Energy Reporting Scheme (NGERS)*	To establish a national framework for Australian corporations to report greenhouse gas emissions, reductions, removals and offsets, and energy consumption and production.	Greenhouse gas emissions have been identified for a range of Project construction activities.	Emissions will be reported under the NGERS as required	Clean Energy Regulator	Chapter 14 Air Quality
Native Title Act 1993 (Cth)	Recognition and protection of native title. Also provides for Indigenous Land Use Agreements (ILUAs)	There are determined areas of native title and native title claims over the area of the Project. A registered ILUA is also in place.	ElectraNet is in the process of negotiating appropriate agreements with the relevant native title groups and Traditional Owners that will be impacted by the Project.	Attorney-General (Cth)	Chapter 9 Land Use and Tenure

Act	Objective	Relevance to the Project	Approvals / legislative requirements	Administering agency	EIS Chapter
Water Act 2007 • Schedule 1 – Murray-Darling Basin Agreement • Murray-Darling Basin Plan (MDBP)	Provides the legislative framework for ensuring that the Murray-Darling Basin—is managed in the national interest, recognising that states in the Murray-Darling Basin continue to manage Basin water resources within their jurisdictions. Establishes the Murray-Darling Basin Authority (MDBA)	The Study area is located within the Murray-Darling Basin. The MDBA regulates Basin-state government water agencies responsible for water planning and compliance, and river operations. The MDBP provides a coordinated approach to environmentally sustainable water use across the Basin states and ACT, balancing environmental, social and economic considerations.	No approvals required.	Murray-Darling Basin Authority	Chapter 10 Physical Environment

Table 5-7: Relevant Commonwealth Standards, Codes of Practice and Guidelines and other regulatory instruments referred to in the EIS

Document	Purpose	EIS Chapter
AS1692: Steel tanks for flammable and combustible liquids	Provides design and construction requirements for the storage of flammable and combustible liquids in steel tanks	Chapter 10 Physical Environment
AS9140: The storage and handling of flammable combustible liquids	Provides technical guidance on the storage and handling of flammable combustible liquids	Chapter 10 Physical Environment
Australian Code for the Transport of Dangerous Goods by Road and Rail	Sets out the requirements and guidelines for transporting dangerous goods by road or rail	Chapter 10 Physical Environment
Australian Standards AS IEC 61672.1	Provides electroacoustical performance specifications of sound level meters	Chapter 15 Noise and Vibration
Australian and New Zealand Guidelines (ANZG) for Fresh and Marine Water (2018)	To facilitate the productive and sustainable use of water resources while still maintaining the biological communities and ecological processes that the resource supports, consistent with the principles of ecologically sustainable development.	Chapter 10 Physical Environment
AUSTROADS Guide to Road Design	Provides designers with a framework that promotes efficiency in design and construction, economy, and both consistency and safety for road users.	Chapter 16 Traffic and Transport
AUSTROADS Guide to Traffic Management	Provides comprehensive traffic management guidance for practitioners involved in traffic engineering, road design and road safety.	Chapter 16 Traffic and Transport

Document	Purpose	EIS Chapter
Building Code of Australia (National Construction Code)	Contains technical provisions for the design and construction of buildings and other structures.	Chapter 7 Project Description
International Commission on Non-Ionizing Radiation (ICNIRP) Guidelines	Adopted by the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) Establishes guidelines for the protection of humans exposed to electric and magnetic fields in the low-frequency range of the electromagnetic spectrum	Chapter 18 Hazards and Risk Management
National Electricity Law (NEL) and National Electricity Rules (NER)	The NEL is the schedule to the *National Electricity (South Australia) Act 1996* (refer Table 5-4) The NEL is supported by further regulations and the NER. The NER govern management of power system security by AEMO and applies to the states and territories in the NEM. The NER have the force of law	Chapter 2 Project Justification
National Electricity Network Safety Code	Provides a basic overview of the safety principles applying to design, construction, operation, maintenance, commissioning and decommissioning of electricity networks	Chapter 18 Hazards and Risk Management
National Environment Protection (Ambient Air Quality) Measure (Ambient Air Quality NEPM)	Establishes national ambient air quality standards and a national framework for the monitoring and reporting of six common air pollutants,	Chapter 14 Air Quality
National Environment Protection (Assessment of Site Contamination) Measure 1999 (ASC NEPM)	Provides nationally consistent guidance on how to assess and manage contamination.	Chapter 10 Physical Environment

5.6.3. International Conventions and Agreements

The International Conventions and Agreements relevant to the Project generally relate to protection of biodiversity, threatened species and habitats, and migratory species. The protection and management of species and habitats which are the subject of international agreements is administered through the EPBC Act.

United Nations Convention on Biological Diversity

Australia is a Party to the UN Convention on Biological Diversity (CBD), which is implemented through the national biodiversity strategy and action plan – *Australia's Strategy for Nature 2019-2030*. The strategy is the overarching framework for all national, state, territory and local strategies, legislation, policies and actions that target nature. Such strategies include the Threatened Species Strategy, the Australian Weeds Strategy and Australia's Strategy for the National Reserve System, and legislation such as the EPBC Act.

These strategies have informed the assessment of the impacts of the Project on threatened species and biodiversity contained in this EIS.

Ramsar Convention on Wetlands

Australia is a Contracting Party to the Convention on Wetlands of International Importance (the Ramsar Convention). The broad aims of the Ramsar Convention are to halt the worldwide loss of wetlands and to conserve those that remain. In designating a wetland as a Ramsar site, countries agree to establish and oversee a management framework aimed at conserving the wetland and ensuring its wise use.

Australia has developed National Guidelines for identified Ramsar Wetlands to improve management of Ramsar sites and maintain ecological character, in line with Australia's commitments under the Convention and environmental management responsibilities under the EPBC Act.

The Riverland Ramsar site is located adjacent to the River Murray between Renmark and the Victorian and New South wales borders. The Project area passes through small sections on the northern mapped boundary of the Ramsar site, intersecting a marginal area of upper floodplain.

The Project's implications for the Ramsar site were assessed by DAWE in the EPBC Act referral for the Project and were not considered to be sufficiently significant to require assessment as part of the controlled action. However, the Project has been designed to minimise impacts to important areas of ecological value such as the Riverland Ramsar site through route alignment and other management measures (refer Chapter 4 Route Selection and Chapter 11 Flora and Fauna).

Riverland Biosphere Reserve

Biosphere Reserves are areas of ecosystems which are internationally recognised within the framework of the United Nations Educational, Scientific and Cultural Organisation (UNESCO) Man and Biosphere (MAB) programme. A biosphere reserve includes one or more protected areas and surrounding lands that are managed to combine both conservation and sustainable use of natural resources. The designation of Biosphere Reserve is made on the basis of nominations submitted by countries participating in the MAB.

Calperum and Taylorville Stations form part of the Riverland Biosphere Reserve which is considered as being of conservation significance due to the presence of a number of rare and endangered species and ecosystems. The Project is expected to have a negligible impact on the conservation of the environment and sustainable management of the Riverland Biosphere Reserve. Specific impacts on flora and fauna within sensitive ecosystems are addressed in Chapter 11 Flora and Fauna. Potential effects of the Project on other land uses within the Biosphere Reserve are discussed in Chapter 9 Land Use and Tenure.

International Migratory Bird Agreements

The Australian Government is signatory to a number of international bi-lateral migratory bird agreements aimed at conserving migratory bird populations and their habitats. These agreements include the Japan–Australia Migratory Bird Agreement (JAMBA), China–Australia Migratory Bird Agreement (CAMBA), Republic of Korea–Australia Migratory Bird Agreement (ROKAMBA), and the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention). The agreements provide for the protection and conservation of migratory birds and their important habitats, protection from take or trade, the exchange of information, and building cooperative relationships.

Impacts to fauna species protected under these agreements are expected to be negligible (refer Chapter 11 Flora and Fauna for further discussion).

5.6.4. Principles of ecologically sustainable development

Ecologically sustainable development (ESD) in Australia is defined in the Commonwealth Government's National Strategy for Ecologically Sustainable Development (NSESD) (COAG 1992) as:

'using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased'.

The NSESD was adopted by all levels of government in Australia in 1992 and comprises three core objectives and seven guiding principles which are to be read together to achieve a balanced approach in the pursuit of ESD. Since 1992 Commonwealth and State Governments have applied the objectives and principles to strategic and policy frameworks to ensure they are taken into consideration in policy making processes and decision making, development of legislation and design of government programs.

A range of South Australian legislation has adopted the principles of ESD as objectives for their operation including the *Environment Protection Act 1993*, the *Climate Change and Greenhouse Emissions Reduction Act 2007* and the *Landscape South Australia Act 2019* (refer Table 5-4).

A summary of the NSESD objectives and guiding principles and the relevant section of the EIS where these principles are demonstrated is provided in (refer Table 5-8).

Table 5-8: NSESD core objectives and guiding principles

Core Objectives	EIS Chapters
Enhance individual and community wellbeing and welfare by following a path of economic development that safeguards the welfare of future generations	Chapter 2 Project Justification Chapter 17 Socio-economic Environment
Provide for equity within and between generations	Chapter 2 Project Justification
Protect biological diversity and maintain essential ecological processes and life-support systems	Chapter 11 Flora and Fauna
Guiding Principles	
Decision-making integrates long and short-term economic, environmental, social and equity considerations	Chapter 2 Project Justification Chapter 3 Alternatives to the Project Chapter 4 Route Selection Chapter 17 Socio-economic Environment
Threats of serious or irreversible environmental damage and lack of full scientific certainty not used to postpone preventative environmental measures	Chapter 9 Land Use and Tenure Chapter10 Physical Environment Chapter 11 Flora and Fauna Chapter 12 Cultural Heritage Chapter 13 Visual Amenity Chapter 14 Air Quality

Core Objectives	EIS Chapters
	Chapter 15 Noise and Vibration Chapter 16 Traffic and Transport Chapter 18 Hazards and Risk Management Chapter19 Waste Management Chapter 21 Environmental Management Framework
Consideration of global environmental impacts	Chapter 5 Legislative and Planning Framework
Development of a strong, growing and diversified economy to enhance environmental protection	Chapter 2 Project Justification Chapter 17 Socio-economic Environment
Maintain and enhance international competitiveness in an environmentally sound manner	Chapter 2 Project Justification Chapter 17 Socio-economic Environment
Adoption of cost effective and flexible policy instruments	Chapter 5 Legislative and Planning Framework
Decisions and actions provide for broad community involvement on issues which affect them	Chapter 6 Stakeholder Engagement

5.6.5. Greenhouse gas emission policies

At the Paris Climate Conference in 2015[3] Australia committed to a greenhouse gas emissions target of 26–28% below 2005 levels by 2030, which is being implemented through emission reduction measures, energy efficiency improvement and support for low emissions technologies and practices. The National Greenhouse and Energy reporting Scheme (NGERS) established under the *National Greenhouse and Energy Reporting Act 2007* provides the methodology for reporting on greenhouse gas emissions.

The South Australian Government *Climate Change Action Plan 2021-2025* outlines state-wide targets of more than 50% reduction in emissions by 2030 (from 2005 levels) and net zero emissions by 2050.

The Project will result in release of greenhouse gases through construction activities (e.g. combustion of fuel and land clearing) (refer Chapter 14 Air Quality). Positive outcomes (i.e. emissions reduction) are also anticipated through the interconnection of the NEM with SA by improving access to high quality renewable resources across regions. This will allow renewable energy from SA to provide national benefits and assist SA in meeting its carbon emission and renewable energy targets and facilitate the transition to a lower carbon emissions future (refer Chapter 2 Project Justification for further discussion).

5.7. Planning Assessment

The Project has been assessed for consistency with the following State, regional and local planning instruments:

- relevant State Planning Policies
- applicable regional plans (which are volumes of the South Australian Planning Strategy)
- the Planning and Design Code.

5.7.1. Assessment conclusions

The Project has been assessed as consistent with the objectives of the applicable State Planning Policies and the policies of the relevant Region Plans.

[3] United Nations Climate Change Conference, Paris, France, 30 November 12 – December 2015

Assessment against the provisions of the Code demonstrates that the Project is an envisaged form of development and that potential impacts of the Project in relation to biodiversity, native vegetation and the interface between the Project and adjoining land uses can be satisfactorily managed.

Any potential adverse environmental impacts should be weighed against other positive environmental aspects of the project, particularly the long-term benefits to the region and the State through establishment and operation of renewable energy facilities both within South Australia and New South Wales, contributing to a lower carbon emissions future.

5.7.2. Assessment against State Planning Policies

The State Planning Policies (SPPs) were released on 1 January 2019 and define South Australia's planning priorities, goals and interests at a State level. The policies set out a framework for land use in SA and are the highest level of policy in the new planning system, addressing the economic, environmental and social planning priorities for the State (SPC 2019a and 2019b).

The SPPs relevant to the Project are:

- Policy 1: Integrated Design
- Policy 2: Design Quality
- Policy 4: Biodiversity
- Policy 5: Climate Change
- Policy 7: Cultural Heritage
- Policy 8: Primary Industry
- Policy 10: Mineral and Energy Resources
- Policy 12: Energy
- Policy 17: Special Legislative Scheme *River Murray Act 2003.*

Table 5-9 assesses the consistency of the Project with the SPPs which are considered relevant to the Project.

Table 5-9: Assessment of the Project against relevant State Planning Policies

State Planning Policy	EIS Assessment
Policy 1: Integrated Planning	
Objective: To apply the principles of integrated planning to shape cities and regions in a way that enhances our livability, economic prosperity and sustainable future.	The interconnection of electricity infrastructure between SA and NSW supports the concept of integrated planning, increasing SA's access to the National Electricity Market, and accommodating an increase in renewable energy production which can then be exported to the national market. The development will also deliver essential services and infrastructure for existing businesses, improving energy security and assisting to lower electricity prices.
Policy 2: Design Quality	
Objective: To elevate the design quality of South Australia's built environment and public realm.	The proposed alignment seeks to minimise the social and environmental impacts of the Project and has been selected to take into account the interface with other land uses. The Project is also expected to deliver positive economic benefits. The construction process will support job growth in regional areas of SA, whilst the interconnector will support the growth of SA's renewable energy industry by providing access to the National Electricity Market.
Policy 4: Biodiversity	

State Planning Policy	EIS Assessment
Objective: To maintain and improve our state's biodiversity and its life supporting functions.	The Project design and siting has been informed by a number of specialist studies which consider the impact of the development on the ecology of environmentally sensitive areas. The proposed alignment has been selected to minimise impacts on and protect identified high value areas of biodiversity. Where practical, the route corridor follows existing road networks to minimise impacts to existing habitats and native vegetation. Micro-siting towers and conductors will provide flexibility in the final location of infrastructure, which will further assist with managing disturbance and adverse impacts on environmentally sensitive areas.
Policy 5: Climate Change	
Objective: Provide for development that is climate ready so that our economy, communities and environment will be resilient to climate change impacts.	The Australian Energy Market Operator Integrated System Plan (ISP) identifies 'Renewable Energy Zones (REZs) as priority areas for renewable developments. The REZ's are therefore key to the continued transition of the National Electricity Market to a greater mix of renewables, in line with lower carbon emission targets. The proposed transmission corridor is substantially located within the Riverland REZ and the development involves the installation of transmission infrastructure, including new powerlines and substations to support the increase in electricity to be generated by renewable energy facilities. The interconnection with NSW will enable SA to further increase its production of renewable energy (beyond local demand) for supply to the national market. The increased production and use of renewable energy will assist to reduce Australia's national greenhouse gas emission levels.
Policy 7: Cultural Heritage	
Objective: To protect and conserve heritage places and areas for the benefit of our present and future generations.	The findings of the cultural heritage investigations discussed in Chapter 12 confirm that the development is unlikely to adversely impact on any known places of Aboriginal and non-Aboriginal heritage value. Any sites discovered through Project activities will be protected from damage by the requirements set out in cultural heritage management plans.
Policy 8: Primary Industry	
Objective: A diverse and dynamic primary industry sector making the best use of natural and human assets.	The primary objective of this SPP is to support South Australia's diverse primary industry sector, in recognition of the industry's important role as a major generator of economic activity and employment. The proposed alignment has been sited to make use of existing infrastructure easements, road reserves, property boundaries, existing tracks and other disturbed areas wherever possible. Accordingly, the development has been designed to minimise disturbance to land which supports (or is capable of supporting) primary industries. Micro-siting of towers and location of the easement will be undertaken with landholders to maximise continuity and opportunity for primary industry activities.
Policy 10: Key Resources	
Objective: To protect key resources that contribute to our state's economy and provide valued employment opportunities.	This SPP seeks to support the growth in the mineral and energy resource sectors. As previously discussed, the interconnector will facilitate the growth of the renewable energy sector by providing access to the National Electricity Market.
Policy 12: Energy	
Objective: To support the ongoing provision of sustainable, reliable and affordable energy options that meet the needs of the community, business and industry.	The interconnector will facilitate the transition and growth in South Australia's renewable energy market and will also increase the reliability, security, accessibility and affordability of energy supply for South Australian communities, business and industry.
Policy 17: Special Legislative Scheme River Murray Act 2003	
Objective: To protect, restore and enhance the River Murray in order to sustain the physical, economic and social well-being of	SPP 17 is a 'Special Legislative Scheme' established under section 63 of the *Planning Development and Infrastructure Act 2016*.

State Planning Policy	EIS Assessment
the community and facilitate the economic development of the state.	Consistent with the objectives of SPP 17, the proposed alignment has been sited to avoid adverse impacts on the River Murray. The transmission line corridor is located 5 km north the main channel of River Murray and avoids impacts to associated floodplain and wetland systems.

5.7.3. Assessment against the State Planning Strategy and Region Plans

The EIS guidelines require an assessment of the consistency of the Project with the South Australian Planning Strategy.

The Planning Strategy was developed in accordance with section 22 of the Development Act and outlines the State government's direction for land use change and development for the period 2010 – 2036. Various volumes of the strategy cover the different geographic regions of the State in the form of Region Plans. These Region Plans set out how the State government proposes to balance population and economic growth, with the need to preserve the environment and protect the heritage, history and character of regional communities.

Regional Plans for each region are also required under the PDI Act, consistent with the relevant State Planning Policies. As part of the transition to the PDI Act, the Region Plans applicable to the Project (Mid North, Murray and Mallee, and Far North) prepared under the Development Act will continue to apply until the new Regional Pans are prepared and adopted.

The local government areas (LGAs) in the region of the Project and the applicable Region Plans are summarised in Table 5-10. The location of the relevant LGAs is shown in Figure 5-2.

Table 5-10: Local Government Areas and applicable Region Plans

Local Government Area	SA Planning Strategy Region Plan
Regional Council of Goyder	Mid North Region Plan May 2011
Mid Murray Council	Murray and Mallee Region Plan January 2011
District Council of Loxton Waikerie	
Berri Barmera Council	
Renmark Paringa Council	
Land Not Within a Council Area (Pastoral Unincorporated Areas and the Unincorporated Riverland Areas)	Far North Region Plan July 2010

Table 5-11 provides an assessment of the Project against the relevant Principles and Policies prescribed within each of the applicable Region Plans.

Table 5-11: Assessment of the Project against applicable Region Plans

Region Plan Principle	EIS Assessment
Principle: Recognise, protect and restore the region's environmental assets	
Mid North RP Principle 1 • *Policies 1.1, 1.8, 1.9, 1.11, 1.12,1.13 & 1.14*	This principle and associated policies seek to ensure that biodiversity, water ecosystems and areas of conservation, landscape and environmental significance, are preserved and protected from inappropriate development. The proposed alignment has been selected to minimise the effects of the Project on the ecologically significant Calperum and Taylorville Stations (Riverland Biosphere Reserve) and the Riverland Ramsar site. This route will also minimise disturbance to established native vegetation and adverse impacts to biodiversity by utilising existing disturbed areas (e.g. existing tracks) where practicable and co-locating infrastructure. Micro-siting of towers will allow flexibility in the final location of infrastructure, further assisting with managing disturbance and impacts on existing vegetation and habitat for significant species.
Murray and Mallee RP Principle 1 • *Policies 1.1, 1.5, 1.6, 1.10, 1.11, 1.12, 1.13, 1.16, and 1.17*	
Far North RP Principle 1 • *Policies 1.1, 1.7, 1.8, 1.10, 1.12, 1.13, & 1.14*	

Region Plan Principle	EIS Assessment
	The Project infrastructure will be a dominant feature in the landscape in some locations, however the proposed alignment has been selected to minimise where practicable the visual impact of the infrastructure on sensitive receptors and generally avoids populated areas.
Principle: Identify and protect places of heritage and cultural significance, and desired town character	
Mid North RP Principle 3 • *Policies 3.1 and 3.3* Murray and Mallee RP Principle 4 • *Policies 4.1 and 4.5* Far North RP Principle 5 • *Policies 5.1 and 5.3*	Cultural heritage policies in the Region Plans seek to protect and preserve places of heritage and cultural value, including national, state and local registered sites, and areas of Aboriginal cultural significance. Aboriginal cultural heritage surveys have been undertaken in consultation with Traditional Owners prior to any ground disturbance and Cultural Heritage Management Plans will be in place to ensure sites of cultural heritage are avoided, and procedures are implemented for managing discoveries. Sites which are discovered during planning and design can be generally avoided through selective placement of towers and access tracks. The proposed alignment avoids non-Aboriginal cultural heritage sites.
Principle: Create conditions for the region to become resilient to the impacts of climate change	
Mid North RP Principle 4 • *Policies 4.3 and 4.4* Murray and Mallee RP Principle 2 • *Policies 2.6 and 2.7* Far North RP Principle 6 • *Policy 6.3*	The identified policies seek to accommodate new developments and infrastructure projects which provide for alternative and innovative energy generation (including wind and solar technologies). The proposed infrastructure route is substantially located within the Riverland and Mid North Renewable Energy Zones[4] and involves the installation of transmission infrastructure to support growing electricity generation by renewable energy facilities. The interconnection with NSW will also enable SA to further increase renewable energy production beyond local demand, for supply to the national market, thereby reducing national greenhouse gas emission levels.
Principle: Foster sustainable alternative energy and water supply industries	
Far North RP Principle 14 • *Policies 14.1 and 14.2*	This principle relates solely to far north regions of SA. As discussed above, the proposed development will establish essential infrastructure required to support the establishment of renewable energy facilities within the Far North region of SA.
Principle: Protect and build on the region's infrastructure	
Mid North RP Principle 5 • *Policy 5.7* Murray and Mallee RP Principle 5 • *Policies 5.3, 5.4 and 5.5* Far North RP Principle 7 • *Policy 7.2*	The policies associated with this principle seek to protect existing corridors and areas where important infrastructure (including electricity infrastructure) is located. Various policies (including Policy 5.4 of the Murray and Mallee Region Plan and Policy 5.7 of the Mid North Region Plan) also seek to promote the establishment of renewable energy developments. Policy 5.3 of the Murray and Mallee Region Plan also seeks to 'provide for strategic electricity infrastructure corridors for augmentation and extension of the transmission network'. Policy 5.5 seeks to ensure new infrastructure is located to minimise adverse interface impacts on residential areas and other sensitive receptors. Where practical to do so, the infrastructure will be co-located with existing 132 kV lines, and will make use of property boundaries and existing roads and access tracks. The route has also been selected to minimise interaction with populated areas, such as townships along the River Murray. The proposed development involves the establishment of strategic infrastructure which will support the establishment of renewable energy facilities within each region.
Principle: Reinforce the region as a preferred tourism destination	
Murray and Mallee RP Principle 7 • *Policy 7.1*	This principle seeks to protect, enhance and promote assets within these regions that attract tourists and are of value to the community. Natural and

[4] Refer Section 2.4.2 and Figure 2-5

Region Plan Principle	EIS Assessment
Far North RP Principle • *Policy 10.1*	rural landscapes assets relevant to the Project including the Riverland Biosphere Reserve, River Murray, the Ramsar-listed wetlands and local areas of cultural and / or heritage significance related to the commercial, pastoral and mining history of the region. As noted above, a key objective for the preferred route selection was to minimise the visual impact of the development on scenic landscapes, avoid areas of cultural and heritage significance and minimise impacts on conservation and environmentally sensitive areas.

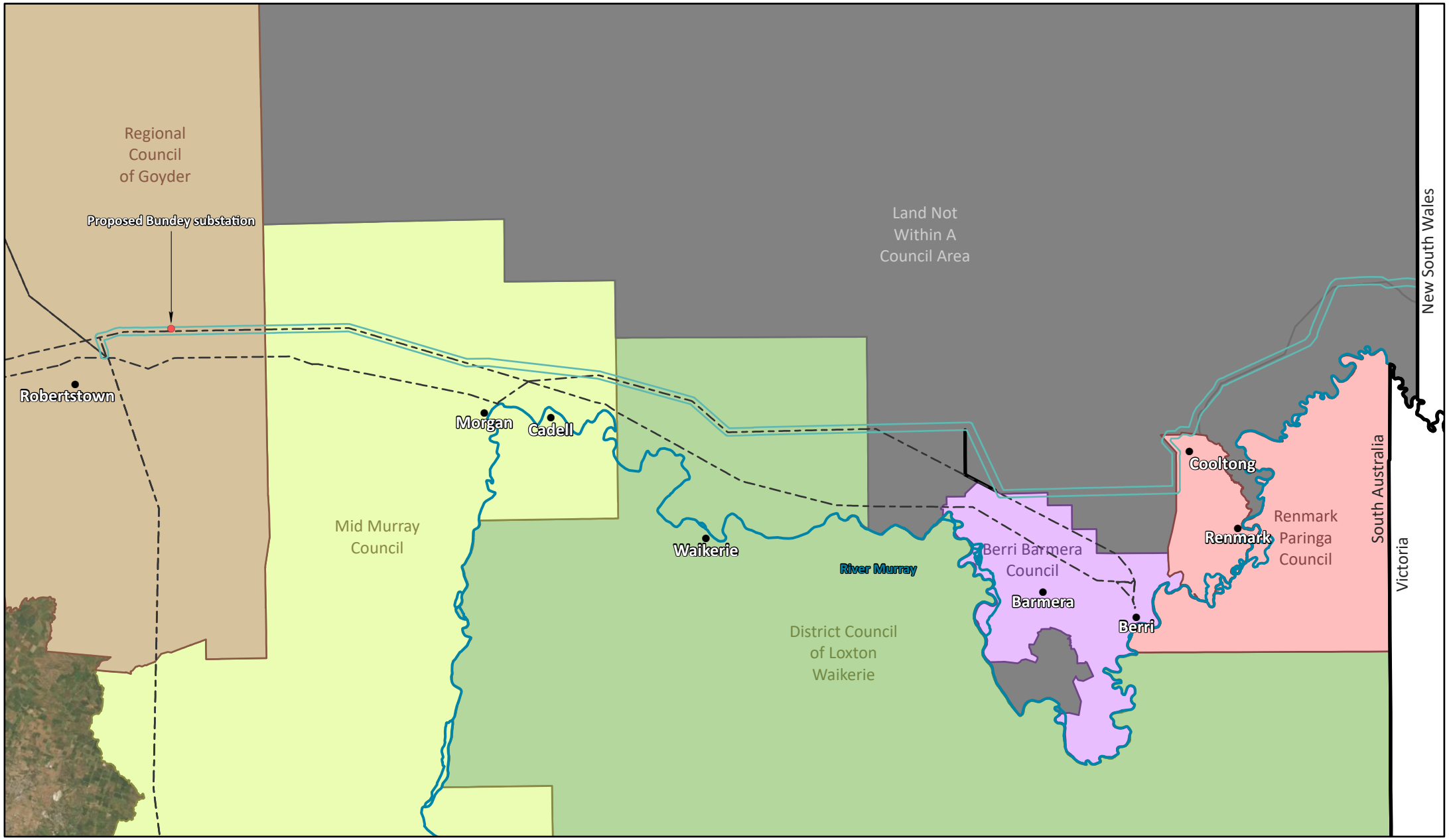


Figure 5-2
LGAs and Out of Council Areas in the region of the Project

5.7.4. Assessment against the Planning and Design Code

The Planning and Design Code under the PDI Act is the statutory policy document which guides the types of development and land uses that are – or are not – envisaged within a particular area through various objectives, principles and policies.

Planning and Design Code

The Code was introduced in three phases and is the guiding policy document for the PDI Act. As each phase commenced the relevant Development Plans for that area were 'turned off' and the Code 'turned on'. The Code contains the framework for the assessment of development incorporating Zones, Sub zones, Overlays and General Development Policies which incorporate Desired Outcomes (DOs) and Performance Outcomes (POs).

In Phase 1 of the PDI Act transition, the Development Plan for Land Not Within a Council Area (Eyre, Far North, Riverland and Whyalla) was replaced by the Code effective from 1 July 2019. As part of Phase 2, Development Plans for the Regional Council of Goyder, District Council of Loxton Waikerie, Berri Barmera Council and the Renmark Paringa Council have also been replaced by the Code effective from 31 July 2020. The final phase was Phase 3 where the Mid Murray Council Development Plan was replaced by the Code on 19 March 2021,

The planning assessment for the Project has been undertaken is in accordance with the Phase 3 Code (version 2021.2) published on the SA Planning Portal on 19 March 2021. An assessment of the consistency of the Project with the Code and the State Planning Strategy is at Section 5.7.

Assessment context

The assessment considered the Zones, Overlays and Policies set out in the Code that are traversed by the proposed transmission line corridor (comprising a 500 metre buffer either side of the proposed alignment) as set out in Table 5-12.

Table 5-12: Summary of Zones, Overlays and Policies applicable to the Project

Zones, Overlays and Policies	
Planning and Development Code	
Zone	Conservation Zone Remote Areas Zone Rural Zone Rural Horticulture Zone Rural Intensive Enterprise Zone
Overlays	Dwelling Excision Hazards (Acid Sulfate Soils) Hazards (Bushfire – General Risk) Hazards (Bushfire – Medium Risk) Hazards (Bushfire – Outback) Hazards (Bushfire – Regional) Hazards (Flooding – General) Heritage Adjacency Key Outback and Rural Routes Limited land Division Murray-Darling Basin Native Vegetation Prescribed Watercourses Ramsar Wetlands River Murray Flood Plain Protection Area State Significant Native Vegetation Areas

Zones, Overlays and Policies	
	Water Resources
General Development Policies	Infrastructure and Renewable Energy Facilities Interface Between Land Uses Transport, Access and Parking

The relevant zones under the Code are shown in Figure 5-3 and the assessment against the relevant Zones is set out in Table 5-13.

The assessment against the Overlay provisions and the General Development policies of the Code is set out in Table 5-14.

Table 5-13: Assessment against Planning and Design Code – Zones

Assessment	Addressed in the EIS
PLANNING AND DESIGN CODE (Version 2021.2 – published on 19 March 2021)	
Conservation Zone – Desired Outcome 1; Performance Outcome: 1.1, 1.2, 3.1, 4.1, 4.2, 4.4	
The Conservation Zone generally encompasses areas of the proposed transmission line corridor which traverse environmentally sensitive areas. The Conservation Zone encompasses small sections of the transmission line corridor traversing the Loxton Waikerie LGA (Pooginook Conservation Park), the Pastoral Unincorporated Area and the Unincorporated Area Riverland (Cooltong Conservation Park, Calperum / Taylorville Stations and Chowilla Game Reserve) applies to some land within the Mid Murray Council (e.g. White Dam Conservation Park). DO 1 seeks to ensure development is sensitively designed to conserve and enhance the natural environment and natural ecological processes, whilst also providing opportunities for public experiences of environmentally valued areas through low-impact recreational and tourism development. The proposed electricity infrastructure does not jeopardise the ability for the Zone to accommodate the various small-scale low-impact land uses contemplated by PO 1.1 and PO 1.2. PO 3.1 also seeks to ensure development is designed to avoid adverse impacts on important habitats, nesting or breeding areas, as well as areas for the migration patterns of fauna, whilst PO 4.1, 4.2 and 4.4 require development to be sensitively designed to minimise adverse visual and environmental impacts. Project infrastructure located within the Conservation Zone, or in proximity to the Conservation Zone, is proposed to follow the alignment of the existing roadways and existing 132 kV lines as far as possible to minimise additional disturbance to environmentally sensitive areas. The transmission line corridor has been selected to follow existing infrastructure corridors and avoid areas of high value conservation and cultural significance as much as possible, whilst recognising the challenges of traversing 205 km east – west across multiple council areas and varying landscape. The ecological assessment undertaken for the Project has assisted in siting to minimise the loss of native vegetation, and management measures will ensure that Project activities will not result in the spread of pest plants into surrounding areas. The visual impact assessment evaluates the visual impact of the infrastructure when viewed from various sensitive receptors from within the 'Theoretical Zone of Visual Influence' (TZVI). The assessment concludes that visual impacts related to the Project have been mitigated through a detailed route selection process which avoids (where possible) visual receptors (e.g. views from key public vantage points) and visually sensitive landscapes, design of Project elements to reduce visual massing, and alignment with other existing transmission and other infrastructure corridors. The limited number of tourists to the conservation areas are likely to be sensitive to changes to the visual landscape, however the low frequency of views of the transmission line will reduce the magnitude of the impact.	Chapter 4 Route Selection Chapter 9 Land Use and Tenure Chapter 11 Flora and Fauna Chapter 13 Visual Amenity
Rural Zone – Desired Outcome 1; Performance Outcome: 1.1, 2.1, 2.2, 9.1, and 10.1	
The Rural Zone covers the western end of the transmission line corridor within the Regional Council of Goyder, together with majority of the alignment traversing land within the Loxton Waikerie LGA and a small section in the north of the Berri Barmera LGA. The Rural Zone also applies to most of the western end of the transmission line corridor traversing the Mid Murray LGA. DO 1 contemplates that land within the Zone will (amongst other things), accommodate energy generation from renewable sources. Renewable energy facilities are also listed within designated performance feature (DPF) 1.1 as envisaged forms of development. PO 9.1 seeks to ensure that renewable energy facilities are designed and sited to minimise the significant fragmentation or displacement of existing primary production activities. Consistent with these provisions, one of the Project's objectives is to support the establishment and ongoing operation of renewable energy facilities and to provide new opportunities for renewable energy and other energy projects to connect to the National Electricity Market. The proposed transmission line alignment follows existing roadways and powerlines to minimise impacts on existing primary production land and potential for fragmentation or displacement of existing primary production will be further minimised through micro-siting of tower locations in consultation with land owners.	Chapter 3 Project Justification Chapter 7 Project Description Chapter 9 Land Use and Tenure Chapter 13 Visual Amenity

Assessment	Addressed in the EIS
PO 2.1 addresses the provision of suitable vehicle access to the development. The Project will require access tracks to provide access to tower sites for construction and maintenance of the transmission line. Access would preferentially use existing public and private roads and tracks to avoid disturbance. Existing access tracks may be upgraded (if required) and new access tracks may be constructed in areas where there are no existing tracks. Easement access will be the subject of consultation with landholders as part of easement negotiations. In accordance with PO 2.2 the infrastructure traversing the Rural Zone will be located on generally flat land, and minimal earthworks will be required to install the infrastructure. Micro-siting will also be used to manage visual and environmental impacts. PO 10.1 seeks to ensure that large buildings are appropriately designed to reduce their visual impacts on scenic and rural vistas. Although PO 10.1 seeks substantial setbacks from public roads, the transmission line corridor has been intentionally sited to follow disturbed areas in the vicinity of existing transmission lines, public roads and other access tracks to minimise the clearance of native vegetation. On balance it is considered that the environmental benefits resulting from this approach to route selection outweigh the mitigation of visual impacts which would be achieved by setbacks from public roads. Transmission lines are not uncommon in rural landscapes and there are several existing transmission lines already located within this Zone. The scale of the project and the nature of the surrounding landform are expected to result in some impact on landscape vistas within the Zone, however the proposed alignment has been selected to take into account and reduce the extent of visual impacts, in accordance with the intent of PO 10.1. Only one major road (the Goyder Highway) is crossed by the transmission line corridor. Location of the proposed transmission line corridor in disturbed and remote areas also assists within the management of visual impacts, as required by PO 10.1. On this basis, the proposed development is aligned with the Desired Outcomes of the Rural Zone.	
Remote Areas Zone – Desired Outcome 1; Performance Outcome – 1.1, 2.1 and 2.2	Chapter 4 Route Selection Chapter 9 Land Use and Tenure Chapter 13 Visual Amenity
The majority of the proposed transmission line corridor within the Pastoral Unincorporated Area and a small section in the Unincorporated Area Riverland, is situated within the Remote Areas Zone. The establishment of electricity transmission infrastructure is generally consistent with the forms of development referenced within the Desired Outcome for the Zone, which includes various renewable energy facilities for the generation and storage of energy. PO 2.1 requires that development is sited and designed to protect natural features and the conservation value of the area. Sections of the transmission line corridor in the Zone will traverse the southern margins of the Riverland Biosphere Reserve which accommodates Taylorville and Calperum Stations however the proposed alignment has been selected to minimise environmental impacts on native flora and fauna found within Calperum Station. PO 2.2 for this Zone seeks to ensure that large buildings are appropriately designed to reduce their visual impacts on scenic and rural vistas – refer to discussion for Rural Zone PO 10.1 above.	
Rural Horticulture Zone – Desired Outcome 1, 2 and 3; Performance Outcome: 1.1; 2.1,2.2; 10.1 and 11.1	Chapter 13 Visual Amenity
A small section of the transmission line corridor (approximately 9.5 km in length) is located within the Rural Horticultural Zone in the area of Cooltong and follows the LGA boundary separating the Pastoral Unincorporated Area and the Renmark Paringa Council. The Desired Outcomes and PO1.1 and 1.2 for the Zone seek to accommodate intensive horticultural land uses, and associated value-adding enterprises and activities. The proposed infrastructure does not jeopardise the ability for the Zone to function in its intended manner. The proposed infrastructure will also support the establishment of renewable energy facilities, as referenced in PO 10.1. PO 2.1 addresses the provision of suitable vehicle access to the development. Access to the section of the transmission line corridor in this Zone will likely be via existing roads and tracks to minimise new disturbance. Any new access will be in consultation with landholders.	

Assessment	Addressed in the EIS
PO 2.2 seeks to ensure development is sited on flat land to avoid adverse visual impacts created by excessive earthworks. The section of the infrastructure traversing the Rural Horticultural Zone follows the alignment of an existing unsealed roadway and is also located on relatively flat land. The extent of earthworks required to establish the infrastructure will be negligible and will be further minimised through opportunities for micro-siting. The visual impact of the infrastructure has been evaluated from the viewpoint of various sensitive receptors from within the TZVI which is calculated to be a distance of 6.2 km from the transmission towers. Modelling of Project infrastructure shows that while the vast majority of the receptors within the TZVI will not have views of the transmission lines, the community of Cooltong within the Rural Horticultural Zone will likely experience a higher degree of visual impact. This impact is expected to be mitigated by the presence of existing electricity distribution infrastructure, and vegetation shielding in the vicinity of most properties.	
Rural Intensive Enterprise Zone - Desired Outcome 1; Performance Outcome: 1.1, 2.2	
A large section of the proposed transmission line corridor approximately 26 km in length traverses the Rural Intensive Enterprise Zone at the western end of the alignment in the Regional Council of Goyder and the Mid Murray LGA. A new 330 / 275 kV substation will also be located within the Rural Intensive Enterprise Zone near Bundey. The site will accommodate primary plant (with the tallest structure being 25 – 30 m in height) and will include gantries, switch gear, 330 / 275 kV transformers, control buildings, lighting and lightning masts, telecommunications tower (approximately 50 m high) enclosed by palisade fencing. The substation will be located approximately 14 km north-east of Robertstown. The Rural Intensive Enterprise Zone is intended to accommodate a range of intensive agricultural production and processing facilities, together with supporting ancillary industries which are considered to be important economic and employment assets for South Australia. The establishment of sensitive land uses which may be incompatible with the contemplated forms of development specified in PO 1.1 is discouraged. It is considered that the proposed infrastructure is highly compatible with the list of envisaged uses outlined within DPF 1.1 and will not jeopardise the ability for the Zone to function in its intended manner. In accordance with PO 2.2, the transmission line and substation traversing this zone will be located on relatively flat land, and adverse visual impacts associated with excessive earthworks will be avoided. It is also noted that the transmission line traversing the Rural Intensive Enterprise Zone will follow the alignment of an existing disturbed area which accommodates an existing roadway and transmission lines, whilst the substation is remotely positioned away from local towns and scenic roads.	Chapter 7 Project Description Chapter 13 Visual Amenity

Table 5-14: Assessment against the Planning and Design Code – Overlays and General Policies

Overlays and General Policies	Assessment	Addressed in the EIS
Infrastructure and Renewable Energy <u>General Development Policies</u> • Infrastructure and Renewable Energy Facilities • DO 1 • PO 1.1, 2.1, 2.2, 2.3, 4.1, 4.2., 5.1, 13.1, 13.2	The Infrastructure and Renewable Energy Facilities provisions of the Code encourage the efficient provision of infrastructure to support renewable energy facilities in a manner that minimises hazard, is environmentally and culturally sensitive and manages adverse visual impacts. The proposed transmission line supports the establishment and operation of renewable energy facilities which are envisaged forms of development within the Rural Zone. These objectives are also consistent with State-wide initiatives to support renewable energy facilities and associated infrastructure, as highlighted in the relevant Region Plans (refer Table 5-11) and zone and policy provisions within the Code (refer Table 5-13). Interconnection with NSW will support the State's renewable energy objectives in SA by encouraging increased production of renewable energy and export to the National Electricity Market.	Chapter 3 Project Justification Chapter 4 Route Selection Chapter 9 Land Use and Tenure Chapter 13 Visual Amenity

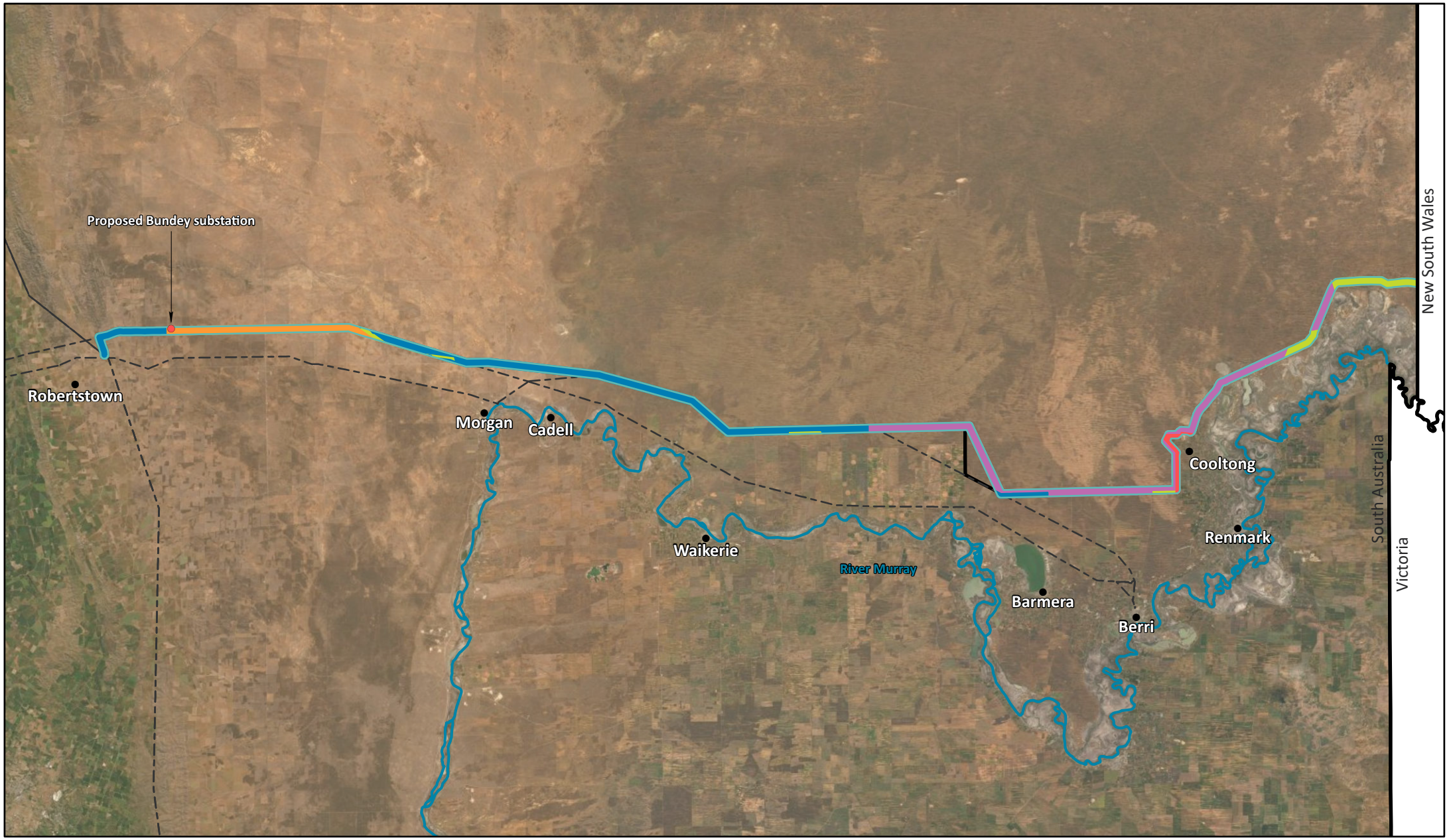
Overlays and General Policies	Assessment	Addressed in the EIS
	The alignment and substation have been sensitively sited to minimise visual impacts consistent with PO 2.1, 2.2 and 2.3. In particular, the transmission line corridor will follow the alignment of existing 132 kV lines, as well as other disturbed areas (such as sealed and unsealed roadways) where practical to do so. The infrastructure route and proposed substation are remotely positioned away from local towns and scenic roads and existing vegetation will provide some visual screening. The visual amenity assessment in Chapter 13 considers the visual impact of the infrastructure when viewed from various sensitive receptors from within the 'Theoretical Zone of Visual Influence'. The assessment concludes that the route has been selected to minimise visual impacts and the Project will not unreasonably impact on the amenity or character of the existing landscapes found within the area of the Project. Route selection has sought to ensure the transmission line corridor is separated as far as practicable from dwellings, public areas, tourism accommodation and aircraft landing strips as required by PO 4.1, 4.2 and 4.3 and that visual impact is minimised as far as practicable through location and design. The final design and micro-siting process will also consider these constraints, as appropriate. Construction activities will be undertaken in accordance with a Waste Management and Minimisation Plan and a Construction Environmental Management Plan to ensure environmental impacts are avoided or minimized. This is consistent with PO 13.1 and 13.2.	Chapter 19 Waste Management Draft CEMP (Appendix P)
Biodiversity and Native Vegetation Overlays • Ramsar Wetlands • Native Vegetation • State Significant Native Vegetation Areas	The proposed transmission line corridor passes through a marginal area of upper floodplain on the northern margins of the Ramsar Wetland and is therefore subject to assessment against the Ramsar Wetland. The Ramsar Wetlands Overlay contains Performance Outcomes relating specifically to the protection of this wetland environment, including existing vegetation and the breeding, feeding, migration and resting areas of ecologically significant migratory or resident wildlife. The proposed alignment has been sited and designed to minimise adverse impacts on the Ramsar Wetlands, as summarised below: • The Riverland Ramsar site receives relatively low visitation from migratory shorebirds compared to other sites in SA. Wetland areas near the transmission line corridor do not hold water for most of year and accordingly, water birds will not be present at most times. • The transmission line corridor is generously separated from the Ramsar Wetlands and the River Murray, and the majority of the transmission line will follow the alignment of an existing disturbed area accommodating an existing access track, to minimise impacts of the infrastructure. • Associated tower span widths will be placed to avoid direct impacts to the wetlands and native bird species. Less than 2.5 km of the corridor is located within 500 m of the wetland. • The potential for bird strike will be further reduced by strategically placing markers / deflectors on certain sections of the transmission line near waterbodies, which have shown to be successful in reducing bird deaths. • Vehicle access points will be surfaced with permeable materials and sufficiently separated from the wetlands to minimise adverse impacts. Sections of the proposed transmission line corridor are subject to an assessment against the Native Vegetation and the State Significant Native Vegetation Areas (SSNVA) Overlays of the Code. The Desired Outcome for both overlays is to protect, retain and restore areas / significant areas of native vegetation. State Significant areas of native vegetation primarily in the vicinity of the transmission line corridor are associated with Pooginook Conservation Park, Cooltong Conservation Park, Taylorville Station,	Chapter 11 Flora and Fauna

Overlays and General Policies	Assessment	Addressed in the EIS
	Calperum Station and White Dam Conservation Park. Smaller pockets of SSNVA are also scattered across the proposed transmission line corridor. Native Vegetation PO 1.1 seeks to ensure development is designed to avoid or minimise the clearance of native vegetation. PO 1.2 states that native vegetation removal should avoid the following: • significant wildlife habitat and movement corridors • rare, vulnerable or endangered plants species • native vegetation that is significant because it is located in an area which has been extensively cleared • native vegetation that is growing in, or in association with, a wetland environment. SSNVA PO 1.1 also seeks to minimise the clearance of State Significant native vegetation, except where such clearance is required to promote an appreciation and awareness of wildlife areas, to support the administration and management of a reserve or park established for the protection of wildlife. The Project has been designed to minimise its ecological impacts in accordance with the Native Vegetation and SSNVA Overlay provisions of the Code. The assessment of Project impacts on native vegetation is provided in Chapter 12 Flora and Fauna, with relevant findings summarised below: • Where practical, the proposed route alignment follows existing access tracks, roadways and other cleared areas to minimise disturbance to native vegetation. • The siting and design of the development will allow for the majority of vegetation within the easement to remain undisturbed. Clearing will be restricted to tower construction sites, with limited clearing in some instances to accommodate laydown areas and access tracks. • The discrete nature of vegetation clearance associated with transmission line construction avoids the removal of large continuous areas accommodating old-growth mallee. • Proposed tower sites with native vegetation present will be surveyed prior to confirming final tower locations, and micro-siting towers and infrastructure will assist with minimising impacts of the development. • Route alignment, line design and tower placement will require minimal ongoing vegetation maintenance pruning due to low vegetation heights along the alignment. • Clearance of native vegetation will be subject to approval under the *Native Vegetation Act 1991*, and a significant environmental benefit payment will be made to partially offset the adverse impacts resulting from native vegetation clearance. • The proposed location for the substation is generally clear of native vegetation.	
Water Resources Overlays • Water Resources • Prescribed Watercourses	The proposed transmission line corridor passes through the northern margins of the River Murray Floodplain and is subject to an assessment against the relevant provisions of the Water Resources, Prescribed Watercourses, River Murray Flood Plain Protection Area and Murray-Darling Basin Overlays of the Code. Where the transmission line corridor traverses the Mid Murray Council it is also subject to the Water Resources Overlay (i.e. where it crosses Burra Creek and other potential water courses), the Hazards (Flooding – General) and Murray-Darling Basin Overlays. The proposed transmission line corridor only crosses one major watercourse at Burra Creek which runs through the	Chapter 10 Physical Environment Draft CEMP (Appendix P)

Overlays and General Policies	Assessment	Addressed in the EIS
• River Murray Flood Plain Protection Area • Murray-Darling Basin • Hazards (Flooding – General)	Mid Murray Council to the River Murray. At its closest point, the transmission line corridor is 5 km north of the main channel of the River Murray. In general terms, the Desired Outcomes for the River Murray Flood Plain Protection and Water Resources Overlays are to ensure the conservation and preservation of important waterbodies and water quality within the riverine environment. The Desired Outcome for the Prescribed Watercourses Overlay is to ensure taking of water from such watercourses is avoided or undertaken in a sustainable manner that maintains their health and natural flow paths. The Murray-Darling Basin Overlay provides for the sustainable water use in the Murray-Darling Basin area. The Desired Outcomes for the Hazards (Flooding-General) Overlay (which primarily seeks to protect people, property, infrastructure and the environment from flood risk), are not considered relevant to the Project and are not assessed further. The proposed alignment traverses outside and does not cross the eastern edge of the River Murray Prescribed Watercourse Area. The nature of the development is such that the infrastructure will not impede the free-flow of flood waters within the floodplain. Water for Project activities will be sourced locally and may include purchasing from pre-existing licenced users including local landholders proximate to the route and local councils. Within the Mid Murray Council, the corridor is also generously separated by from the River Murray by 5 km. This separation distance ensures impacts on water quality of the River Murray will be negligible. The erosion and sedimentation of surface waters during construction is also a relevant consideration due to the alignment location relative to the transmission line crossing at Burra Creek, which can be readily spanned by the 400 m minimum span length. The arid climate, coupled with a flat topography and permeable soils, reduce the likelihood of soil erosion, provided appropriate mitigation measures are implemented. A comprehensive Construction Environmental Management Plan (CEMP) will be established to manage to manage erosion and preserve water quality.	
Cultural Heritage Overlays • Heritage Adjacency	The Desired Outcome of the Heritage Adjacency Overlay is to ensure that development which is adjacent to areas or places of state or local heritage significant, preserves the heritage and cultural value of those places. A small section of the eastern end of the study area is subject to an assessment against Heritage Adjacency Overlay, and relates to one State Heritage Place located over 500 m from the proposed alignment on the southern side of the Renmark-Wentworth Road. The alignment is generously separated from the only State Heritage Place applicable to the Heritage Adjacency Overlay. There are no Local, State, National or Commonwealth Heritage Places in proximity to the balance of the alignment. The selected route for the development has also been informed by early engagement with key indigenous groups including the First Peoples of the River Murray and Mallee Region together with the claimants of western most section of the investigation corridor, which is subject to the Ngaduri Nation #2 Native Title Claim. The most sensitive Aboriginal cultural heritage areas found within the study areas include river crossings and floodplains which reflect the historical importance of water in human settlement. The main activities associated with the construction of the transmission line which have the potential to impact on Aboriginal heritage sites are access track construction, and tower construction.	Chapter 12 Cultural Heritage
Bushfire Protection Overlays	The Desired Outcome for each Bushfire Overlay is to ensure development is appropriately designed to minimise the threat and impact of bushfires on life and property taking into account the increased frequency and intensity of bushfires as a result of climate change.	Chapter 18 Hazards and Risk Management

Overlays and General Policies	Assessment	Addressed in the EIS
• Hazards (Bushfire – Medium Risk) • Hazards (Bushfire – Outback) • Hazards (Bushfire – Regional) • Hazards (Bushfire – General Risk)	The western end of the alignment traversing the Regional Council of Goyder, together with that section of the alignment traversing the District Council of Loxton Waikerie is subject to an assessment of the Hazards (Bushfire - Regional) Overlay. The eastern end of the study area traversing the Pastoral unincorporated area (PUA), the Unincorporated Area (UIA) Riverland, and the Renmark Paringa Council is subject to an assessment against the Hazards (Bushfire – Outback) Overlay. Small sections of the study area traversing the Renmark Paringa Council are also subject to an assessment against the Hazards (Bushfire – Medium) Overlay. The entire length of the alignment traversing the Mid Murray Council is subject to an assessment against the Hazards (Bushfire – General Risk) Overlay. Bushfire mitigation measures for the proposed development are summarised below: • transmission lines are designed to the relevant Australian and International Standards with particular attention given to minimising the risk of the fire start, including protection systems and increased conductor spacing to eliminate risk of 'conductor clashing' • vegetation management (i.e. vegetation clearance) • asset inspection and maintenance via maintenance tracks • operation of the transmission system to lower the fire start risk • monitoring network performance and investigating fault events to determine root cause • preparation of a Fire Management Plan for construction and operation phases of the Project. In addition to the above management practices, powerline easements can also assist with regional fire management by acting as physical, maintained fire breaks or providing alternative improved access arrangements for emergency service vehicles.	
Soils Overlays • Hazards (Acid Sulfate Soils)	The Hazards (Acid Sulfate Soils) Overlay covers several small sections of the eastern extent of the investigation corridor, where low lying and ephemeral drainage areas may exhibit acid sulphate soils. The Desired Outcome seeks to ensure development occurs with minimal disturbance of potential or actual acid sulfate soils and / or the release of acid drainage. Overall, soils in the investigation corridor have a low surface acidity, low to moderate salinity and low acid sulphate soil potential. The greatest likelihood of encountering acid sulphate soils is towards the eastern end of the investigation corridor, in low lying areas particularly near salt lakes. However, it is unlikely that acid sulfate soils will be a hazard for the Project as low-lying areas near salt lakes can be avoided by micro-siting the towers. Other potential impacts to soil quality and quantity from the Project primarily relate to the clearing of land for access tracks and tower sites, earthworks required for the construction of foundations, and the impacts of vehicle movements during construction. To minimise soil disturbance, vegetation clearance will be kept to a minimum, and generally limited to land which needs to be cleared for the construction of foundations. The Construction Environmental Management Plan will include standard sediment and erosion control measures to minimise impacts on soil quality and quantity. The CEMP prepared for the Project will also include control measures to minimise impacts of acid sulfate soils should they be encountered during the construction process.	Chapter 10 Physical Environment
Traffic Overlays	The provisions of the Overlay include Performance Outcomes which seek to ensure that development is designed to accommodate safe and convenient vehicle movements. The Desired Outcome for the Overlay is 'a comprehensive, integrated and connected transport system that is safe, sustainable, efficient, convenient and accessible to all users'. The Transport, Access	Chapter 16 Traffic and Transport

Overlays and General Policies	Assessment	Addressed in the EIS
• Key Outback and Rural Routes General Development Policies • Transport, Access and Parking	and Parking General Development Policies within the Code contain similar provisions, albeit more generally worded, applicable to urban, regional and outback regions of South Australia. The majority of the eastern section of the alignment which runs through the UIA Riverland and PUA is subject to an assessment against the Key Outback and Rural Routes Overlay of the Code. This Overlay also covers other smaller sections of the alignment further west traversing the Berri Barmera Council, PUA land, the District Council of Loxton Waikerie, and the Regional Council of Goyder. The section of the alignment traversing the Goyder Highway is also subject to an assessment against the provisions of this Overlay. The construction phase of the Project will result in a temporary increase in traffic volumes along roads near the Project and key transport routes within the study area. Potential impacts include disruption to current land uses, travel times and deterioration of road pavements from increased use by heavy vehicles. These impacts will be limited to the construction period only, and there will be no permanent, ongoing traffic impacts to be generated by the development. A Traffic Management Plan will be established to manage short-term traffic related impacts throughout the construction phase.	
Interface with Other Land Uses Overlays • Dwelling Excision Overlay • Limited Land Division Overlay General Development Policies • Interface between Land Uses	The Code includes Interface between Land Use provisions which seek to ensure developments are appropriately designed to mitigate adverse impacts on neighbouring and proximate land uses together with air quality, noise and traffic impacts during the construction process. Sections of the transmission line corridor which traverse the Renmark Paringa Council, the District Council of Loxton Waikerie, and the Mid Murray Council are subject to an assessment against the Dwelling Excision Overlay. The western end of the transmission line corridor and the proposed substation within the Regional Council of Goyder and the Mid Murray Council are both subject to an assessment the Limited Land Division Overlay. The Desired Outcomes for both overlays seek to limit the intensification of development by constraining opportunities for further land division. The Dwelling Excision Overlay also seeks to specifically limit the number of habitable dwellings (sensitive receivers) in areas allocated for primary production. Whilst these overlays do not directly impact on the proposed transmission line and substation, limiting further development within the transmission line corridor and in proximity to the substation assist within the management of interface impacts. A Construction Environmental Management Plan (CEMP) will be developed and will include standard dust control measures to minimise dust emissions during the construction phase. Potential noise and vibration impacts on sensitive receptors resulting from construction activities are expected to be negligible. This is due to the rural location of the Project, the distance from sensitive receptors, and the short term and transient nature of construction activities. While the Noise EPP does not apply to construction activities relating to public infrastructure, EPA SA guidelines will be used to manage construction noise impacts on noise sensitive receptors. As previously discussed, the Project will not generate a notable increase in the levels of traffic following construction of the transmission lines, and traffic generated during construction will be managed via the implementation of a traffic management plan.	Chapter 14 Air Quality Chapter 15: Noise and Vibration Chapter 16 Traffic and Transport Draft CEMP (Appendix P)



Planning and Development Code Zones
- Conservation
- Remote areas
- Rural
- Rural horticulture
- Rural intensive enterprise

- Transmission line corridor
- Cultural heritage avoidance alignment
- Existing ElectraNet transmission line
- River Murray
- Proposed Bundey substation

Figure 5-3
PDI Code Zones on the transmission line corridor

0 20
Kilometres

N

ElectraNet energy connect JBS&G

EIS Volume 1 Chapter 6

Stakeholder Engagement

JBS&G

project energy connect

Contents

6. Stakeholder Engagement 6-1
6.1. Introduction 6-1
6.2. Setting the Context 6-1
6.2.1. EIS Guidelines 6-1
6.2.1. Standards and industry guidelines 6-1
6.3. Approach to Stakeholder Engagement 6-1
6.3.1. Objectives 6-2
6.3.2. Stakeholder identification 6-2
6.4. Engagement and Communication Programme 6-5
6.4.1. Summary of engagement phases 6-5
6.4.2. Engagement channels 6-5
6.5. Feedback from Stakeholders 6-14
6.5.1. Telephone survey 6-14
6.5.2. Summary of key issues raised 6-15
6.6. Further Opportunities to Provide Feedback 6-21
6.6.1. Public exhibition of the EIS 6-21
6.6.2. EIS response phase 6-21
6.6.3. Ongoing community feedback 6-22

List of Tables

Table 6-1: EIS Guidelines addressed in the Stakeholder Engagement chapter 6-1
Table 6-2: Key stakeholder groups 6-2
Table 6-3: Phases of and summary of activities 6-7
Table 6-4: Engagement channels 6-9
Table 6-5: Top three benefits and impacts identified in telephone survey 6-14
Table 6-6: High level summary of stakeholder feedback and associated outcomes 6-16

List of Figures

Figure 6-1: Stakeholder groups engaged 6-4
Figure 6-2: High level summary of stakeholder engagement timing 6-6

6. Stakeholder Engagement

6.1. Introduction

This chapter presents a summary of the key engagement activities undertaken to date as part of the EIS process, as well as future engagement opportunities. It serves as a summary of a more detailed Stakeholder Engagement Plan (SEP) that has been developed and implemented for the Project and covers ElectraNet's engagement objectives, the engagement approach adopted, lists the stakeholders consulted and the methods used to share information and receive feedback. It also provides a high-level summary of key issues raised and where these have been addressed in the EIS.

Further details of stakeholder engagement activities and collateral used for stakeholder engagement are provided in Appendix G of the EIS.

6.2. Setting the Context

This section provides information on the EIS guidelines and industry standards that have been drawn upon to inform ElectraNet's engagement approach for the Project.

6.2.1. EIS Guidelines

The EIS Guidelines require a description of community consultation processes undertaken by ElectraNet with information relating to community attitudes toward the Project as set out in Table 6-1.

Table 6-1: EIS Guidelines addressed in the Stakeholder Engagement chapter

EIS Guidelines and Assessment Requirements	Assessment level
Effect on Communities *Assessment requirement 9*: the proposed development has the potential to affect the local community during construction and through the establishment of linear infrastructure.	
• 9.3: Describe any community consultation processes conducted by the proponent for the proposal and indicate community attitudes towards the proposal, where identified.	Medium

6.2.1. Standards and industry guidelines

In addition to the EIS Guidelines, ElectraNet has utilised the following sources to inform its approach to stakeholder engagement:

- ElectraNet's Engagement Principles and Commitments (ElectraNet, June 2018)
- *International Association for Public Participation (IAP2) Quality Assurance Standard for Community and Stakeholder Engagement* (IAP2 2015)
- *Clean Energy Council Community Engagement Guidelines* (CEC 2018)
- *South Australian Government Better Together Principles of Engagement* (Second edition) (Department of the Premier and Cabinet 2019).

6.3. Approach to Stakeholder Engagement

ElectraNet is committed to early, transparent, and ongoing engagement with all interested stakeholders and community members. Before any engagement commenced for the Project, ElectraNet developed a detailed Project-specific SEP to guide its approach to identifying and engaging stakeholders through the route selection and EIS processes. Specifically, the SEP set out the key desired outcomes, a process for identifying stakeholders and appropriate engagement strategies to achieve the overall objectives of the SEP. These are discussed further below.

6.3.1. Objectives

The key objectives adopted by ElectraNet to engage with stakeholders during the route selection and EIS processes include:

- **Early and ongoing engagement:** Involving stakeholders in the route selection process, the scoping of potential constraints and opportunities, the assessment of potential impacts and the acceptability of proposed mitigation measures
- **Ensuring understanding:** Providing tailored channels of communication to distribute information about the Project that are clear and accessible so that all stakeholders have the ability to be informed and have a genuine opportunity to provide feedback
- **Building relationships:** Providing opportunities for stakeholders and the community to participate in face-to-face engagement with representatives of ElectraNet, genuinely considering stakeholder concerns and being responsive
- **Ensuring compliance:** Effectively meeting the minimum requirements set out in the EIS Guidelines and where possible, exceeding engagement expectations.

6.3.2. Stakeholder identification

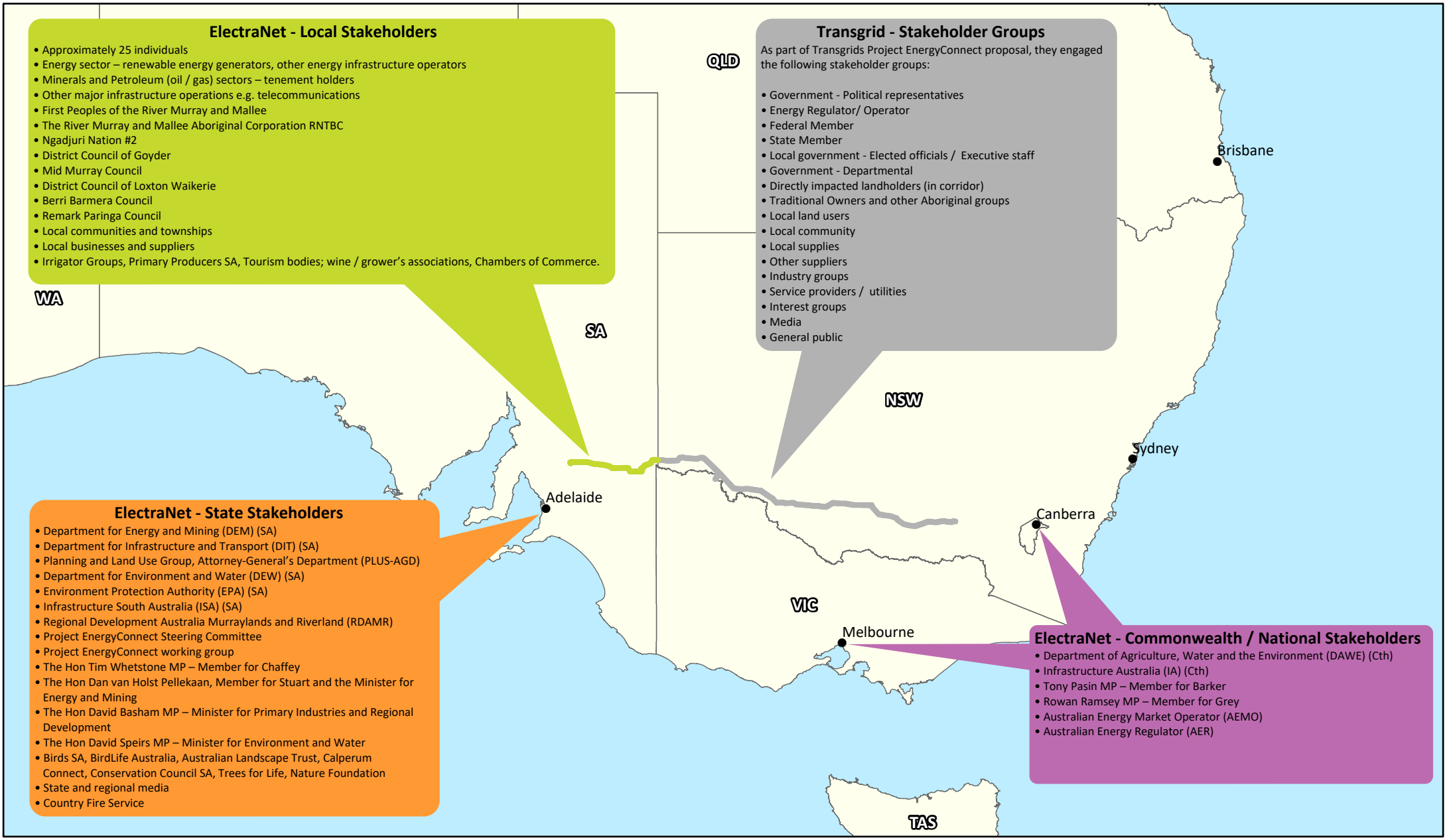
During the route selection and EIS development processes, ElectraNet identified stakeholders that may have an interest in or may potentially be affected (either directly or indirectly) by the Project at a national, State and local level.

Table 6-2 and Figure 6-1 present a summary of the key stakeholder groups identified and engaged during both the route selection process and through the development of this EIS.

Table 6-2: Key stakeholder groups

Stakeholder Group	Key Stakeholders
	Commonwealth / National
Commonwealth Government Agencies	• Department of Agriculture, Water and the Environment (DAWE) • Infrastructure Australia
Federal Political Representatives	• Tony Pasin MP – Member for Barker • Rowan Ramsey MP – Member for Grey
Energy Regulator	• Australian Energy Market Operator (AEMO) • Australian Energy Regulator (AER)
	State
SA Government Agencies	• Department for Energy and Mining (DEM) • Department for Infrastructure and Transport (DIT) • Planning and Land Use Services within the Attorney-General's Department (PLUS-AGD) • Department for Environment and Water (DEW) • Environment Protection Authority (EPA SA) • Infrastructure South Australia (ISA) • Regional Development Australia Murraylands and Riverland (RDAMR)
Project EnergyConnect Steering Committee and Working Group	• Appointed representatives from: - SA government agencies: DEM, EPA, DEW, PLUS-AGD - NSW Department of Planning, Industry and Environment (DPIE) - ElectraNet - TransGrid - JBS&G / Consentium
SA Political Representatives (e.g. local Members)	• The Hon Tim Whetstone MP – Member for Chaffey • The Hon Dan van Holst Pellekaan, Member for Stuart and the Minister for Energy and Mining

Stakeholder Group	Key Stakeholders
	• The Hon David Basham MP – Minister for Primary Industries and Regional Development • The Hon David Speirs MP – Minister for Environment and Water
Special interest groups	• Birds SA, BirdLife Australia, Australian Landscape Trust, Calperum Connect, Conservation Council SA, Trees for Life, Nature Foundation SA
Media	• State and regional media
Emergency Services	• Country Fire Service (CFS)
Local	
Landholders	• Approximately 25 individual landholders in respect of 82 land parcels, comprising freehold title, pastoral leases and conservation reserves.
Other major land users	• Energy sector – renewable energy generators, other energy infrastructure operators • Minerals and petroleum (oil / gas) sectors – tenement holders • Other major infrastructure operations e.g. telecommunications
Traditional Owners / Native Title Parties	• First Peoples of the River Murray and Mallee (native title claimants (SC2019/001) and a party to The River Murray and Crown Lands Indigenous Land Use Agreement (SI2011/025) • The River Murray and Mallee Aboriginal Corporation RNTBC (as holders of native title in specific areas) (SCD2011/002) • Ngadjuri Nation #2 ((SC2011/002) (native title claimants)
Local Government	• Regional Council of Goyder • Mid Murray Council • District Council of Loxton Waikerie • Berri Barmera Council • Remark Paringa Council • Pastoral Unincorporated Area
Local and regional communities	• Communities and townships in the vicinity of the Project including Robertstown, Morgan, Loxton, Waikerie, Berri, Barmera, Renmark and Cooltong.
Local businesses	• Local businesses and suppliers
Industry Representative Bodies	• Irrigator Groups, Primary Producers SA, Tourism bodies; wine / grower's associations, Chambers of Commerce.



Transmission line corridor - ElectraNet

Transmission line corridor - Transgrid

Cities

Figure 6-1
Stakeholder groups engaged

0 500

Kilometres

N

ElectraNet

energy connect

JBS&G

6.4. Engagement and Communication Programme

6.4.1. Summary of engagement phases

Route selection engagement

The key objective of the route selection process and associated stakeholder engagement was to find an alignment that is broadly supported by and acceptable to stakeholders. This was achieved through an extensive engagement programme that consulted on the route selection methodology, investigation corridor and multiple route options. The route selection process is detailed in Chapter 4 Route Selection.

As part of this process, a number of communication tools were developed for the Project to provide information to stakeholders and obtain feedback. These tools were tailored specifically to obtain feedback from a broad range of stakeholder groups. Engagement for route selection commenced in August 2018 and concluded with a preferred proposed route alignment in November 2020. This route was broadly supported by all stakeholders engaged and was used as the basis of assessment in this EIS.

Landholder engagement

The approach to engaging with directly impacted landholders involved more targeted activities than those employed with the general public and other stakeholders. This was important due to the requirement to secure an approximately 80 m wide easement on land that is otherwise utilised for primary production or other purposes.

Engagement with landholders primarily took the form of one-on-one meetings, phone calls and e-mails. The focus of this engagement was on securing input into the route selection process, understanding local level constraints and opportunities, obtaining information on any planned future land use, addressing any concerns and reaching agreement on the establishment of an easement. Information was shared with landholders in the form of fact sheets and maps. All feedback from landholders was captured and stored in an online mapping portal and stakeholder management database for future reference during surveys and construction.

EIS engagement

In addition to route selection and landholder engagement, the engagement process has been designed to align to the Project approval phases (as discussed in Chapter 1 Introduction), namely:

- determination of the approval process
- environmental baseline data gathering and assessment of impacts
- exhibition of the EIS
- assessment and determination (response phase).

A summary of these phases, the objective and key engagement activities is summarised in Table 6-3 and illustrated in Figure 6-2 below.

6.4.2. Engagement channels

Given the geographical extent of the Project, ElectraNet took an initial approach of combining face-to-face engagement and digital communication tools with the aim of reaching as many stakeholders as possible to capture broad stakeholder feedback. Given the introduction of COVID-19 restrictions in early 2020, ElectraNet re-assessed and tailored its approach to engagement and communications with a greater emphasis on online engagement, whilst still holding one-on-one and targeted stakeholder meetings where possible.

Details of all the engagement channels made available is provided in Table 6-4 below.

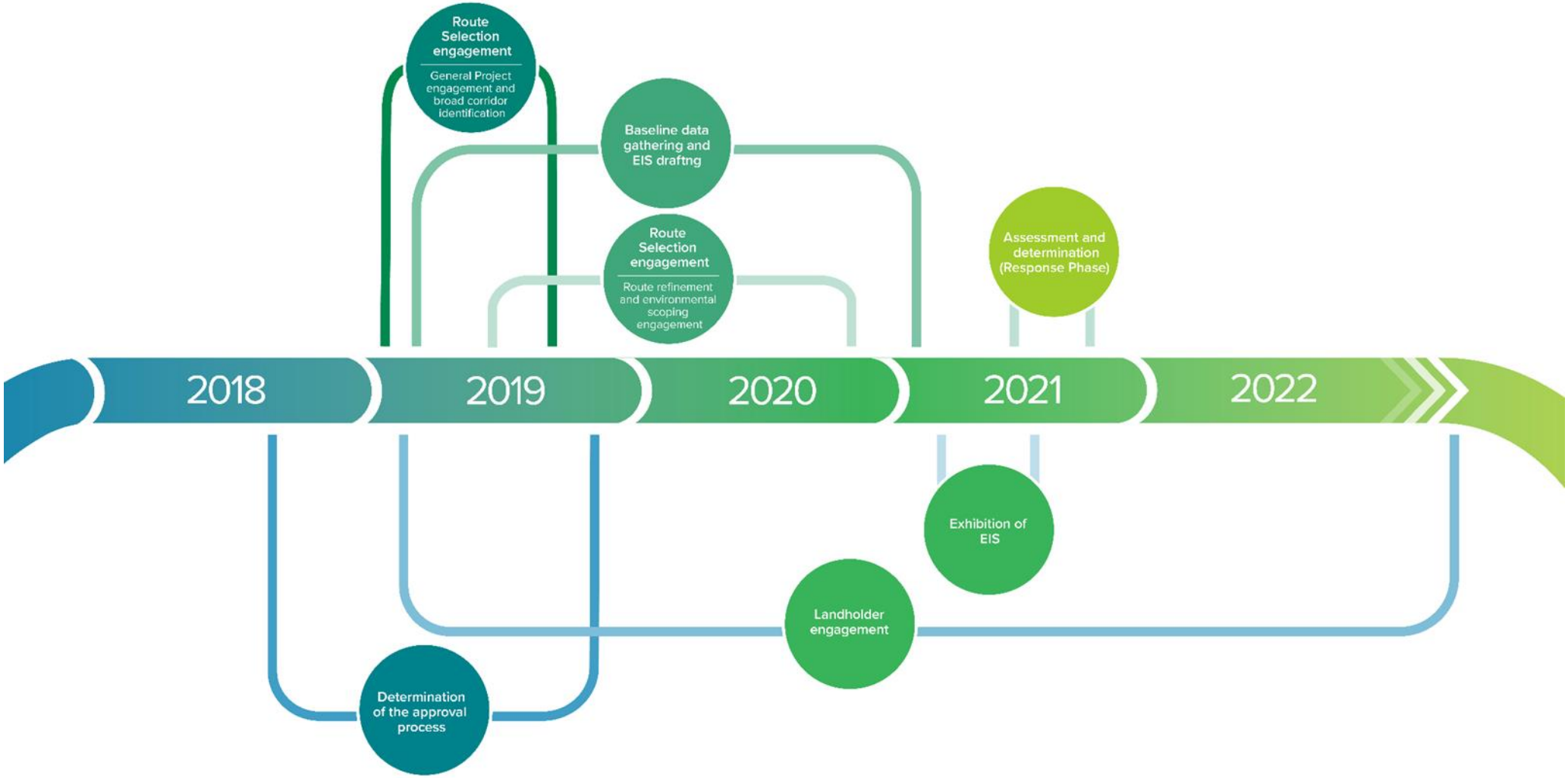


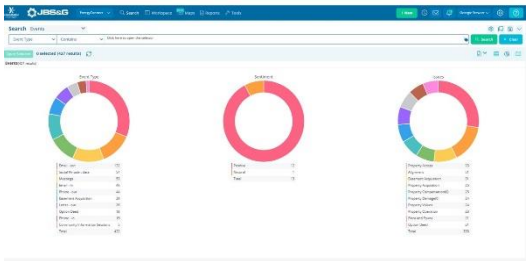
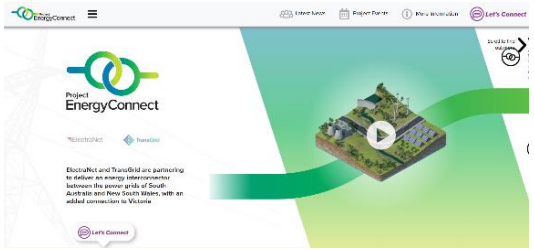
Figure 6-2: High level summary of stakeholder engagement timing

Table 6-3: Phases of and summary of activities

Phase of engagement	Objective	Key engagement activities	Key outputs
Determination of the approval process (August 2018 – November 2019)	• Determine the appropriate approval process in consultation with both State (SA) and Commonwealth governments	• Face to face engagement with appropriate government (State and Commonwealth) departments to determine the appropriate approval processes and the setting of EIS guidelines • Face to Face engagement with State Planning Commission (SPC) • Formation and monthly face to face meetings with the Project EnergyConnect Steering Committee • Lodgment of a Major Development application with PLUS-AGD • Lodgment of an Environmental Protection and Biodiversity Conservation Act (EPBC Act) Referral with DAWE	• EIS Guidelines prepared by the SPC and released by the Minister for Planning and Local Government
Route selection engagement – General Project engagement and broad corridor identification (January 2019 – August 2019)	• Launch the Project and provide suitable information to stakeholders about the Project, its need, the route selection and EIS process and the opportunities stakeholders have to participate • Consult on the route selection methodology • Identify stakeholder values, key regional constraints and opportunities	• Launch of the Project EnergyConnect website and registration of stakeholder interest • Targeted meetings and workshops with key stakeholders, such as State and local government, Traditional Owner groups, the Project EnergyConnect Steering Committee, landholders, conservation bodies etc.) • Establishment of web-based interactive mapping platform on the Project EnergyConnect website to obtain public feedback • Community information sessions in region • Interactive hubs in local councils and libraries • E-newsletters, media briefings, briefing papers etc. • Monthly Project EnergyConnect Steering Committee meetings • Regular Project EnergyConnect Working Group meetings and workshops	• Launch of the Project in the public domain • Broad acceptance of the route selection methodology • Establish key stakeholder values, potential concerns, constraints and opportunities at a broad level to inform investigation corridor • Registration of stakeholder interest
Route selection engagement – Route refinement and environmental scoping engagement (June 2019 – November 2020)	• Narrow the 20 km investigation corridor, identify potential routes and identify a preferred route for assessment in the EIS • Gain a preliminary understanding of the scope of the Project and potential impacts • Consult with stakeholders on the next steps and opportunities for engagement	• Updates to the Project EnergyConnect website • Targeted meetings / briefings with key stakeholders (including national, State and local government, and Traditional Owner groups) • Updates to the web based interactive mapping platform to obtain ongoing public feedback • Regional community information sessions in region (including a booth at the Riverland field days) • Interactive hubs in local councils and libraries	• Identify local level constraints and opportunities to inform the multiple route options within the investigation corridor and refine as appropriate (including field visits and survey) • Understand stakeholder issues and concerns to inform the scope of works for the specialist studies for the EIS • Broad acceptance of preferred route by stakeholders to assess in the EIS

Phase of engagement	Objective	Key engagement activities	Key outputs
		• E-newsletters, briefing papers, latest news updates on the website etc. • Phone surveys (random sample of 200 residents of the five local government areas along the proposed alignment to understand Project awareness, key areas of community interest, key concerns and how the community wish to be engaged going forward)	• Endorsement from the Project EnergyConnect Steering Committee and working group on both the methodology used to select the investigation corridor and preferred route for assessment in the EIS
Landholder engagement (February 2019 – ongoing)	• Identify property level constraints and opportunities (current land use activities, residential dwellings, flood areas, access tracks etc.) • Explain the land access process to landholders (preliminary activities proposed, timeframes, negotiation process etc.)	• One on one meetings • Landholder communications (phone calls, email notifications, targeted updates, e-newsletters, land use surveys)	• Broad acceptance by landholders of the location of the Project at a local level • Establish property level constraints and opportunities • Understand landholder issues and concerns • Landholders understand the process and their rights • Negotiated and executed agreements for an easement
Baseline data gathering and EIS drafting (March 2019 – February 2021)	• To discuss baseline data collection through detailed specialist survey • To discuss the EIS preliminary findings and proposed mitigation measures with interested and affected stakeholders and general public to ensure concerns are adequately addressed in the EIS	• Key stakeholder and government site visits • Cultural heritage surveys with traditional owners • Key stakeholder presentations on preliminary findings • Virtual online EIS engagement room and interactive online feedback tools to share preliminary findings and receive feedback	• Broad acceptance by key stakeholders • Stakeholder concerns are adequately addressed in the EIS
Exhibition of EIS (April 2021)	• Share the preliminary findings and full EIS with the public for review and comment	• Dissemination of the EIS and executive summary for public comment via government process (30 days) • Dissemination of the full EIS and executive summary for public comment via a virtual online EIS engagement room • Key stakeholder presentations • In region engagement, as appropriate	• EIS and executive summary available in an interactive way that allows stakeholders to understand the findings and are able to voice their opinions
Assessment and determination (Response phase) (June – end 2021)	• Respond to any further stakeholder concerns based on submissions on the EIS	• Preparation of a Response Document by ElectraNet responding to submissions made during the SA Government public consultation period • Disclosure of response document publicly	• Response document outlining all stakeholder submissions and ElectraNet's response to outstanding issues or concerns

Table 6-4: Engagement channels

Engagement channels	Engagement summary	Example of engagement channel
Telephone and email	• A dedicated toll-free telephone number (**1800 560 577**) and email address (**projectenergyconnect@electranet.co.au**) was established in January 2019 to receive and respond to queries from interested and affected stakeholders. • All correspondence was recorded, tracked and reported in stakeholder and community engagement software to ensure all queries were recorded and responded to appropriately.	
Project EnergyConnect website	• A dedicated Project EnergyConnect website (**www.projectenergyconnect.com.au**) was developed and launched in January 2019. The website includes an overview of the Project, the Project status, an online EIS virtual engagement room, interactive maps, latest news and events, ways to participate in the process, contact details and links. • The website has undergone numerous updates as the Project has progressed. • As of December 2020, over 17,000 people had visited the website.	
Online interactive mapping platform	• An interactive mapping platform was developed and launched in May 2019 to provide ongoing opportunities for stakeholders to have input into the route selection process. The mapping tool evolved as the route was refined and primarily sought to obtain feedback on stakeholder values and concerns. • This interactive mapping tool was made available via the Project website, advertised via social media platforms, e-newsletter updates etc. • The interactive mapping tool was also accessible via the interactive hubs set up in relevant councils.	

Engagement channels	Engagement summary	Example of engagement channel
Online EIS virtual engagement room	• A **Project EnergyConnect online EIS virtual engagement room** was launched on 29 January 2021. This room was launched in two phases. The first phase of the engagement room provided details on the preliminary findings of the EIS and sought public feedback. The first phase of the engagement room included Project summaries in the form of short films, downloadable fact sheets and presentations, animations and interactive tools for the public to access information and provide feedback. The second engagement room includes a downloadable version of this EIS and executive summary. • The launch of the engagement room and exhibition of the EIS was advertised via the media, ElectraNet media releases, key stakeholder letters, the Connector e-news, via Project EnergyConnect social media platforms and via the Project website.	
One on one meetings, key stakeholder briefings and workshops	• Up to December 2020, a total of 38 meetings with key stakeholders, including the Australian Landscapes Trust, Birdlife Australia, government agencies and local Councils, have occurred. These meetings commenced during the route selection process and have continued as required during the EIS development process. • Since 2019, approximately 60 directly affected landholder meetings have been held to discuss land access and easement acquisition. These meetings are ongoing. • Approximately four meetings with three Traditional Owner groups have been held since 2019, in addition to several cultural heritage surveys. Targeted engagement continues. • Targeted stakeholder briefings and workshops were held with five local Councils, with valuable input into the route selection process, local community values, potential impacts and economic development benefits provided by participants. Five briefings and five workshops were held in March and April 2019 and were followed up with multiple updates to each Council.	
Key stakeholder site visits	• A number of key stakeholder site visits were undertaken in from July 2019 – February 2021. These included: - Cultural heritage surveys with the relevant Traditional Owner Groups - Site visits and walkovers with representatives from Australian Landscapes Trust (ALT), DEW, PLUS-AGD - Site visits and walkovers with landholders.	

Engagement channels	Engagement summary	Example of engagement channel
Steering Committee and Working Group meetings	• A total of 29 Project EnergyConnect Steering committee meetings and five working group workshops have been undertaken for the Project between August 2018 and February 2021. These meetings were attended by appointed representatives from: - SA government agencies: DEM, EPA, DIT, DEW, PLUS-AGD - NSW Department of Planning, Industry and Environment (DPIE) - ElectraNet and TransGrid - JBS&G / Consentium.	
Community drop-in sessions	• During the route selection process, ElectraNet hosted six drop-in sessions across five council areas, including Berri, Renmark, Waikerie, Morgan and Burra. These drop-in sessions included posters and maps outlining the route selection process, the methodology to be adopted and initial investigation corridor. Feedback was sought from the general public on the methodology, environmental values and any constraints or opportunities. These drop-in sessions were well attended and provided useful local input into the route selection process.	
Riverland field days	• Representatives from ElectraNet and JBS&G Australia, hosted an information booth at the Riverland Field Days (**www.riverlandfielddays.com.au**) held in Barmera during September 2019. Over 13,000 people attended this event. This provided ElectraNet an additional chance to meet with community members and stakeholders, provide information about the Project and obtain feedback about route selection, environmental and other values, and discuss any concerns.	

Engagement channels	Engagement summary	Example of engagement channel
Interactive hubs	• It is acknowledged that not everyone has access to a computer or an internet service. As such, interactive hubs powered by iPads have been placed at strategic locations throughout the broader Project area to allow stakeholders to view Project related information on the website, interactive map and online EIS virtual engagement room. The interactive hubs are located in the following locations: - ElectraNet Head office reception - 55/52 East Terrace, Adelaide SA 5000 - Remark Paringa Council - 61 Eighteenth Street Renmark - Waikerie Library and Visitors Centre – Strangman Road, Waikerie, 5330 - Berri Library - Kay Ave, Berri SA 5343 - Barmera Library - 4 Barwell Ave, Barmera SA 5345.	
The Connector – e-newsletters	• "The Connector" e-newsletter launched in June 2019 and is emailed to over 600 subscribers who have registered to receive updates. • The Connector is circulated each quarter, the purpose being to inform stakeholders of material updates with respect to the Project. Subject matters to date included updates on the EPBC Act application status, the Riverland Field Days, the Australian Energy Regulator (AER) determination and other Project updates. • The e-newsletter was also used to advise stakeholders of the launch of the virtual engagement room and the availability of the online EIS summary and commencement of the EIS public exhibition process.	
Social media	• ElectraNet has strong social media following and presence and regularly utilises LinkedIn and Facebook for updates on its various projects across South Australia, including Project EnergyConnect. Content focuses on information relating to the latest news, broader energy market and renewables transition, safety education and the information on the energy sector. • A **Project EnergyConnect Facebook page** was set up in April 2019. • Social media platforms (including ElectraNet's LinkedIn and the Project EnergyConnect Facebook page) were used to advise stakeholders of the launch of the online EIS virtual engagement room and commencement of the EIS public exhibition process.	

Engagement channels	Engagement summary	Example of engagement channel
Media and advertisements	• Project EnergyConnect information and updates have been published in various media sources since late 2018, including articles or mentions in: - The Advertiser - InDaily - The Murray Pioneer - Financial Review - GlamAdelaide - RenewEconomy - Daily Telegraph • Local media such as The Murray Pioneer has been utilised to advise community members of upcoming regional events, such as the Community drop-in sessions, virtual engagement room etc.	 **Call for local feedback on interconnector project** RIVERLANDERS can provide assistance and feedback regarding the proposed construction of a power interconnector through the region at information hubs set up by energy contractor ElectraNet. Interactive iPads can now be found at numerous public outlets across the Riverland, which can be used by locals to discuss any social or environmental issues surrounding project EnergyConnect. ElectraNet land services manager Scott Haynes encouraged Riverlanders to share any feedback that may help identify an optimal route for construction of the interconnector. "As we work to narrow our existing 10km-wide study corridor for the interconnector to a final easement, we are interested in hearing about any opportunities or constraints to the locations which the local community can identify," Mr Haynes said. "People can provide the same input via their own mobile devices and computers, but these iPads in community locations provide an additional opportunity for those who may struggle with connectivity at home. "These hubs have been created in partnership with local government and I would like to thank the regional councils involved as well as Regional Development Australia, and their staff for their willingness to assist." EnergyConnect information hubs can be found at the Renmark Paringa Council foyer, and at libraries in Loxton, Waikerie, Berri and Barmera. Renmark Paringa Council assistant Tish Moritz, customer service officer Jenni Thiel and ElectraNet stakeholder advisor Angela Faulkner unveil the EnergyConnect information hub. PHOTO: supplied

6.5. Feedback from Stakeholders

The engagement approach adopted by ElectraNet has allowed for structured feedback collection from stakeholders. The initial focus was on the route selection methodology and hierarchy of constraints which was widened to focus on environmental, economic and social matters during impact assessment investigations.

Feedback through a range of engagement channels has been received in relation to the route selection methodology, community values, land access and land use requirements, cultural heritage values, native vegetation and birds.

Most stakeholders have advised that the Project is important from a regional and State-wide perspective as it will provide safe, secure and reliable electricity for consumers and enable the unlocking of various renewable energy sources, such as solar generation.

As indicated in Table 6-4, the feedback received has been captured in a variety of different ways including interactive maps via the Project website, interactive hub stations, online EIS engagement room, feedback forms, telephone survey, direct discussions at community drop-in information sessions, one-on-one meetings, targeted workshops and queries via the dedicated Project email address and toll-free telephone number. All feedback collected has been entered into the Project's central database in strict alignment with accepted privacy and confidentiality requirements.

6.5.1. Telephone survey

In 2019, ElectraNet commissioned an independent fieldwork company to undertake a telephone survey of residents located within the five local government areas along the proposed transmission line route. The purpose of the survey was to understand the level of awareness of the Project, key areas of community interest, concerns, potential perceived benefits and how community members would like to be engaged going forward.

Prior to being contacted for the survey, 44% of respondents indicated that they were aware of Project EnergyConnect or the SA / NSW Interconnector project. Of those aware of the Project, the most common sources of information were:

- TV 46%
- newspaper 38%
- radio 28%
- word of mouth 19%
- social media 15%

The top three perceived benefits and impacts of the Project as identified by the survey respondents are provided in Table 6-5.

Table 6-5: Top three benefits and impacts identified in telephone survey

Perceived benefits	Percentage	Perceived negative impacts	Percentage
Increased energy security / reliability	33%	Loss of productive / agricultural land	11%
Lower power prices	33%	Impacts on crops / livestock	8%
Employment / jobs	15%	Impacts on vegetation and birds	6%

The top three factors considered important when refining the route were identified as being: avoiding impacts to tourism and recreational use of the River Murray; avoiding townships and residential areas; and avoiding areas of environmental value, such as areas with sensitive flora / fauna.

The respondents advised the preferred methods of engagement for the Project are:

- email 44%
- newspaper 24%
- radio 15%
- social media 11%
- community information sessions / drop-in sessions (7%)

The results of the survey shaped engagement methods and communication and tools as provided in Table 6-4, and the potential impacts raised during the survey were considered by the Project team as outlined in Table 6-6.

6.5.2. Summary of key issues raised

As noted in Chapter 4 Route Selection, ElectraNet's approach to route selection was generally viewed positively by stakeholders who provided detailed feedback on regional and local level constraints and opportunities that would contribute to minimising potential impacts and maximising the use of areas of existing disturbance.

A consistent view put forward by various stakeholders, particularly local Councils, Traditional Owners and local businesses, is that the proposed route should not traverse south of the River Murray. The social, economic and environmental reasons put forward included the number of landholders who would be impacted, number of productive agricultural and viticultural operations that would be impacted, potential impacts to tourism, proximity to the floodplains and potential impacts to cultural heritage. As noted in Chapter 4 Route Selection, the River Murray was noted as a Tier 1 constraint, therefore the Project alignment runs north of the River Murray at all times.

Perceived impacts on locally endangered flora and fauna (and more specifically mallee birds) were a significant concern raised by stakeholders during early engagement in 2019. ElectraNet spent a considerable amount of time engaging with stakeholders around these concerns and commissioned additional specialist studies to better understand potential impacts to flora and fauna, refine the route selection and feed into the EIS. Further details of these specialist studies and the results are discussed in Chapter 11 Flora and Fauna. As a result of the specialist studies and stakeholder engagement, the route alignment selected avoids areas of dense mallee habitat which was identified as a key environmental value.

Stakeholders recognised the economic benefits of the Project, including improving reliability in power supply, aiding in the transition away from the use fossil fuels, job creation and flow on effects to the local region including the procurement of goods and services.

Various impact assessments have been undertaken to support the EIS and deal with the issues, concerns and opportunities raised by stakeholders.

Each EIS chapter provides information on feedback received throughout the route selection and EIS processes and describes how identified impacts will be managed via appropriate mitigation measures.

A high-level summary of the key feedback received to date is provided in Table 6-6 including where these have been specifically addressed in the EIS. A detailed list of all values, concerns, opportunities and specific feedback is provided in Volume 2 Appendix G,

Table 6-6: High level summary of stakeholder feedback and associated outcomes

Value	Aspect	Concern / opportunity raised	Outcome of engagement / summary of response	EIS chapter reference
Corridor selection **Socio-economic**	Route selection methodology	• Opportunity to align with existing infrastructure (such as roads and other transmission lines) to avoid additional disturbance	• Constraints and opportunities identified at a regional and local level • Broad stakeholder acceptance of the route selection methodology and hierarchy of constraints	• Chapter 4 Route Selection
		• Hierarchy of constraints (how constraints were identified and ranked. i.e. what constitutes a tier 1 versus a tier 2 constraint)		
		• Easement acquisition such as process, impacts to land and compensation	• Easement acquisition clearly explained to landholders • Executed option agreements which set out compensation and other relevant matters	• Chapter 9 Land Use and Tenure
	Land use / operations	• Impacts on areas of intensive agriculture (irrigation, viticulture, horticulture and citrus growing)	• Areas of intensive agriculture avoided	• Chapter 4 Route Selection
		• Impacts to conservation land / habitat loss	• Areas of high conservation and habitat value avoided	• Chapter 4 Route Selection • Chapter 9 Land Use and Tenure • Chapter 11 Flora and Fauna
		• Impacts to townships and residential areas	• Proposed route avoids all townships. Specialist studies (including visual, air quality, noise and vibration, traffic and transport and socio-economic) completed, and appropriate mitigations measures proposed in the EIS	• Chapter 4 Route Selection • Chapter 13 Visual Amenity • Chapter 14 Air Quality • Chapter 15 Noise and Vibration • Chapter 16 Traffic and Transport • Chapter 17 Socio-economic Environment
		• Impacts on aerial mustering practices on nearby property	• Transmission line marker balls may be installed where appropriate	• Chapter 9 Land Use and Tenure
		• Impacts on native title and cultural heritage values	• Cultural heritage surveys complete and engagement with Traditional Owners is ongoing	• Chapter 9 Land Use and Tenure • Chapter 12 Cultural Heritage

Value	Aspect	Concern / opportunity raised	Outcome of engagement / summary of response	EIS chapter reference
	Tourism	• Impacts to tourism and recreational use on the River Murray	• Prominent tourism areas avoided and the transmission line will not traverse the River Murray	• Chapter 4 Route Selection
Hazard management	Fire risk	• Opportunity to provide a fire break between Calperum station and Cooltong community and reduce the risk of bushfires	• ElectraNet will work with landholders to ensure a safe clearance distance is maintained between vegetation and the transmission line • A Fire Hazard Management Plan for the Project will be developed and align with the regional fire management plans and consultation with CFS	• Chapter 18 Hazards and Risk Management • Fire Hazard Management Plan (Appendix S)
		• Perception that transmission lines attract lightning strikes and may cause a bushfire	• Transmission lines do attract lightning strikes but act as lightning conductors and reduce the risk of lightning strikes as a source of fire	
		• Opportunity to share access routes with CFS through high risk bushfire areas that currently have little access available (e.g. Hawks Nest station)	• A Fire Hazard Management Plan for the Project will be developed and align with the regional fire management plans and consultation with CFS	
		• Fire risk associated with transmission lines through high bushfire risk areas such as Calperum and Taylorville stations.	• A Fire Hazard Management Plan for the Project will be developed and align with the regional fire management plans and consultation with CFS	
	Human health	• Impacts on human health arising from transmission lines	• While concerns have been raised in relation to exposure to electromagnetic fields, studies have shown that levels outside of the transmission line easement would be similar to those readings within a home	
Flora and Fauna	Ecology	• Concern that the transmission line may spark a bush fire in area of critical habitat	• A Fire Hazard Management Plan for the Project will be developed and align with the regional fire management plans and consultation with CFS	• Chapter 4 Route Selection • Chapter 11 Flora and Fauna • Chapter 18 Hazards and Risk Management
		• Impacts on critical habitats because of vegetation clearance for project	• Constraints and opportunities identified at a regional and local level were considered in	

Value	Aspect	Concern / opportunity raised	Outcome of engagement / summary of response	EIS chapter reference
		construction – towers, laydown areas, access.	the route selection process and resulted in the proposed route alignment. • Impacts assessed via extensive specialist study	• Fire Hazard Management Plan (Appendix S)
	Native Vegetation	• Impacts on mallee vegetation.		
	Birds	• Impacts on flight paths of migratory birds because of overhead transmission lines		
		• Impacts on local endangered wildlife such as Black Eared Miners and Malleefowl because of habitat segregation		
	Fauna	• Impacts on wild animals		
Traffic and Transport	Traffic	• Impacts to local traffic due to increase in vehicle movements	• The construction of the Project is expected to occur within an 18–24 month timeframe, in a linear manner and occurring concurrently, thereby there will be limited impact to local traffic. • A Traffic Management Plan prior to construction commencement • ElectraNet will consult prior to construction with the appropriate roads authority regarding works which may affect roads or traffic	• Chapter 16 Traffic and Transport
	Roads	• Opportunity for potential road upgrades	• ElectraNet will consult prior to construction with the appropriate roads authority regarding works which may affect roads or traffic	
		• Impacts on road quality and who is responsible for costs of upgrading / maintaining during project construction	• A Traffic and Transport study has been undertaken which shows that all planned construction and operational phase traffic impacts are within the capacity of the existing road network	
		• Opportunity for increased access created by tracks required for the transmission line construction and maintenance	• Tracks created for the construction and ongoing maintenance of the Project will be for use by the landholder, ElectraNet and its appropriate contractors and not the general public	

Value	Aspect	Concern / opportunity raised	Outcome of engagement / summary of response	EIS chapter reference
Economic	Employment	• Opportunities for employment	• ElectraNet will use local labour where appropriate; however, many positions require experienced and highly skilled workers which may need to be sourced from outside of the region • Opportunities for employment will be via ICN and registration available on ElectraNet's virtual engagement room	• Chapter 17 Socio-Economic Environment
	Local business	• Opportunity for local businesses to provide goods and services	• ElectraNet and its engineering, procurement and construction (EPC) contractor will use local businesses wherever possible and as appropriate for the delivery of the Project • Opportunities for the provision of goods and services will be via Industry Capability Network (ICN) and registration available on ElectraNet's virtual engagement room	
	Renewable energy	• Opportunity to enable renewable energy projects in the area and as a result increase economic activity	• The Project will enable renewable energy developers to connect to the electricity grid. A corresponding increase in economic activity will follow as renewable energy developers plan and subsequently build their projects	• Chapter 2 Project Justification • Chapter 9 Land use and Tenure • Chapter 17 Socio-Economic Environment
	Power supply	• Access to secure, reliable, affordable power for South Australians	• The Project will provide access to lower cost energy generation, decrease South Australia's reliance on other States to provide electricity and result in lower household and business power bills over time	
Visual amenity	Construction of transmission line	• Opportunity to underground the transmission line to reduce visual impact.	• Undergrounding the transmission line was considered in early project development but ruled out due to the potential for unacceptable environmental impacts, in addition to higher construction and maintenance costs.	• Chapter 9 Land Use and Tenure • Chapter 13 Visual Amenity

Value	Aspect	Concern / opportunity raised	Outcome of engagement / summary of response	EIS chapter reference
	Lifestyle	• Impact to quality of lifestyle due to large structures obstructing landscape	• During the route selection process, the alignment was sited away from areas that are visually sensitive, such as towns and scenic tourism locations.	
	Property values	• Impact on property values as a result of the transmission lines obstructing view.		
Construction	Project management	• Concern for breakdown in communication between the company and contractor regarding treatment of the local environment by contractor undertaking project construction	• ElectraNet will develop a Construction Environmental Management Plan with its engineering, procurement and construction (EPC) contractor which will set out a range of matters, including communication channels, roles and responsibilities, and compliance reporting.	• Draft Construction Environmental Management Plan (Appendix P)
Cultural Heritage	Protection of areas of cultural heritage significance remains	• Impacts on areas of cultural heritage significance due to tower clearance and construction	• Cultural heritage surveys have been completed along the corridor and engagement with Traditional Owners is ongoing. • Traditional owner teams will act as 'monitors' during work that involves any level of land disturbance.	• Chapter 12 Cultural Heritage
		• Mitigation management process to ensure that areas of cultural heritage significance are protected		
		• Compensation	• ElectraNet and the relevant Traditional Owner groups are negotiating various heritage and other agreements, which deals with the issue of compensation	
		• Avoid crossing the River Murray	• Constraints and opportunities identified at a regional and local level were considered in the route selection process and resulted in the proposed route alignment, with no part crossing the River Murray	

6.6. Further Opportunities to Provide Feedback

6.6.1. Public exhibition of the EIS

The Minister for Planning and Local Government will place this EIS on public exhibition for a period of at least 30 business days. The public exhibition process is the government's formal consultation with stakeholders, providing an opportunity for all interested parties to read about the Project and submit questions or comments to government who make a decision on whether to approve the Project.

When published, there will be a variety of different ways for stakeholders to view, download and provide comment on the environmental, social and economic impact assessments that ElectraNet undertook as part of the EIS process. These include via:

- the SA government's SA Planning Portal – https://plan.sa.gov.au/state_snapshot/development_activity/major_projects/majors/south_australiansw_electricity_interconnector
- the Project EnergyConnect website (www.projectenergyconnect.com.au)
- the Project EnergyConnect online EIS Engagement Room – https://lnkd.in/gp_DcCj
- the interactive hubs located at the following locations:
  - ElectraNet Head office reception – 55/52 East Terrace, Adelaide SA 5000
  - Remark Paringa Council – 61 Eighteenth Street Renmark
  - Waikerie Library and Visitors Centre – Strangman Road, Waikerie, 5330
  - Berri Library – Kay Ave, Berri SA 5343
  - Barmera Library – 4 Barwell Ave, Barmera SA 5345.

Hard copies of the EIS Executive Summary and a digital copy of the EIS and appendices on a USB will be made available on request. Requests may be made via the virtual engagement room, the Project website or by contacting the Project team directly on:

- Email: ProjectEnergyConnect@electranet.com.au or
- Phone: 1800 560 577

In addition, during the public exhibition process PLUS-AGD will facilitate one or more community meetings to provide a further opportunity for stakeholders to hear about the Project. This meeting or meetings may be held in person or online and will generally comprise:

- a presentation on the Project by ElectraNet
- an overview of the Government assessment process by PLUS-AGD
- an opportunity to ask questions directly to either PLUS-AGD or ElectraNet representatives.

Information on the date, time and location of the community meeting(s) will be advertised by PLUS-AGD in local newspapers and on the SA Planning Portal prior to the event. ElectraNet will also provide details about the meeting(s) on the Project website and via The Connector e-newsletter and social media platforms.

Due to COVID-19, face-to-face stakeholder interactions may be restricted, therefore it is likely that virtual engagement methods may be adopted during the public exhibition process.

6.6.2. EIS response phase

All submissions received on the EIS via any of the above sources during the public exhibition process will be reviewed by ElectraNet, and all matters addressed in a Response Document. Together, the EIS

and Response Document will form the final application to government for the assessment and consideration of Project approval.

6.6.3. Ongoing community feedback

ElectraNet is focused on developing the Project in a manner that generates maximum benefit for the broader South Australian community. Extensive engagement and communication activities and channels have enabled ElectraNet to gain a strong understanding of potential issues and benefits the Project may bring. As noted in Table 6-6, the potential issues and benefits raised by stakeholders have been considered by ElectraNet and the Project team will be addressed through Project design and appropriate mitigation measures wherever possible.

ElectraNet is committed to open and transparent engagement with stakeholders and community members throughout the EIS process and beyond and will continue to provide updates via the Project website, virtual engagement room and social media platforms.

EIS Volume 1 Chapter 7

Project Description

JBS&G

project energy connect

Contents

7. Project Description 7-1

7.1. Introduction 7-1
7.2. EIS Guidelines 7-1
7.3. Overview of the Project 7-3
7.4. Project Location 7-3
7.5. Key Infrastructure Components 7-5
7.5.1. Robertstown substation 7-5
7.5.2. Bundey substation 7-5
7.5.3. Transmission lines from Robertstown substation to the SA / NSW border 7-9
7.5.4. Telecommunications 7-13
7.5.5. Access tracks 7-13
7.5.6. Associated temporary facilities 7-16
7.6. Project Timing and Construction Staging 7-19
7.6.1. Indicative construction programme 7-19
7.6.2. Early contractor involvement 7-19
7.6.3. Enabling works 7-19
7.6.4. Site establishment 7-19
7.6.5. Construction of the Bundey Substation 7-20
7.6.6. Construction of the transmission lines from Robertstown substation to the SA / NSW border 7-20
7.6.7. Clean-up and reinstatement 7-20
7.6.8. Operation and maintenance 7-21
7.6.9. Life of asset and decommissioning 7-21
7.7. Key Project Activities (Bundey Substation) 7-23
7.7.1. Site clearance 7-23
7.7.2. Earthworks and civil construction 7-23
7.7.3. Electrical works 7-24
7.7.4. Operation and maintenance 7-24
7.8. Key Project Activities (Transmission Line) 7-24
7.8.1. Establishment of access tracks 7-24
7.8.2. Vegetation clearance and topsoil stockpiles 7-26
7.8.3. Foundations and footings 7-28
7.8.4. Tower assembly and erection 7-28
7.8.5. Conductor stringing 7-31
7.8.6. Clean up and rehabilitation 7-34
7.8.7. Operation and maintenance 7-34
7.9. Resources and Materials 7-36
7.9.1. Borrow material 7-36
7.9.2. Water supply and use 7-36
7.9.3. Concrete batching 7-36
7.9.4. Hazardous materials and chemicals 7-37
7.9.5. Plant and equipment 7-37
7.9.6. Traffic and transport 7-38

7.9.7. Waste management 7-43
7.10. Workforce and Working Hours 7-43
7.10.1. Workforce 7-43
7.10.2. Construction working hours 7-44
7.11. Quality Assurance and Contingency Planning 7-45

List of Figures

Figure 7-1: Project components 7-4
Figure 7-2: Typical substation components 7-6
Figure 7-3 Indicative layout of the proposed Bundey substation 7-7
Figure 7-4: Typical structure types and easement width 7-10
Figure 7-5: Indicative modelled suspension tower (left) and strain tower / terminal tower (right) to be used for the Project 7-11
Figure 7-6: Typical transmission line components 7-13
Figure 7-7: Existing access track locations 7-15
Figure 7-8: Typical temporary worker construction camp layout 7-17
Figure 7-9: Indicative construction process and duration for transmission lines 7-20
Figure 7-10: Indicative Project timing 7-22
Figure 7-11: Construction and operation access track options 7-25
Figure 7-12: Typical pad layout with two stage assembly 7-29
Figure 7-13: Typical stringing-strain to strain arrangement 7-32
Figure 7-14: Typical stringing arrangement for an angle structure 7-32
Figure 7-15: Typical stringing pad arrangement with OPGW pads 7-33
Figure 7-16: Typical stringing pad arrangement (floating method) 7-33
Figure 7-17: Vegetation clearance requirements for operation of the Project 7-35
Figure 7-18: Requirements of *Electricity (Principles of Vegetation Clearance) Regulations 2010* 7-35
Figure 7-19: Indicative port and haulage route locations 7-41
Figure 7-20: Indicative local haulage routes 7-42

List of Plates

Plate 7-1: Existing Robertstown substation 7-5
Plate 7-2: Base of typical lattice tower 7-12
Plate 7-3: Indicative temporary worker construction camp 7-17
Plate 7-4: Example of foundation construction 7-28
Plate 7-5: Example of tower assembly and erection 7-30
Plate 7-6: Examples of helicopter lifting and tower transport 7-30
Plate 7-7: Brake site from where the conductor is pulled out under tension 7-31

7. Project Description

7.1. Introduction

This chapter describes the key elements and activities of the Project. These details have been used as the basis for determining the potential impacts of the Project (see Chapters 9 to 19). This chapter presents several options and scenarios in order to :

- allow for conservative environmental and social assessment
- provide flexibility for detailed design, operational change and continual improvement without compromising the ability to mitigate potential negative impacts and enhance positive impacts of the Project.

Where relevant, the environmental and social impact assessments presented in Chapters 9 to 19, assess the more conservative scenarios. For example, the tallest tower option has been assessed for visual impact assessment and the maximum vegetation clearance option assessed for ecology impacts. ElectraNet and its selected engineering, procurement and construction contractor (EPC) will endeavour to reduce environmental disturbance as far as possible using alternative design and construction techniques (subject to technical and financial feasibility, workforce and public safety and the quality and reliability of the infrastructure).

7.2. EIS Guidelines

The EIS Guidelines require a description of the proposal as set out in Table 7-1.

Table 7-1: EIS Guidelines addressed in the Project Description chapter

EIS Guidelines and Assessment Requirements	Assessment level
General Requirements	
Description of the Proposal • The nature of the proposal and location • A project plan to outline objectives, constraints, key activity schedule and quality assurance • Site layout plans (including indicative land division plan, if relevant) • The construction and commissioning timeframes (including staging) • Details of all buildings and structures associated with the proposed development • Details of any other infrastructure requirements and availability • Details of the construction methods to be used • Details on the operation of the proposed development, including proposed maintenance programs • A contingency plan for delays in construction	
Hazard Risk *Assessment Requirement 10:* The construction and operation of a high voltage powerline involves a range general and specific risks.	
• 10.3: Describe any hazardous materials, with reference to storage, use, handling and disposal of these materials during construction and operation.	Medium
Alternatives *Assessment Requirement 11:* There are a number of alternatives that require exploring	
• 11.3 Identify alternative design and construction techniques to meet the proposed objectives (e.g. undergrounding, tower design and placement), with reference to any hazards / risks and the social, environmental and economic advantages and disadvantages of each.	Medium
Traffic Effects *Assessment Requirement 14*: The proposal requires access for the transportation of infrastructure and construction material to site and ongoing access for maintenance purposes.	

EIS Guidelines and Assessment Requirements	Assessment level
• 14.1 Describe all components of transport and storage of infrastructure (including towers and substation kit) and construction materials to site. Include reference to anticipating timing, sources of materials, routes, number and methods of transport (e.g. by shipping, vehicle and/or helicopter).	Standard
Construction, Operation and Maintenance Effects *Assessment requirement 15: The construction and operation of the proposal would require a range of impacts to be minimized, mitigated and monitored through an environmental management plan framework*	
• 15.1: Describe construction techniques and the timing of construction, with reference to any climatic and temporal implications for the biophysical environment. This should include reference to potential land degradation, pollution and implications for the breeding seasons of native species.	Standard
• 15.2: Outline the sources of waste and methods of disposing waste material, including reference to management of vegetation removed, indication of temporary and final locations for spoil and other waste and the possibilities for reuse or recycling of all waste streams. Provide details of a waste management plan.	Standard
• 15.5: Describe sources of water for construction, including for the construction worker's accommodation camps, concrete batching plant and dust suppression.	Standard
• 15.9: Outline the approximate size of the construction workforce including any need for any construction workers camps or accommodation. Describe the location and management of accommodation camps including sources of water and power, and the management of waste, wastewater and noise impacts.	Standard
• 15.10: Outline any on site infrastructure required during construction (e.g. borrow pits, site compounds, concrete batching facilities etc.) including the management and decommissioning of these areas.	Standard
• 15.11: Describe the location(s) where mobile concrete batching plants would be used and the management of wastewater, dust emissions and noise from such plant.	Standard
• 15.12: Describe the rehabilitation of the areas needed for construction including lay down, concrete batching and construction worker's accommodation areas.	Standard

Aspects of assessment requirements identified in Table 7-1 above which are not addressed in this chapter are listed in Table 7-2 together with the applicable chapter.

Table 7-2: Aspects of assessment requirements addressed in other chapters

Assessment Requirement	Chapter
10.3 Storage, use, handling and disposal of hazardous materials during construction and operation.	Chapter 10 Physical Environment
11.3 Outline of alternative construction methods	Chapter 3 Alternatives to the Project
15.1 Potential land degradation and pollution	Chapter 10 Physical Environment
15.1 Implications of construction timing and technique for native species breeding seasons	Chapter 11 Flora and Fauna
15.2 Soil stockpiling and management	Chapter 10 Physical Environment
15.2 Outline the sources of waste and methods of disposing waste material	Chapter 19 Waste Management
15.9 Management of soil, waste, wastewater from construction camps	Chapter 10 Physical Environment
15.9 Noise impacts from construction camps	Chapter 15 Noise and Vibration
15.9 Size of the construction workforce and any need for any construction workers camps and accommodation	Chapter 17 Socio-Economic Environment
15.9 Waste from construction camps	Chapter 19 Waste Management
15.11 Management of wastewater from concrete batching	Chapter 10 Physical Environment
15.11 Management of dust emissions from concrete batching	Chapter 14 Air Quality

Assessment Requirement	Chapter
15.11 Management of noise emissions from concrete batching	Chapter 15 Noise and Vibration
15.12 Rehabilitation of areas needed for construction	Chapter 10 Physical Environment

7.3. Overview of the Project

As discussed in Chapter 1 Introduction, the Project comprises:

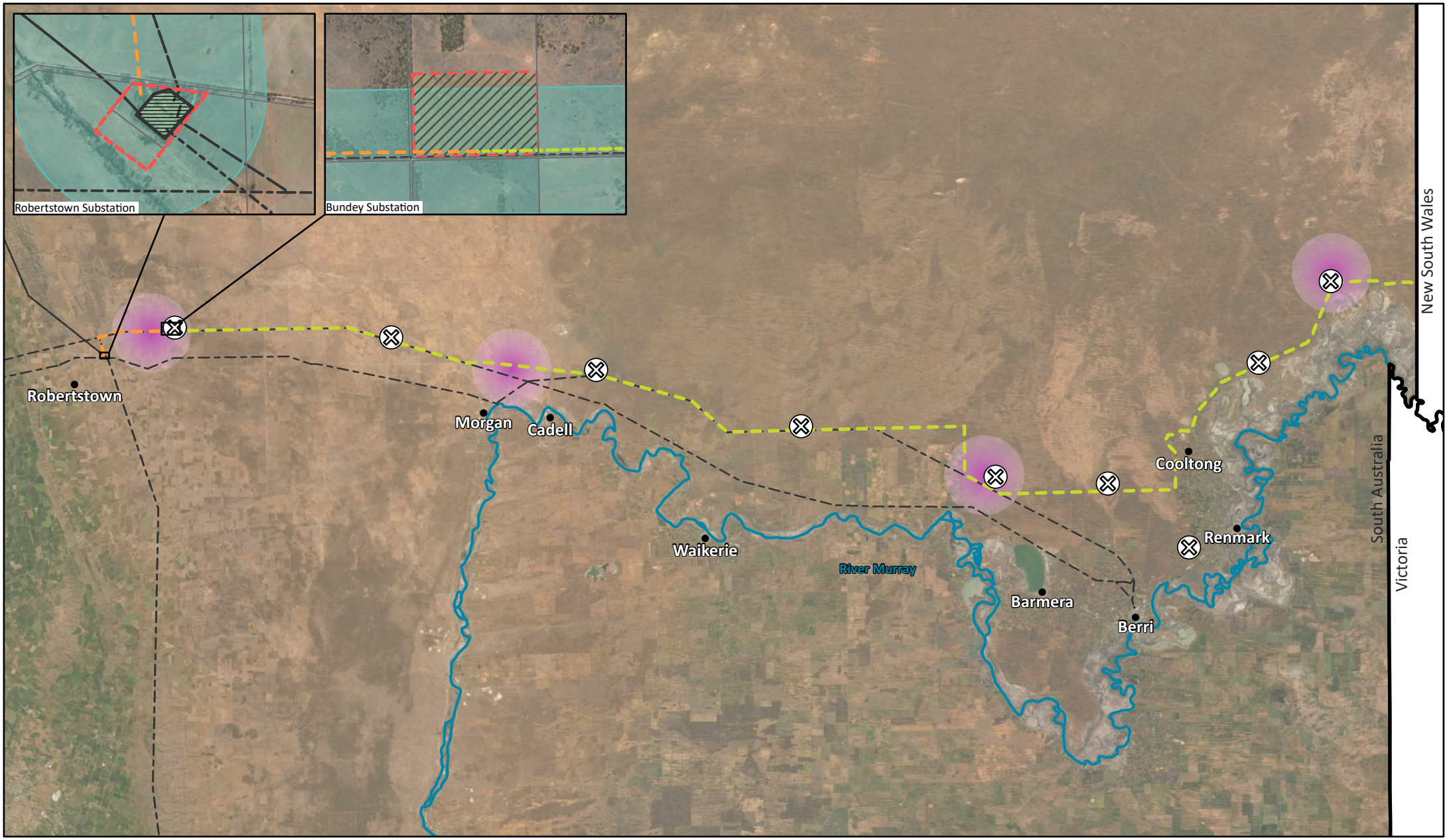
- a new substation located at Bundey, towards the western extent of the transmission line, approximately 14 km north east of Robertstown, that will facilitate the increase in voltage required from the existing system (from 275 kV to 330 kV) and control the flow between the two systems. A description of the substation and its construction is provided in Section 7.5.2
- approximately 10 km of 275 kV overhead transmission line supported by steel lattice towers from the existing Robertstown substation to the proposed new Bundey substation
- approximately 195 km of 330 kV transmission line supported by steel lattice towers from the new Bundey substation to the SA / NSW border at the interface point with TransGrid's NSW portion of Project EnergyConnect. The component parts of the transmission line are described with construction detail in Section 7.5.3
- associated telecommunications infrastructure for operation of the transmission line comprising overhead optical ground wires linked by radio towers (one in SA)
- associated access tracks to provide access to tower sites for construction and maintenance of the transmission line
- associated temporary facilities (i.e. construction compounds, site offices, laydown areas, borrow pits, mobile concrete batching plants, helicopter staging sites, and mobile construction camps).

7.4. Project Location

The Project will traverse approximately 205 km between Robertstown in the Mid North and the SA – NSW border. Chapter 4 Route Selection describes the approach used to identify and refine the transmission line corridor and proposed alignment. An overview of the key components is discussed further in Section 7.5 and illustrated in Figure 7-1 below.

The final alignment and easement of the transmission line will be confirmed during detailed design and is expected to remain largely within the transmission line corridor (refer Section 4.8).

Preliminary plans of the proposed route and the Bundey substation are contained in Appendix D and Appendix E respectively.



Robertstown substation augmentation
Transmission line corridor
Existing Robertstown substation
Proposed Bundey substation
Potential temporary worker accomodation laydown and staging location

Existing ElectraNet transmission line
Proposed alignment
330 kV
275 kV
River Murray
Potential helicopter staging sites (indicative)

Figure 7-1
Project components

0 20
Kilometres

N

ElectraNet
energy connect
JBS&G

7.5. Key Infrastructure Components

7.5.1. Robertstown substation

The existing Robertstown substation owned by ElectraNet is currently undergoing augmentation as part of the installation of two synchronous condensers at the site (separately approved June 2019 – DA 422/V004/19). The purpose of these synchronous condensers is to manage changes in system strength, inertia and voltage control and they are anticipated to be energised in April 2021.

Two existing 275 kV bays at the Robertstown substation will be made vacant by the synchronous condensers project through the extension of the substation bench to the south-west and construction of new bays to integrate the plant into the network. The new Project EnergyConnect 275 kV feeders will be terminated on the gantry structures in these vacant bays at Robertstown substation.

Environmental assessments and approvals for this proposed augmentation are subject to a separate approval and are not covered within this EIS.

Plate 7-1: Existing Robertstown substation

7.5.2. Bundey substation

Proposed substation layout

The Project will require a new substation to be sited at Bundey, approximately 14 km north-east of Robertstown (refer Figure 7-1). This substation will connect the 275 kV and the 330 kV transmission lines and control the flow between the two systems.

ElectraNet is in final negotiations for the land selected for the Bundey substation. The site measures approximately 80 ha, however only 400 m by 250 m (9 ha) is required (subject to detailed design) for the development of the Bundey substation and its associated bench, allowing room for potential future expansion. The final area required for the Project will be confirmed during detailed design.

The Bundey substation will comprise typical primary plant (see Figure 7-2), including:

- transmission gantries which guide transmission lines into the substation

- surge arrestors to protect equipment within the substation from any voltage spikes on the transmission lines
- power transformers which allow the step change in voltage
- line disconnectors which allow the transmission lines and equipment within the substation to be safely isolated for maintenance work
- voltage and current transformers which measure voltage and current entering and moving through the substation
- circuit breakers which are automatic switches that interrupt electrical flow to de-energise equipment and clear faults
- busbars which are conductors that connect equipment within the substation
- light poles which provide emergency lighting for crews that might need to attend the site in the event of a fault
- lightning masts which attract lightning strikes away from sensitive substation equipment
- a weather station which provides real time information about localised conditions that could affect the safe and reliable operation of the transmission network
- communication / radio tower which allow the substation to be remotely monitored and operated
- associated control and amenities buildings.

Figure 7-3 shows the indicative layout and elevations of the proposed Bundey substation.

The tallest structures will be a lightning mast (approximately 30 – 50 m), telecommunication tower (approximately 50 m) and gantries (approximately 25 m).

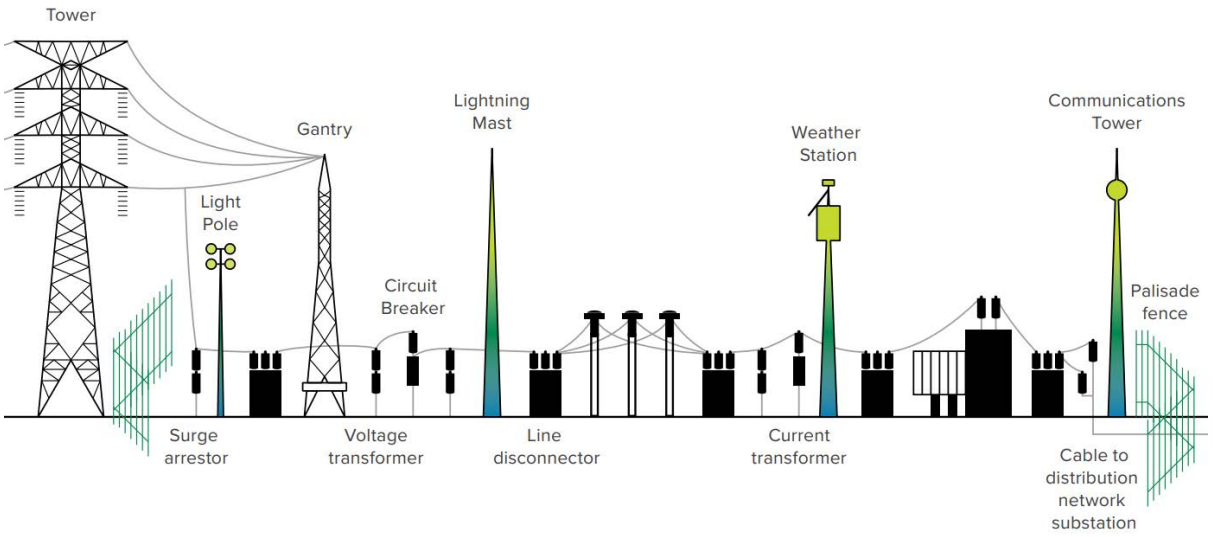
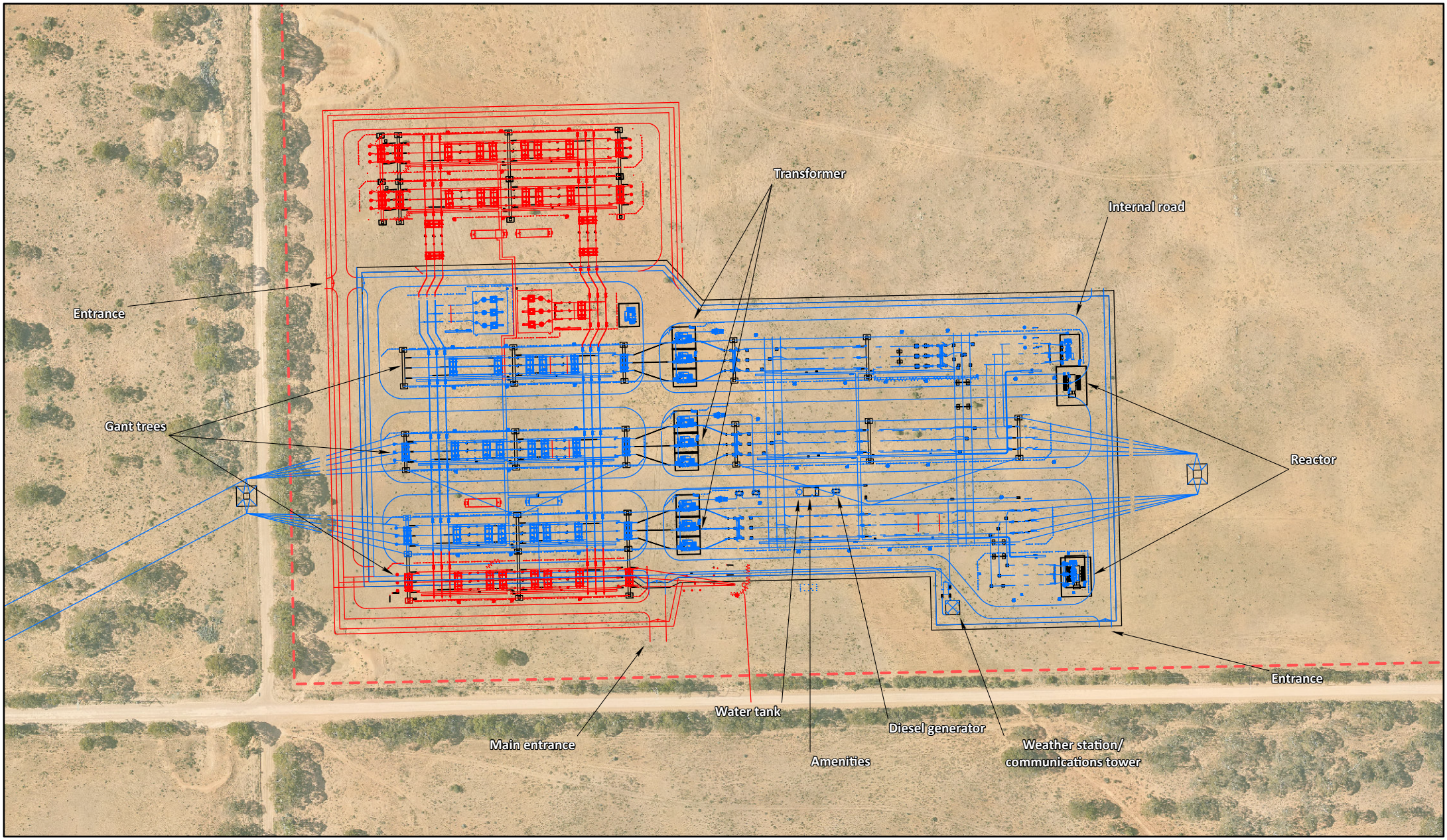


Figure 7-2: Typical substation components



Proposed Bundey substation Certificate of Title

Indicative Bundey substation layout

Current proposed

Potential future

Figure 7-3
Indicative layout of the proposed Bundey substation

0 100

metres

N

ElectraNet

energy connect

JBS&G

Fencing and security

Multi-layered security and safety measures are required around ElectraNet substations to ensure public safety, protect the integrity of the equipment and ensure uninterrupted operation. The developed area of the Bundey substation will be surrounded by an approximately 3 m high palisade perimeter fence, in accordance with ElectraNet's requirements for substation fencing. This fence will be made of galvanised steel (or similar) with up to two main access points with sliding gates. The substation will include all appropriate safety and public information signposts.

Lighting

Site lighting will be required for the operation of the Bundey substation. These external lights are only utilised when operational or maintenance crews need to attend the site in the event of a fault and do not remain illuminated at night. Typically, substation lighting is positioned on poles approximately 4 m in height along the site boundary and within the substation site. Lighting will be designed and installed to minimise light spill outside of the substation site boundary, particularly to traffic traveling on Powerline Road or any fauna in the area. All lighting will be in accordance with ElectraNet's requirements for substation lighting.

Access and parking

Bundey substation will be accessed via Powerline Road, a public unsealed two-way road under the care of the Regional Council of Goyder / Mid Murray Council. The substation site will have two main entry points, one on the southern boundary with Powerline Road and one on the western boundary, off the existing Sutherlands Road. The access driveways will be designed to allow suitable vehicle access for construction and operation and in accordance with relevant road design and council guidelines.

All parking for both the construction and operation of the substation will be accommodated within the site boundary. An internal perimeter road will be constructed as shown in Figure 7-3.

Water supply and sewage

Due to the remote location of the Bundey substation, suitable mains water is not available. A minimum of a 9 kilolitre rainwater tank will be installed at the site and reticulated to the amenities facilities. The rainwater tank will be positioned to enable it to be supplied by rainwater runoff from the roof of the amenities and control buildings. The tank will be filled on construction completion. The amenities will include connection to an on-site septic tank system.

Stormwater and drainage

An on-site stormwater drainage system will be designed and installed to capture and discharge stormwater runoff collected from the site during construction and operation. The substation earthworks will be undertaken in accordance with ElectraNet's Asset Design Manual (1-11-ADM-5) for substation earthworks and stormwater drainage requirements. Transformers will be bunded and incorporate a flame trap and drainage point in the event of an emergency. The substation site will be covered with gravel fill. Hardstand areas will be designed to drain to a reinforced concrete oil water separator / containment tank. General runoff would be discharged to adjacent land using appropriate dispersion / dissipation structures or drainage systems in accordance with the substation detailed design. Stormwater management will be in accordance with ElectraNet's discharge requirements.

Landscaping

The road reserve along Powerline Road and Sutherlands Road has existing vegetation which offers some screening. No additional landscaping on or surrounding the site is proposed as this presents security and bushfire risks.

7.5.3. Transmission lines from Robertstown substation to the SA / NSW border

Transmission technology alternatives

Transmission technology alternatives, including in the form of high-voltage electrical current (Alternating Current (HVAC) or Direct Current (HVDC)) and design (overhead line (OHL) or underground cable (UGC)) were considered by ElectraNet through the RIT-T process and preliminary environmental scoping studies.

Through numerous specialist studies it was ultimately determined that HVDC technology would be significantly more expensive than the HVAC option, for a similar capacity, and not provide any additional benefits from a system security perspective.

UGC options were also considered and deemed to have significantly higher environmental and cost impacts than an OHL. UGC options were ruled out for the following reasons:

- UGC would require approximately six metre wide trenches of one metre in depth be dug over the extent of the underground section, requiring approximately 6 cubic metres of material be excavated per linear metre, resulting in unacceptable land disturbance and environmental impact.
- Should there be a fault, outage or maintenance work, re-excavating a whole section of UGC and installing new cable and joint bays may be required thus causing ongoing impacts. Reclosing the UGC would also require manual switching at each underground / above-ground transition station, which would not meet operating criteria for the Project.
- UGC and associated transition stations would cost more than three times more than OHL and depending on the distance required would result in the interconnector being cost prohibitive or reduce the potential benefits.

Overhead HVAC interconnection was determined to provide the best solution to meet the Project objectives.

Transmission line easement

The proposed alignment will be situated within an easement typically 80 m wide that allows the construction, operation and maintenance of the transmission line. The easement is a permanent legal right which will allow ElectraNet to use and access property, and which will be registered on the relevant land title and remain part of the land title regardless of changes in ownership. While existing land uses will be able to continue across much of the easement, and most existing vegetation will remain undisturbed, the easement will also restrict certain landholder activities.

The purpose of the easement is to provide a safety margin between the high-voltage transmission lines and surrounding structures, a path for ground-based inspections and access to the transmission towers for repairs and maintenance. Where possible, the easement has been aligned with existing infrastructure easements, road reserves, existing tracks and disturbed areas to minimise the need for new disturbance.

Land access protocols will be established with each landholder during the acquisition of property or easement interests, including access requirements where necessary. Access to the proposed easement for construction and operational purposes would preferentially use existing public and private roads and tracks although some new access may be required to provide appropriate access to construction areas and may be retained for operational purposes in some circumstances.

Following cultural heritage surveys in February 2021, sites of aboriginal cultural heritage significance were identified in Hawks Nest Station. As a result, an alignment deviation was necessary to avoid these sites. The deviation aligns with the western boundary of Hawks Nest Station, existing access tracks and the existing ElectraNet 132 kV transmission line. The Hawks Nest alternative is illustrated in Figure

7-1. The exact location of the easement will be determined following detailed design, micro-siting and survey activities.

Transmission line structures

A range of tower structure types are typically used to support transmission lines, depending on the voltage of the line, the function of the structure as well as physical, environmental and engineering constraints. An example of the various transmission towers currently used across SA is provided in Figure 7-4.

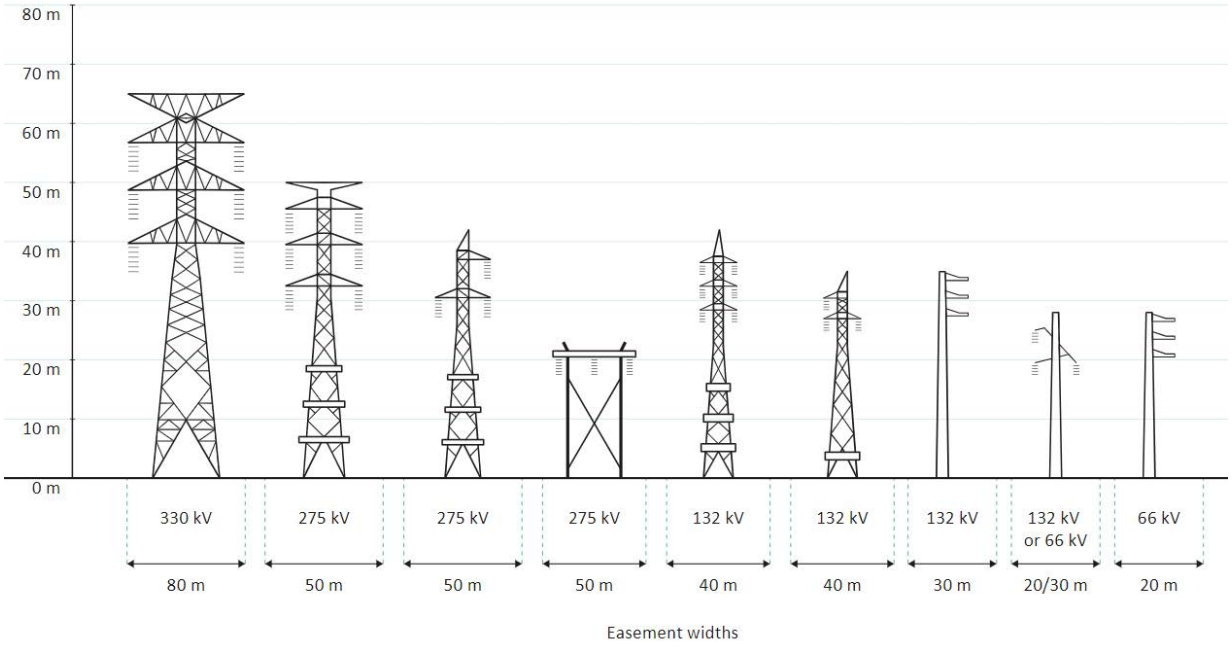


Figure 7-4: Typical structure types and easement width

Transmission structure alternatives were assessed by independent specialists for the Project using a multi-criteria analysis during the preliminary design process and environmental scoping studies. These investigations assessed the use of self-supporting steel lattice towers, self-supporting monopoles, guyed towers, and chainette towers. Criteria assessed were ease of construction, ease of operation and maintenance, line security, access / easement requirements, and potential environmental impacts. It was determined that self-supporting lattice towers performed the best when assessed against the Project specific criteria. This is consistent with international and Australian practice where lattice towers are the standard for double circuit high voltage transmission lines where reliability and security are paramount (Beca 2019).

The Project proposes to utilise steel lattice towers for both the 275 kV and 330 kV double circuit transmission lines. These structures will typically include a combination of steel lattice suspension towers and steel lattice strain towers. Alternative structure types, such as monopoles, may be used in selected isolated circumstances in order to mitigate potential impacts.

Suspension structures are designed to carry the overhead conductors for the in-line sections of the transmission line, or for minor bends in the alignment. Suspension structures are designed to withstand the vertical and transverse wind loadings of the conductors. The tension (or pulling) forces from the conductors are generally equal on either side of a suspension structure. Figure 7-5 shows a conceptual model of the suspension structures to be used for the majority of the proposed alignment.

Strain towers, also known as tension structures are of heavier and wider construction than suspension structures in order to withstand the horizontal loadings associated with significant changes in

direction (angle strain) and line terminations (see Figure 7-5). The tension forces can be much greater on one side of a tension structure than the other, resulting in greater stress on the structure.

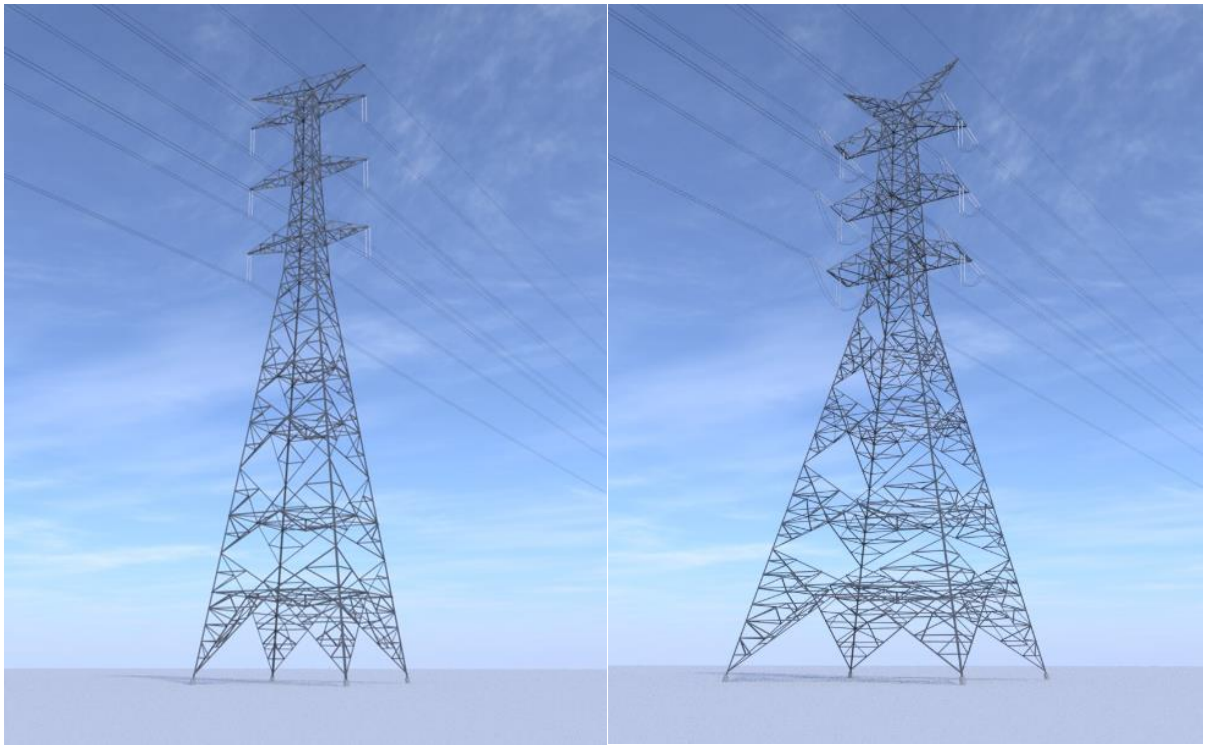


Figure 7-5: Indicative modelled suspension tower (left) and strain tower / terminal tower (right) to be used for the Project

These structures will range between approximately 45 and 65 m in height and will typically be spaced between 400 m and 600 m apart. This type of structure was chosen as the preferred tower type over guyed structures, which are being used on the NSW portion of Project EnergyConnect, due to the reduced footprint required and associated vegetation clearance requirements. Preliminary designs estimate approximately 380 towers in total for the Project, however the exact number and design of the towers will be determined during detailed design and following the micro-siting process.

Foundations and footprint

Concrete foundations will be constructed underground to hold up the towers. The type and size of tower foundations is influenced by the type of structure, terrain and the underlying geotechnical conditions. Strain structures require more extensive foundations for support than suspension structures.

Bored pier foundations will typically involve a cast in-situ concrete foundation of 13 – 16 m deep and 1.2 – 1.8 m in diameter at each leg of the tower. Up to 600 mm of the concrete footings will protrude above ground level (see Plate 7-2) which will vary in diameter and height according to tower type and local ground conditions. Strain towers will have larger footings than suspension towers. Footing designs will be finalised during detailed design.

Plate 7-2: Base of typical lattice tower

Conductors and insulators

The primary function of transmission line conductor systems is to carry the electrical power between designated locations. The Project proposes to use double circuit aluminium conductor steel reinforced (ACSR) of varying diameter. The conductors are attached to the tower cross arms using toughened glass disc insulators.

The transmission lines will also include earth wires with the optical ground wires (OPGW), which provide the function of both grounding and communications. This provides an electrical path for lightning and fault currents to earth, reducing the likelihood of direct lightning strikes or other electrical damage to the conductors. Dampers are used on conductors to control wind-induced vibration and movement.

The 330 kV transmission line between Bundey substation and the SA / NSW border will utilise twin mango conductor (12 wires) and the 275 kV transmission line between Robertstown substation and Bundey substation will utilise single olive conductor (6 wires).

Transmission line markers and bird diverters

Transmission line markers, which are typically made of fibreglass, will be attached to the conductors in areas of the proposed alignment that are close to airstrips to provide visual warning to aircraft of the location of the wires.

In addition, bird diverters will be attached to the conductors selectively in areas where the proposed alignment parallels sensitive wetlands, water courses or known migratory bird flight paths. The diverter target swings and spins freely in the wind and is easily seen by a bird in flight. These diverters mitigate the risk of bird strike.

Typical transmission line components and their configuration may be seen in Figure 7-6 below.

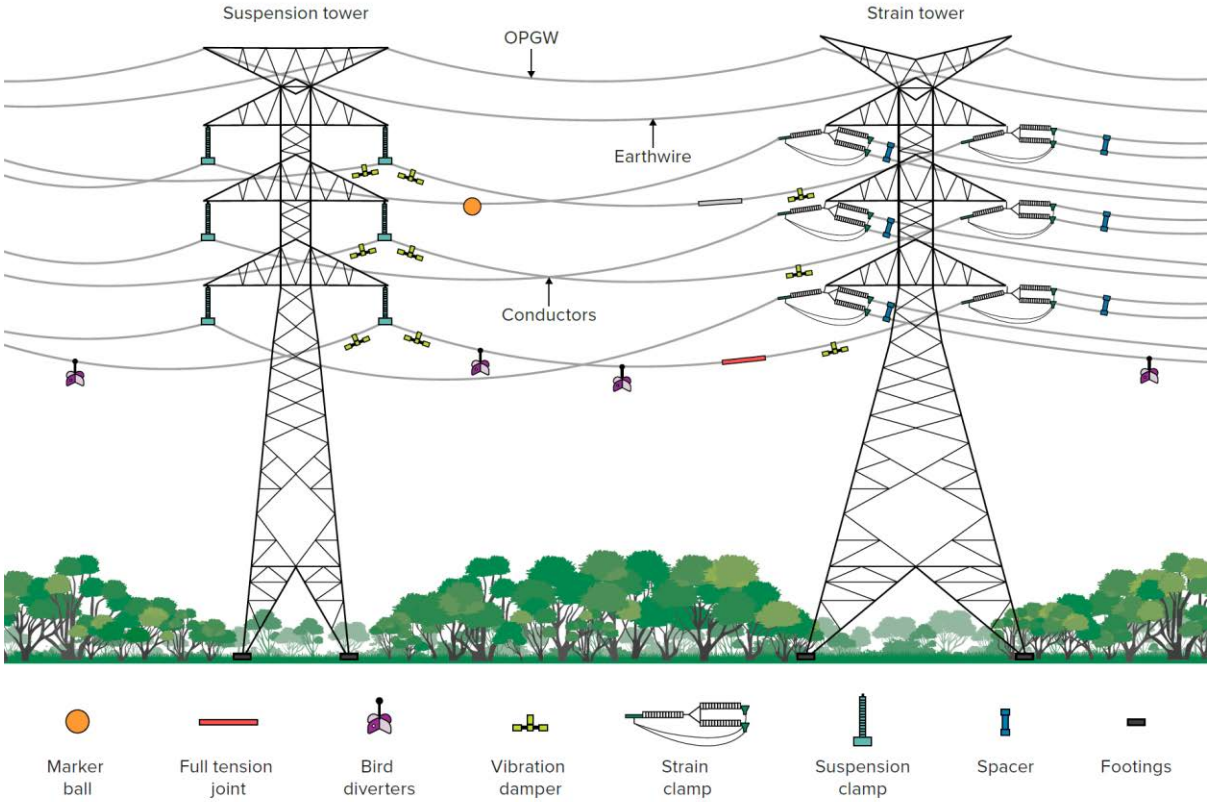


Figure 7-6: Typical transmission line components

7.5.4. Telecommunications

Telecommunications for operation of the transmission line will be through the OPGW, which consists of an optical fibre core within the earth wire discussed above, and by radio links. It is anticipated that one new radio site is required for the Project to enable the system to connect into the existing network and the additional radio sites which will be constructed in NSW and Victoria. The radio site in SA will consist of an approximately 50 m high radio tower and a local telecommunications hut which will all be contained within the footprint of the Bundey substation site.

A repeater station will also be required in a location close to the SA/ NSW border. The repeater station will typically include a fully enclosed containerised communications room approximately 3 m by 4 m. It will also require a small set of solar arrays (approximately 4 m by 5 m) for power, an access track and will be fenced with palisade fencing around its perimeter.

7.5.5. Access tracks

Access to the proposed easement will be required for both construction and operation of the Project.

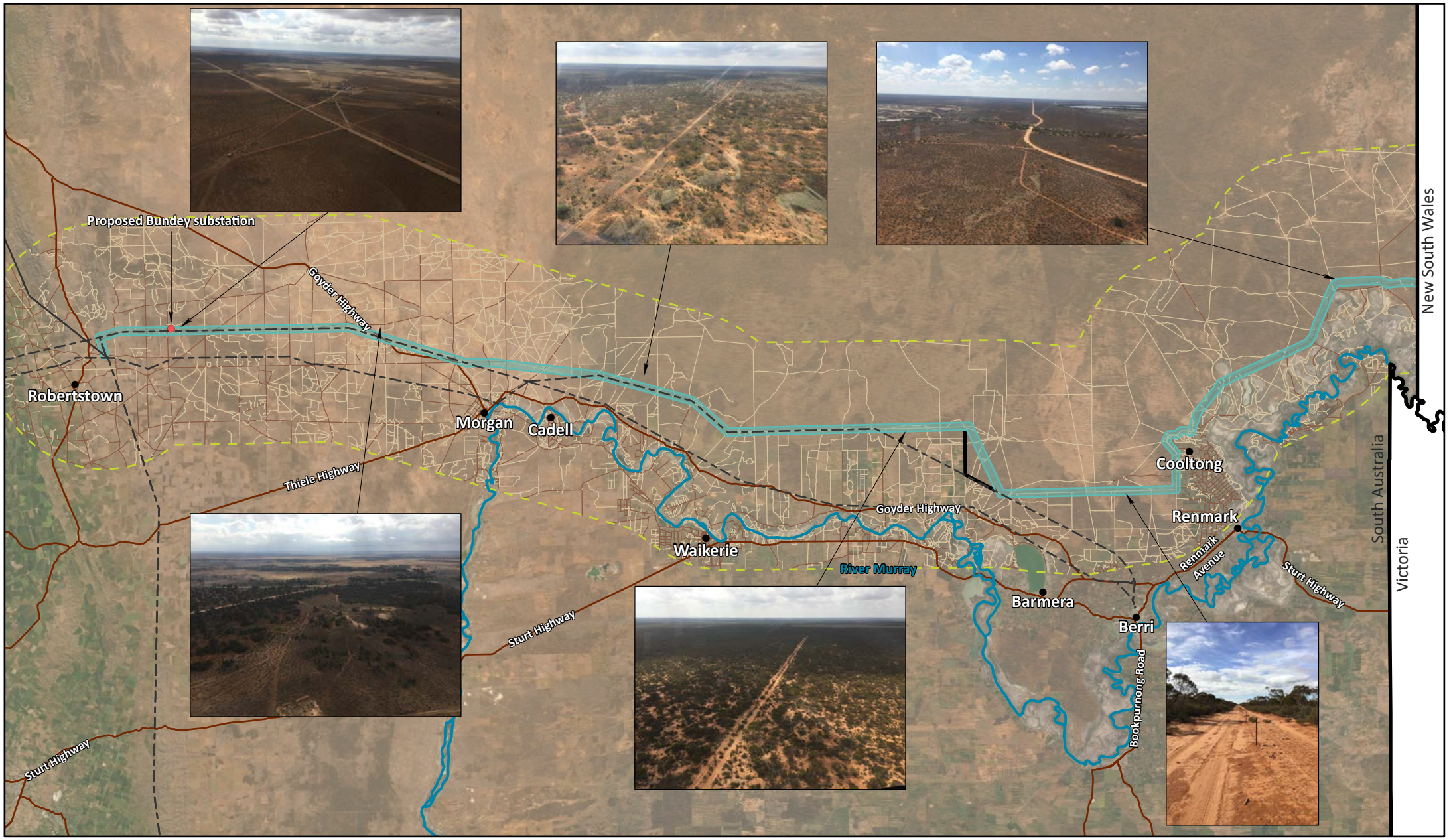
Preliminary access alternatives were assessed through the route selection process (refer Chapter 4 Route Selection) where existing public and private roads, tracks and easements were targeted for the proposed alignment to allow easy access and reduced environmental disturbance. Primary access to the easement will preferentially be via the use of existing public and private roads and the host of existing tracks on the properties traversed by the Project and adjacent properties subject to landholder agreement, including the access tracks and easement used to maintain ElectraNet's existing 132 kV transmission lines.

Some of these existing access tracks will be upgraded (where required) and new access tracks constructed in areas where there are no existing tracks to facilitate access for the construction of

towers. Imported fill material may be required for upgrading or establishing new access tracks, particularly through sandy areas. The exact composition and quantities of fill material will be determined following geotechnical investigation during enabling works and through detailed design. Should fill material be required, this will be sourced from local quarries with approved extractives minerals licences or new licences will be applied for by the EPC contractor.

Access tracks for construction will need an approximately 5 m cleared track to each tower location with additional access and temporary stringing corridor between each structure. Additional temporary clearance may be required for access to stringing and brake and winch sites, as discussed further in Section 7.8.1.

Locations and examples of existing access tracks may be seen in Figure 7-7. Further detail on access track establishment and vegetation clearance requirements for both construction and operation is discussed further in Section 7.8.



30 km investigation corridor
Transmission line corridor
Cultural heritage avoidance alignment
Road
Access track
Main road
Existing ElectraNet transmission line
River Murray
Proposed Bundey substation

Figure 7-7
Existing access track locations

0 20
Kilometres

N

ElectraNet
energy connect
JBS&G

7.5.6. Associated temporary facilities

Temporary construction camps

While it is anticipated that the local townships (including Morgan and Renmark) will be capable of providing a portion of the accommodation requirements for the Project, the workforce will be distributed along the length of the proposed alignment and it is unlikely that local townships will be able to accommodate the peak workforce. Travel time from local townships to the proposed alignment will also add significant travel limitations and safety risks.

Preliminary construction planning assessed multiple location alternatives and it is anticipated that up to four self-contained temporary worker camps along the proposed alignment may be required. Dependent on whether one, two, three or four camps are utilised, they will need to cumulatively accommodate a total of approximately 200 – 250 workers during peak construction. The construction workforce may be as low as 20 during site establishment, increasing to approximately 120 – 250 during the later stages. Further detail on Project staging is provided in Section 7.6.

Temporary worker camp locations will be determined during detailed design. These locations are likely to be close to the Bundey Substation, North West Bend / Morgan, Hawks Nest Station and Chowilla as indicatively shown in Figure 7-1. This will allow ease of access to construction locations. The appointed EPC contractor will engage local council and hotels to discuss accommodation in local townships (including Morgan and Renmark).

ElectraNet requires that all temporary worker camps are sited in areas already disturbed by development or in areas with limited native vegetation, using the following criteria:

- location is close to the proposed alignment, is relatively flat, stable and capable of being secured and screened
- suitable access for B-double trucks
- site has previously been cleared, requiring no (or minimal) native vegetation clearance, where possible
- no listed flora and fauna species are present
- there are no environmentally sensitive watercourses or wetlands within close proximity
- items or sites of cultural heritage significance are not affected and relevant clearances have been obtained
- site is located away from residences and other sensitive social receptors.

It is estimated that each temporary camp would require between two and five hectares of land. Each temporary camp will provide accommodation, amenities and kitchen (dry mess) facilities for the construction work force. The camp will also incorporate local site offices, workshops, car park, site communications, local power generation facilities (requiring integrated self-bunded diesel fuel storage tanks), wastewater treatment and stormwater management regimes. A typical construction camp layout is shown in Figure 7-8 below.

The appointed EPC contractor will obtain all necessary licences and approvals for establishing and operating the temporary camp (s) from the relevant authorities prior to establishment.

Being of a temporary nature, the workers camp sites will be cleared and rehabilitated immediately after use.

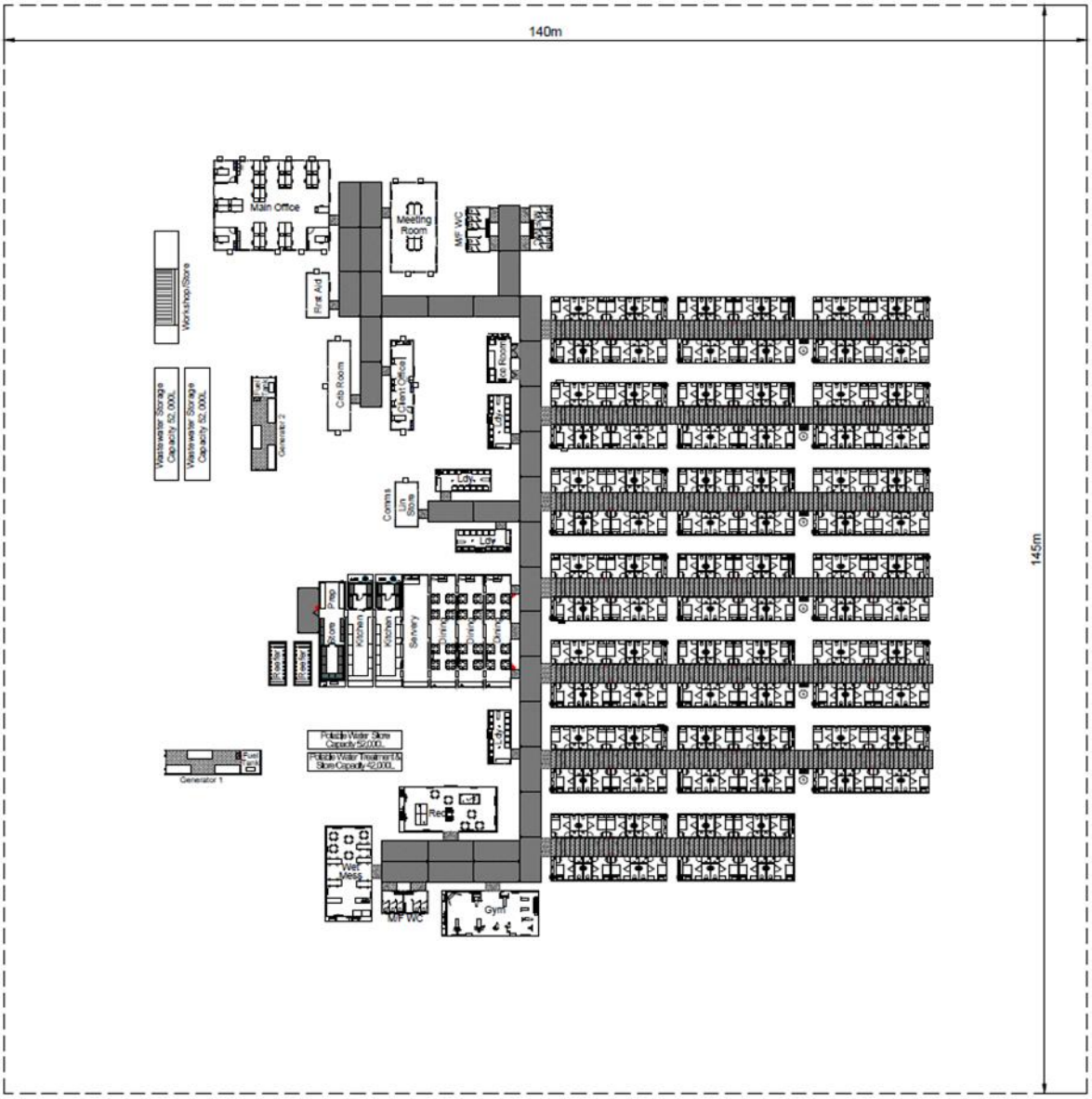


Figure 7-8: Typical temporary worker construction camp layout

Plate 7-3: Indicative temporary worker construction camp

Temporary laydown areas

The Project requires the development of up to four main laydown areas, each approximately one to two hectares in size. These areas will likely be located on the western, central and eastern sections of the proposed alignment (nominally in the proximity of the Bundey substation, North West Bend substation, Hawks Nest Station and Chowilla). Where possible, these will be co-located with the temporary worker camps.

These main laydown areas will be used to store heavy vehicles, equipment and bulk materials (including large drums of conductor and earth wire cabling) needed to construct the transmission line and for the handling and preassembly of towers, depending on the construction method employed. The laydown areas will include associated temporary offices and amenities if not co-located with construction camps. Final siting of the laydown areas will be determined by the appointed EPC contractor as part of the detailed design phase, using the same site selection criteria detailed above.

The EPC contractor undertaking the works will access the main laydown areas to collect required equipment and materials which will then be transported to specific construction sites along the alignment. Smaller temporary laydown areas will be set up on existing access tracks along the transmission line corridor (where possible) and in tower construction footprints (pads) for assembly, depending on the construction method employed. Tower structure components will be transported directly to each tower site, where possible and depending on the construction method employed.

Helicopters staging sites

The application of aerial technologies on transmission lines is gaining popularity in both project execution and for operation and maintenance of existing networks around the world. Advanced technologies like helicopter tower transport, tower erection and stringing, Light Detection and Ranging (LiDAR), sky crane and Unmanned Aerial Vehicles (UAVs) or drones are used in planning, design and construction of overhead transmission lines and for ongoing maintenance tasks. The Project may utilise helicopters during both construction and operation.

Aerial installation using heavy lift helicopters and sky cranes can be faster than traditional ground-based construction methods and often adopted in ecologically sensitive areas, where towers can be constructed off site in designated staging areas and flown into place partially assembled. There is still a requirement for a ground crew to be present to secure the tower to the foundation, but the size and impact of the ground-based construction vehicles and activities may be decreased.

This method will be considered further during detailed design, however it is anticipated that this technique may be used through sensitive areas with difficult access, such as Calperum Station, Taylorville Station and Hawks Nest Station, subject to health and safety, commercial and technical feasibility. This method is expected to reduce construction footprints and required vegetation clearance, and save time in delivery and erection of towers.

Subject to land access, detailed design and construction planning, helicopter staging sites may be required approximately every 50 tower structures. These staging sites would be used as laydown areas where towers would be preassembled before being flown to tower locations via helicopter. These staging sites would also include a helipad and refuelling station and would be preferentially located in areas previously disturbed and away from potential noise sensitive receptors. Depending on the location and number of helicopter staging sites these would require a temporary cleared area of up to approximately 6 ha. Nominal spacing of these staging sites are illustrated in Figure 7-1.

In addition to tower transport, the Project may utilise helicopters for aerial stringing of conductors. This would be subject to health and safety, commercial and technical requirements. The use of aerial stringing may further reduce disturbance footprints and required vegetation clearance as conductors can be strung over ecologically or culturally sensitive areas and reduce the requirement for a temporary 10 m cleared stringing corridor between towers in certain sections. Brake and winch site

will however still be required. Should helicopters be used for stringing, these smaller helicopters will use the same helicopters staging sites as per tower transport helicopter and / or may also use the required brake and winch sites to reduce the need for additional disturbance. Aerial installation and stringing techniques and are discussed further in Section 7.8.4.

7.6. Project Timing and Construction Staging

7.6.1. Indicative construction programme

The construction of the Project is expected to require staging of certain elements. Staging is proposed to enable the commencement of some activities, such as enabling works or low impact activities in advance of the detailed design being finalised and environmental approvals being obtained.

The main construction activities (as discussed in Section 7.8) are anticipated to commence towards the end of 2021, subject to all necessary state and Commonwealth environmental approvals and land acquisition requirements.

7.6.2. Early contractor involvement

ElectraNet engaged in an early contractor involvement (ECI) process for the Project in February 2021. An ECI process is a type of construction contract where an EPC contractor is engaged at an early stage in the Project to offer input into the pre-design and design phase. It is in contrast to the typical design–bid–build model where the EPC contractor is only brought onboard at the end of the design phase. The model allows the contractor to have an input in the design of the Project and suggest value engineering changes. The ECI model is also valuable in integrating the finding of the EIS and proposed mitigation measures into the design and planning process.

7.6.3. Enabling works

Enabling works are mobilisation activities that would typically be carried out before the start of construction, in order to make ready the key construction sites and to manage specific features or risks to the Project.

Enabling works are expected to include:

- targeted ecological and cultural heritage micro siting surveys and demarcation
- property surveys by a registered land surveyor
- geotechnical and contamination investigations and remediation activities (as required)
- other ground clearance and survey work, including road dilapidation surveys, surveys of existing utilities etc
- establishment of environmental management measures (as appropriate), including installing temporary fencing and security measures, erosion and sediment controls, truck wheel wash or rumble grids etc.

Enabling works are anticipated to commence in Q1 2021.

7.6.4. Site establishment

At the commencement of construction, the first activities which would be undertaken would include:

- clearing and removal of vegetation and topsoil (as appropriate)
- access track establishment (refer to Section 7.5.5) and any specific vehicle access and egress points including adjustment of state and regional roads to ensure safe vehicle movements at relevant locations

- establishment of temporary workers camps (refer to Section 7.5.6) and ancillary facilities, including offices, amenities, workshops, laydown areas, storage and hardstand areas, connections to utilities (water and power, if available), and mobile cement batching plants.

7.6.5. Construction of the Bundey Substation

As discussed in Section 7.5.2, a new substation is proposed at Bundey. The construction of the Bundey substation would include bulk earthworks to form the substation bench, civil construction, electrical works and pre-commissioning works. Key substation activities are discussed further in Section 7.7.

Construction of the Bundey substation is expected to commence in Q4 2021 and will take approximately 18 months.

7.6.6. Construction of the transmission lines from Robertstown substation to the SA / NSW border

Construction would typically occur in a linear manner along the proposed alignment, likely from the SA / NSW border in a westerly direction towards Robertstown, subject to access, weather conditions etc. This means construction activities at each transmission line structure location would be intermittent with construction activities anticipated to progress between 8 to 12 km per month. Up to three work fronts may be running simultaneously on different sections of the proposed alignment.

Indicative workflow process may be seen in Figure 7-9. It should be noted that although the construction processes flow consecutively there may be up to one to three months break between activities. For example, following foundation and footing establishment concrete will be left to cure for a period prior to erection.

Figure 7-9: Indicative construction process and duration for transmission lines

Should helicopters be used for tower transport and stringing, this may speed up the assembly, erection and stringing timeframes. The construction of the transmission line from the SA / NSW border to Robertstown would take approximately 16 – 18 months.

There are inherent risks associated with wet weather in April, as well as periods of extremely hot dry weather from December to February. Construction delivery planning will seek to minimise the program exposure to extreme weather conditions. Ecological considerations with regard to construction schedule, including migration or breeding periods near wetlands, are discussed in Chapter 11 Flora and Fauna.

The commissioning phase involves a series of inspections to check aspects such as phases, line clearances, connections, joints, towers / poles, earthing, line sags and communications prior to energisation of the line. It is anticipated that energisation of the Project would occur in Q2 2023 to align with the NSW portion of Project EnergyConnect.

7.6.7. Clean-up and reinstatement

Areas of temporary disturbance such as stringing corridors, construction footprints, laydown areas, and workers accommodation would be cleaned up and reinstated. Reinstatement would involve removal of construction material, surface contouring and scarifying where required, and respreading of topsoil and cleared vegetation to encourage natural recruitment of vegetation. Construction and operational environmental management plans for the Project are provided in Volume 3.

Site demobilisation, clean-up and reinstatement will occur progressively but will extend approximately four months post energisation, with full completion of works by mid-2023. Figure 7-10 presents an indicative construction schedule.

7.6.8. Operation and maintenance

During standard operation the transmission line will require very little ongoing maintenance. Access tracks, including any imported fill to enable safest operational access to the transmission line towers would be retained for inspection and maintenance activities, predominantly by light 4WD vehicles. The maintenance program would typically involve one detailed ground inspection every three years for signs of unusual wear, structural integrity and corrosion or damage. Bird nest removal is undertaken where required, in accordance with permits obtained under the *National Parks and Wildlife Act 1972*. Helicopter-based inspections and maintenance would be undertaken annually. Insulators would typically be replaced every 25 years.

Extensive vegetation maintenance on the easement during operations is not expected to be required as the vegetation present is generally slow growing and at mature height. Vegetation trimming is typically carried out every three to four years to allow for a three-year growth period. This may vary depending on the type of vegetation and speed of growth. Further detail on vegetation clearance requirements is discussed further in Section 7.8.7.

Although minimal intervention is anticipated, line or tower failures can result in the need to reintroduce heavy equipment, work crews, excavation, and materials transport to affected areas.

7.6.9. Life of asset and decommissioning

The design life of the proposed transmission line, with appropriate maintenance, is approximately 100 years, after which it may need to be replaced in order to ensure the continuity of a safe and reliable supply. Future use will be evaluated by ElectraNet in consultation with the State government and other parties at such a date. The transmission line and associated above-ground infrastructure will be decommissioned to an appropriate standard that addresses environmental objectives, as appropriate and as required by the legislative requirements at the date of decommissioning.

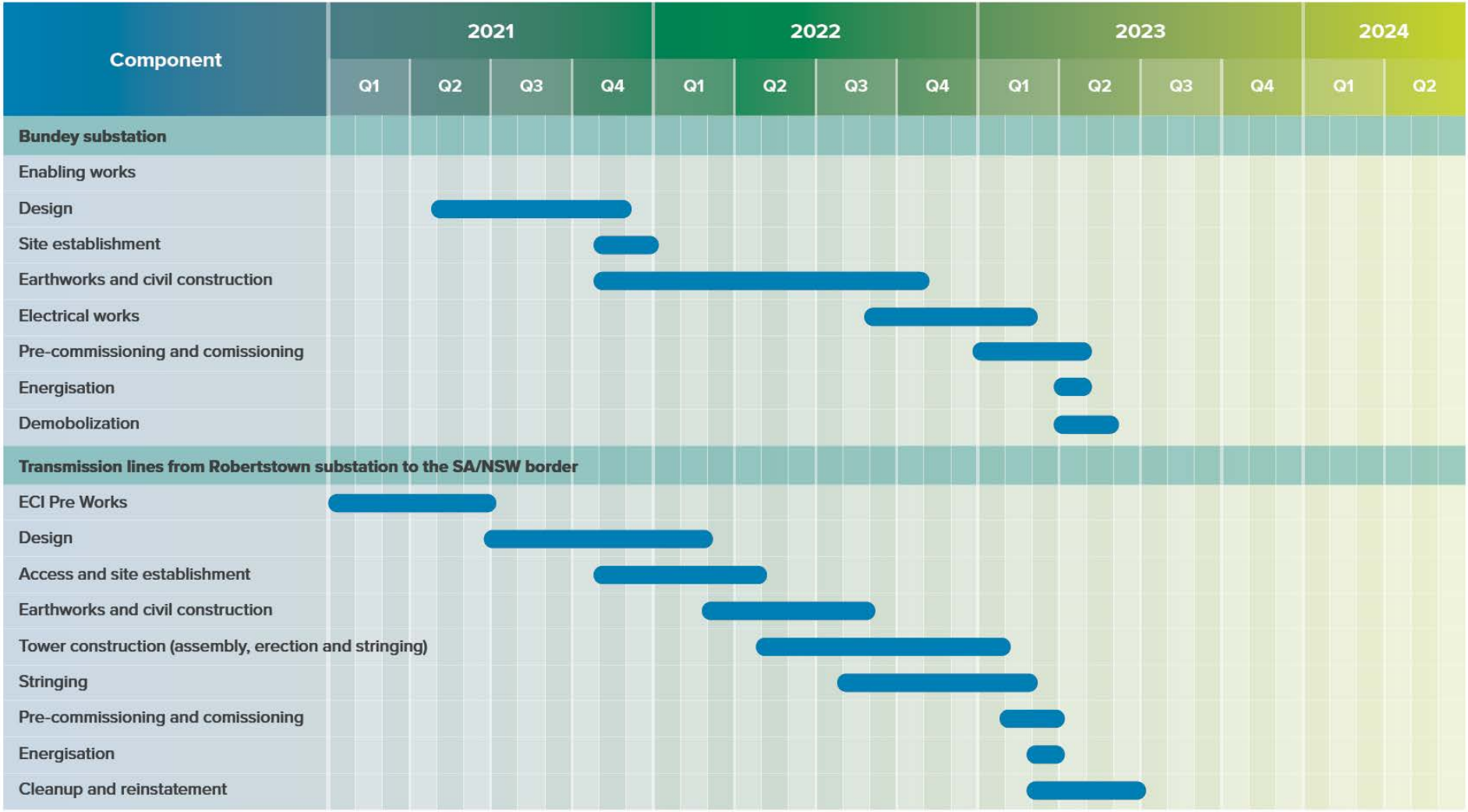


Figure 7-10: Indicative Project timing

7.7. Key Project Activities (Bundey Substation)

7.7.1. Site clearance

New access will be required for the new Bundey substation site. It is anticipated that the main entrance will be located off Powerline Road and a secondary entrance off Sutherlands Road. These entrances will be approximately 8 m wide with the ability to receive B-doubles. Access will be directly onto the site and limited vegetation clearance will be required within the existing road reserve for these entrances. Roadside and boundary vegetation will be retained as far as possible to screen the substation site.

The substation will be located on land previously utilised for livestock grazing. This land has limited to no native vegetation present, however any remnant vegetation, roots, stumps, boulders or rubble will be cleared and the areas backfilled and compacted in preparation for the bench earthworks.

Topsoil will be stripped from the proposed earthworks area and spread across the site in areas outside of the construction footprint.

7.7.2. Earthworks and civil construction

A bench will be constructed from cut and fill material on site or via imported borrow material. The exact composition and quantities will be determined following geotechnical investigation during enabling works and through detailed design of the substation. Should borrow material be required, this will be sourced from local quarries with approved extractives minerals licences.

The EPC contractor will remove all excess material which is unsuitable for use as fill from the site to a suitable (registered if required) disposal facility.

Bulk earthworks and drainage will be undertaken in accordance with detailed design and ElectraNet's Substation Earthworks and Stormwater Drainage requirements (1-11-ADM-15). This site will be surfaced with gravel approximately 100 mm thick and will be sourced from local high spots, depressions or undulations.

Following formation of the bench, internal roads will be established (see Figure 7-3) and trenching of 500 mm for installation of the earthing system which will then be backfilled to continue construction of the substation.

A drill rig will be utilised to drill all structure foundations. If rock is encountered, the use of a rock drilling machine will typically be used. Once drilled, fabricated reinforcement cages will be placed into the foundation, hold down bolts put in place and concrete poured.

The equipment stands will typically be installed onto the footings at each equipment location. This stage involves:

- steel equipment stands delivered in pieces to the site's laydown area or pre-assembled and brought in via a flatbed truck
- stands are either then assembled and / or directly moved to the required structure locations and erected.

Major substation plant will be delivered to the sites laydown area where it will also be assembled and move to its required location and erected. Transformers and control buildings will be delivered directly to their set location.

7.7.3. Electrical works

Final construction of the substation will entail connection all of the equipment via bare steel / aluminium conductor and solid aluminium busbar. Construction teams will utilise elevated work platforms and hand tools to complete the connections.

Major plant auxiliary and protection systems will be wired back to the control rooms via control cables laid in the conduits and trenches which provide vital information for the protection systems and the control room to safety operate the network.

Pre-commissioning and commissioning activities will then be completed where the continuity of the electrical systems are proven and all major plant, protection systems, control systems and communications are rigorously tested to prove functionality and operation.

7.7.4. Operation and maintenance

Routine maintenance tasks will be completed in accordance with ElectraNet's Asset Management maintenance requirements. These tasks will include but not limited to:

- oil sampling and testing
- routine operation testing of major plant
- visual inspections
- routine operation testing of control and protection systems.

7.8. Key Project Activities (Transmission Line)

7.8.1. Establishment of access tracks

Tracks are required to allow access along the transmission line corridor and to each tower location for construction and operation of the transmission line, as discussed in Section 7.5.5.

Where new tracks are required, dozers and graders will be used to clear vegetation (where necessary) to provide a trafficable surface to allow safe passage for large / heavy vehicles and equipment during the construction phase. Light grading alone is often enough, depending on terrain and preparation requirements. Dune and or boggy areas may require capping with imported material.

Tracks will be designed to take the shortest route (with the potential to use short spur tracks off existing roads or access tracks) and with as little impact as possible to native vegetation, existing land uses and landholders. Access tracks for construction will need an approximately 5 m cleared track to access tower construction footprints.

Potential arrangements for access tracks, including situations where there is existing nearby access, are shown in Figure 7-11.

Temporary stringing access corridors approximately 10 m wide between tower locations will also be required to allow stringing of the conductors (see Section 7.8.5). These are typically not graded (except where the access track forms part of the corridor) and need only to be suitable to allow machinery (e.g. a tractor or dozer) carrying draw wires between towers to traverse safely, and to allow draw wires and conductors to be pulled upwards without being impeded by vegetation. Low level vegetation will be rolled where required, rather than removal.

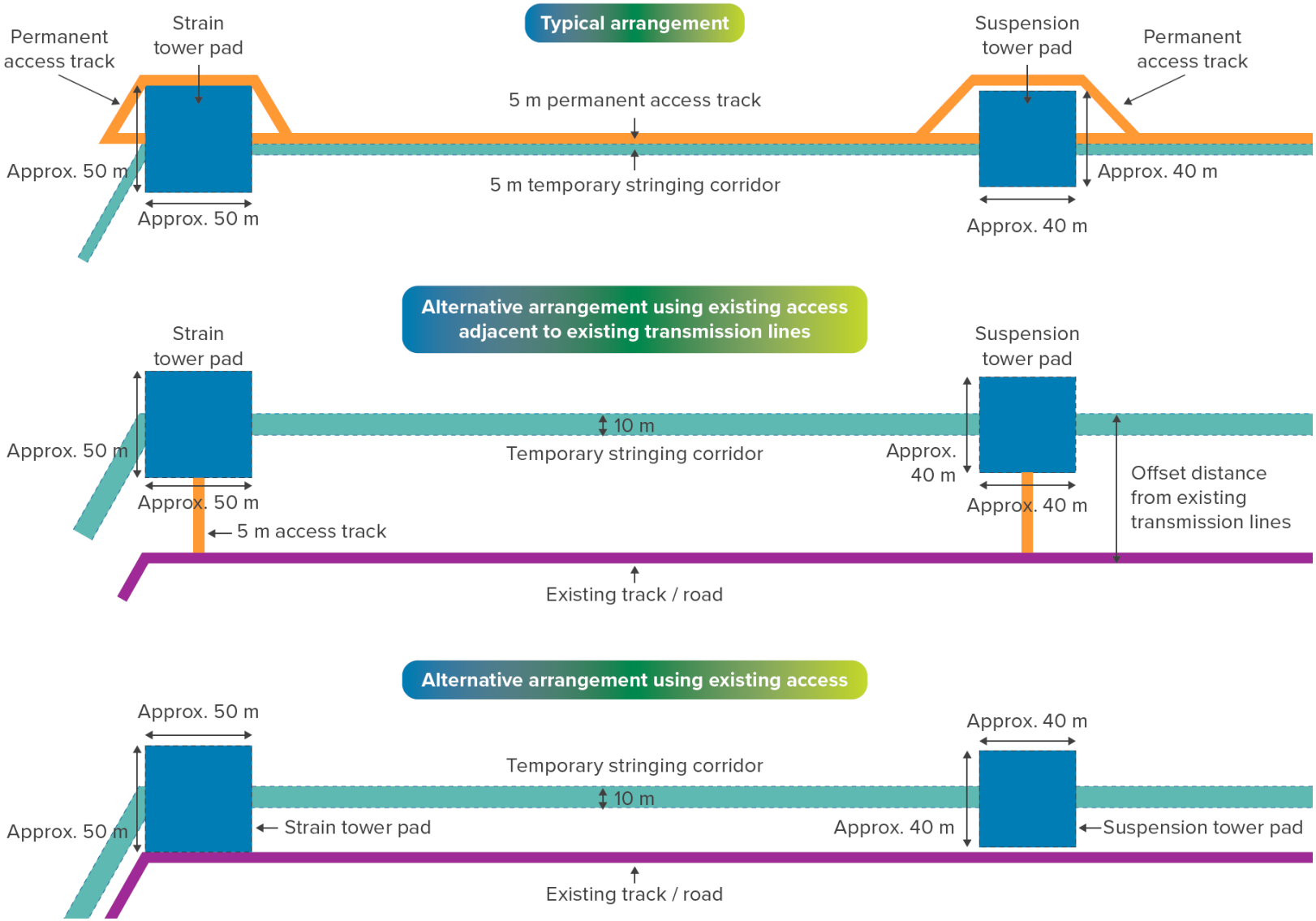


Figure 7-11: Construction and operation access track options

7.8.2. Vegetation clearance and topsoil stockpiles

In areas where native vegetation is present, clearance will be required for access tracks, tower installation (tower pads), stringing pads and other temporary construction activities (e.g. construction camps, laydown, brake and winch sites and helicopter staging sites). Areas where native vegetation is degraded or has been previously cleared will be utilised in preference to clearing vegetation wherever practicable. Cleared vegetation will be stockpiled for use in rehabilitation where required.

Conservative estimates of land disturbance for each component of the Project are provided in Table 7-3. These have been used as a basis for calculation of vegetation clearance in Chapter 11 Flora and Fauna. It is noted that the total area of land disturbance is significantly higher than the potential vegetation clearance area, as many areas along the proposed alignment are already disturbed and devoid of vegetation or comprising only sparse vegetation regrowth (e.g. Bundey substation site, existing access tracks, existing fire break on Calperum Station etc), which will significantly reduce the actual area of vegetation disturbance.

Where feasible, vegetation will be rolled or trimmed rather than being completely removed, however sites such as access tracks, tower locations, helicopter staging sites and some brake and winch sites will require complete removal of vegetation. Removal of larger trees (e.g. trunk diameter over 30 cm) will be avoided where possible.

Preparation of the stringing access corridor between tower locations will typically be undertaken using a dozer with blades raised to remove larger trees while keeping shrubs, grasses and topsoil largely intact. Where possible, the stringing access corridor will be rolled to allow access. Larger trees in the stringing access corridor may be cut off above ground level with rootstock left intact to allow regeneration rather than being removed where practicable.

Trimming of vegetation to maintain electrical clearance requirements for operation may also be required, dependent on detailed design of the line and the height of mature vegetation, as discussed in Section 7.8.7.

Table 7-3: Estimated area of land disturbance for the various project elements

Project component	Assumptions / description	Estimated disturbance area (ha)	Post reinstatement
Access tracks (permanent)	5 m wide access track for entire proposed alignment. This is considered an extremely conservative estimate as existing tracks and minimal clearance is required for much of the line. Alternative access arrangements will be utilised in sensitive areas. Alternative arrangements are covered in Section 7.8.1	Approx. 102 ha (0.5 ha per km) permanent disturbance	Light vehicle access
Stringing access corridor (temporary)	5 m wide temporary disturbance alongside 5 m access track for the entire proposed alignment to allow for stringing access and passing bays. This is considered an extremely conservative estimate as existing tracks and minimal clearance is required for much of the line. Where existing offset access track is used, the temporary stringing access corridor will be up to 10 m in width. Alternative arrangements are covered in Section 7.8.1	**Approx. 102 ha (0.5 ha per km) temporary disturbance**	Nil – These sites are temporary and will be reinstated post construction. Ongoing maintenance clearance requirements are discussed in Section 7.8.7

Project component	Assumptions / description			Estimated disturbance area (ha)	Post reinstatement
Substation (permanent)	400 m x 250 m			**Approx. 9 ha permanent disturbance**	9 ha
Worker accommodation camps, laydowns and helicopter staging sites (temporary)	Up to a maximum of 4 temporary construction camps (2 – 5 ha each) Up to 4 main laydown areas (1 – 2 ha each) Between 4 – 9 helicopter staging sites for tower transport (Up to 6 ha each) (this may reduce the footprint of tower pads to 28 m x 28 m)			**Temporary camps – total maximum clearance of ~ 20 ha** **Temporary laydown areas – total maximum clearance of ~ 8 ha** **Temporary staging – total maximum clearance of ~ 54 ha**	Nil – These sites are temporary and will be reinstated post construction
Concrete batching (temporary)	Up to 3 concrete batching plants			**Approx. 3 ha temporary disturbance**	Nil – These sites are temporary and will be reinstated post construction
Brake, winch and OPGW sites (temporary)	Assuming every 16 km, 3 brake / winch sites (0.24 ha each) and 2 further OPGW sites (0.18 ha each) 1.08 ha per 16 km = 13.84 ha for total alignment, assuming dual use of brake / winch and OPGW sites / helicopter stringing sites			**Approx. 17.3 ha (13.84 plus 25% contingency for additional angles anticipated through Calperum Station) temporary disturbance**	Nil – These sites are temporary and will be reinstated post construction
Towers	**#**	**Assembly method**	**Ha per tower**		
Strain towers *[includes 4 Medium Terminal towers]*	**76**	2-stage Assembly method (50 x 50 m) Alternative methodologies are covered in Section 7.8.4. Should helicopters be used smaller pads will be required.	0.25	**Approx. 19 ha total – 5 ha permanent disturbance and 14 ha temporary disturbance**	Partially rehabilitated. Assumed 25% of area remains cleared. Ongoing maintenance clearance requirements are discussed in Section 7.8.7
Suspension towers *[Assumes heavy, though light is same clearance]*	**300**	2-stage Assembly method (50 x 50 m) Alternative methodologies are covered in Section 7.8.4. Should helicopters be used smaller pads will be required.	0.25	**Approx. 75 ha total – 19 ha permanent disturbance and 56 ha temporary disturbance**	Partially rehabilitated. Assumed 25% of area remains cleared. Ongoing maintenance clearance requirements are discussed in Section 7.8.7
Topsoil stockpiles	**376**	Topsoil removal of 100 mm depth for 76 strain tower locations = approx.. 250 m^3**.** Assume 2 m high Topsoil removal of 100 mm depth for 300 suspension tower locations = approx.	0.0125 0.008	**3.35 ha temporary disturbance**	

Project component	Assumptions / description			Estimated disturbance area (ha)	Post reinstatement
		160 m^3. Assume 2 m high			
Total (Upper estimate) disturbance for the Project				135 ha permanent 278 ha temporary	

Note: Much of the infrastructure will be located in previously disturbed areas, and little to no vegetation removal will be required.

The temporary stockpiling of topsoils and subsoils may be required during the construction phase of the Project, specifically for the establishment of lattice towers and for laydown areas along the proposed alignment. Stockpiles will be located in areas clear of vegetation as far as practicable and away from defined watercourses to reduce the potential for surface water erosion impacts to creek lines and may be temporarily covered with cleared vegetation to reduce the potential for wind erosion. Stockpiles at tower locations will be located outside of the defined tower pad.

Following the completion of construction activities, the stockpiled topsoil and subsoil would be re-spread over the cleared area with the cleared vegetation, and the sites left to naturally revegetate. Where appropriate and as per discussions with the landholder, topsoil may be provided to the landholder for re-use. Where not suitable the spoil may be used for other purposes such as capping or taken to a licensed facility for disposal (See Chapter 19 Waste Management further detail).

7.8.3. Foundations and footings

A drill rig will be employed to drill structure foundations. If rock is encountered, the use of a rock drilling machine is typically used to pre-drill pilot holes. Once drilled, fabricated reinforcement cages will be placed into the foundation, the stub set in place and concrete poured (see Plate 7-4).

Plate 7-4: Example of foundation construction

7.8.4. Tower assembly and erection

The towers will typically be installed onto the footings at each structure location. This stage involves:

- Steel towers delivered in pieces to the structure location on a semi-trailer or via helicopter (as discussed further below)
- Towers are then assembled at each location. This involves a two-stage process (if not preassembled at a staging site and transported to the tower pad):

1. An assembly crew join the steel to build tower sections. This work will usually involve a small crane and supporting utility vehicles.
2. The next work crew will follow behind and erect and join the sections to form the complete tower. They will do this with the support of a larger crane and supporting utility vehicles.

An example of a typical two-stage assembly pad layout and footprint is shown in Figure 7-12 and an example of tower assembly and erection may be seen in Plate 7-5.

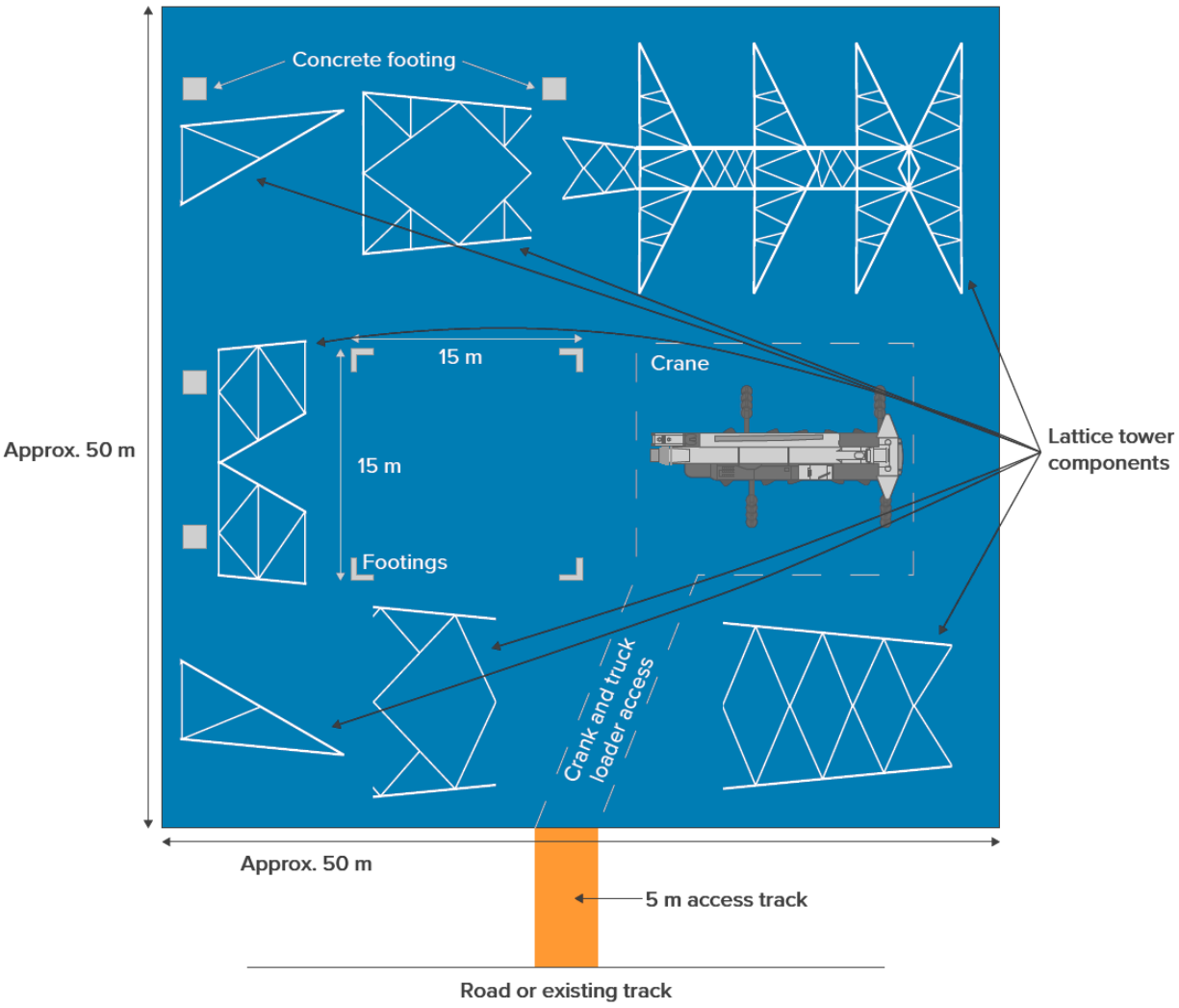


Figure 7-12: Typical pad layout with two stage assembly

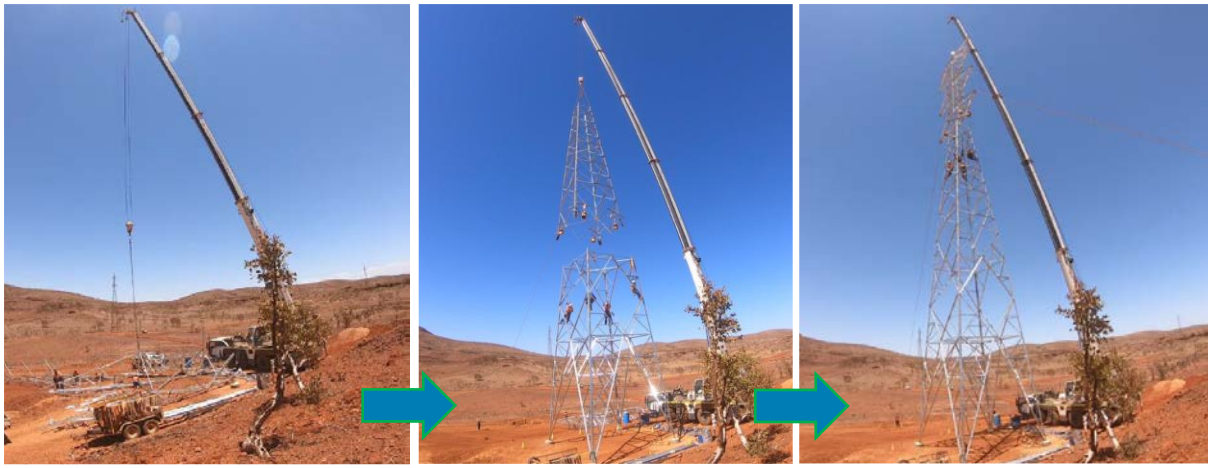


Plate 7-5: Example of tower assembly and erection

Helicopter tower transport and erection

As discussed above, the use of a large twin-engine helicopter or sky crane for the transportation of preassembled towers will be investigated during detailed design as an alternative for tower assembly and erection. Should a helicopter be utilised, it is anticipated that it will transport small sections of towers to tower locations in Taylorville Station, Hawks Nest Station and Calperum Station. Preassembly and helicopter transport of towers, rather than constructing towers at each tower location will significantly reduce disturbance at each tower pad. An example of helicopter lifts and transport may be seen in Plate 7-6.

Plate 7-6: Examples of helicopter lifting and tower transport
(Source: Erickson Incorporated 2020)

7.8.5. Conductor stringing

Once the tower structure has been erected, conductors are strung between the structures. Stringing of the conductor is usually undertaken in sections of 5 – 10 km at a time. Typically stringing will be undertaken within a temporary stringing corridor using equipment such as winches and purpose built stringing machines (see Plate 7-7).

Plate 7-7: Brake site from where the conductor is pulled out under tension

There are two primary methods of stringing, these include strain to strain method and the floating method.

Strain to strain method

The strain to strain method involves the use of pullers and tensioners set up on level pads (see Figure 7-13 and Figure 7-14) to pull the conductor wire under tension from one strain structure to another strain structure. On completion of stringing, the conductor wire is then anchored with rigging gear to the strain cross arms at one end, with the conductor measured, cut, terminated and connected to the strain insulator assembly. At the other end, the conductor wire is pulled to final required tension, measured, cut, terminated and connected to the strain insulator assembly. This process is repeated for all conductor and earth wires before installation of insulator clamp assemblies.

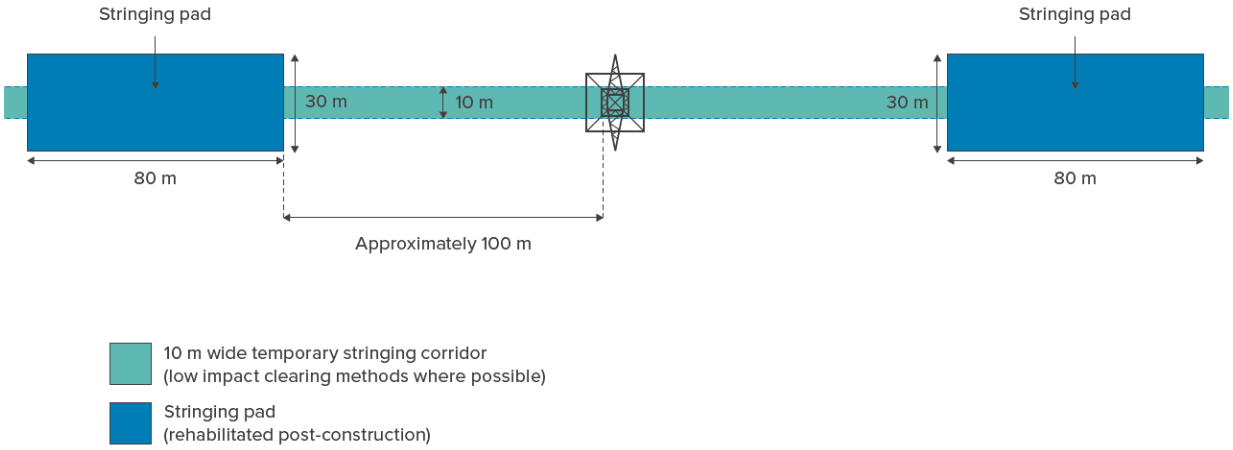


Figure 7-13: Typical stringing-strain to strain arrangement

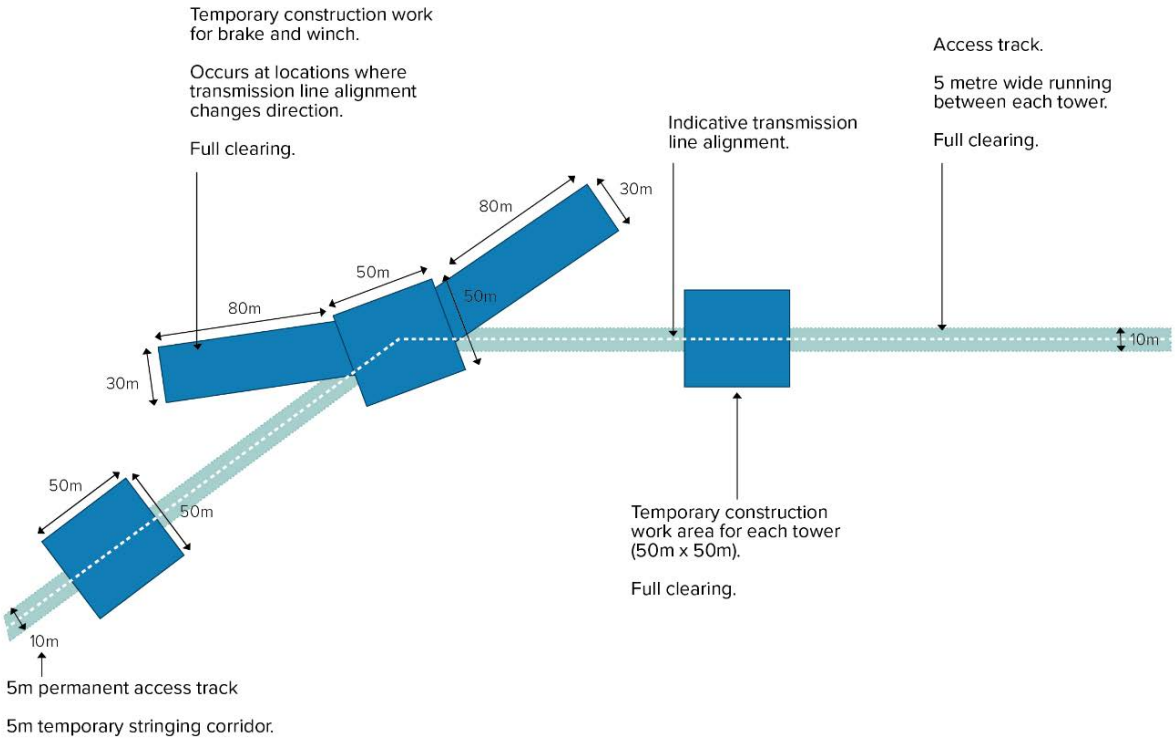


Figure 7-14: Typical stringing arrangement for an angle structure

The OPGW (or optical ground wire) method involves stringing a thinner wire used for both communications and grounding to the top of the structure. As this wire cannot be jointed without bringing it to ground level, additional pads are required along the alignment during the stringing process.

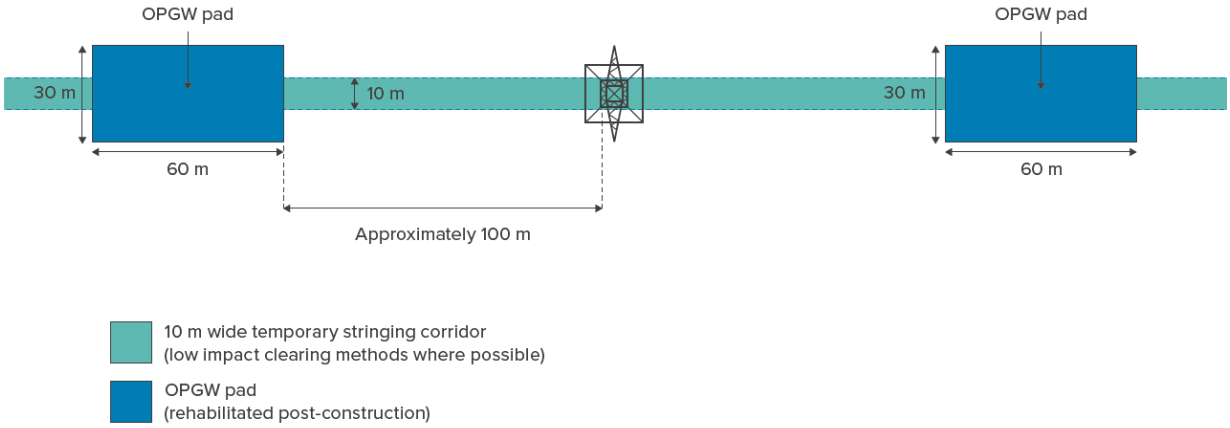


Figure 7-15: Typical stringing pad arrangement with OPGW pads

Floating method

The floating method involves using pullers and tensioners to pull the conductor wire under tension from the middle of a span (see Figure 7-16). On completion of stringing, the conductor wire is then anchored with rigging gear to a ground anchor. The conductor tails are joined using a mid-span joint with the conductor wire then pulled sideways until tension is taken up by a sideways pulled winch. The conductor is then allowed to float until all tension is off the anchors and they can be disconnected. By pulling the other end back the conductor can be taken to final tension, measured, cut, terminated and connected to the strain assembly, or jointed to a previously installed section. This process is repeated for all conductor wires before installation of insulator / clamp assemblies.

This method is generally used for conductor wire stringing.

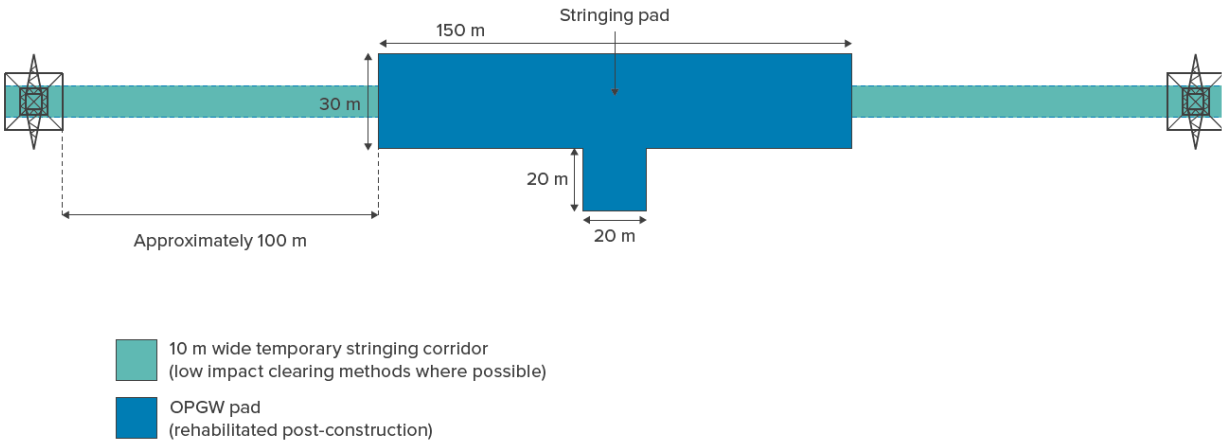


Figure 7-16: Typical stringing pad arrangement (floating method)

Where required, a separate temporary stringing corridor will be established to accommodate the stringing process, as discussed in Section 7.8.2. The vehicle used to carry conductor wires into position will be rubber wheeled (where possible) to minimise damage to remaining vegetation. On completion of stringing, the site will be rehabilitated. Measures will be implemented to prevent stringing access corridors becoming access tracks where possible. There is a possibility that aerial stringing will be used in some locations. This will be confirmed by ElectraNet and the EPC contractor and will be included in the final version of the CEMP.

Helicopter stringing

Helicopters or drones may be used for conductor stringing which will also speed up the stringing process, allowing construction to finish sooner and minimizing disturbance and vegetation clearance.

Helicopters may also be utilised in secondary stringing activities, such as placement of marker balls and spacer rings following completion of stringing. At the forefront of stringing technology is also drone use, which combines the ease of access of helicopter stringing, whilst further minimising environmental impacts through reduced sound levels and carbon emissions.

Pre-commissioning and commissioning

Pre-commissioning involves proving the continuity and insulation of the line (making sure everything is electrically connected from one end to the other and also nothing is accidently connected to earth). This stage involves a range of testing on all pieces of equipment including the substation and transmission lines, to prove that the equipment operates as intended both from the factory and as designed. This process takes approximately one month. Following completion the interconnector will be energised.

7.8.6. Clean up and rehabilitation

Once stringing is complete, areas of temporary clearance will be rehabilitated. This stage involves:

- removing all equipment, vehicles, temporary fencing, signage and refuse from site
- using earthmoving machinery to de-compact areas of compaction (potentially through ripping or appropriate methods) where required
- re-contouring disturbed land to match surrounding ground levels (as appropriate)
- spreading of stockpiled topsoil on top of de-compacted areas.
- in areas of native vegetation - placing cleared vegetation that was stockpiled during access and clearing, over returned topsoil to assist in natural regeneration

7.8.7. Operation and maintenance

Easement access and maintenance

ElectraNet undertakes periodic vegetation management works on all its easements across the South Australian electricity network, to ensure that mandatory minimum clearance between vegetation and transmission lines are maintained. Transmission lines within a designated bushfire or high bushfire rated area are inspected and cleared every year, while lines in all other areas are inspected and cleared every three years.

The clearance distances between transmission lines and vegetation are legal requirements outlined in the *Electricity (Principles of Vegetation Clearance) Regulations 2010* (EPVC Regulations) It should be noted that amendments will be required to be made to these regulations to account for 330 kV transmission lines, which are not currently part of the South Australian electricity network. Vegetation clearing or trimming along the easement will only be carried out where necessary to facilitate access to specific locations such as towers and areas where vegetation will encroach on the clearance zone underneath the transmission line conductors.

Vegetation assessments, including canopy height measurement, are used during the detailed engineering phase to design the line profile. Where possible, conductor heights will be set to avoid or minimise the requirement for vegetation clearance both during construction and ongoing maintenance. Where vegetation clearance is unavoidable and to minimise the risk of power outages, damage to transmission lines or fire starts, vegetation management works are undertaken to make sure that clearance distances between vegetation and transmission lines are established and maintained in accordance with EPVC Regulations (see Figure 7-17).

As much of the native vegetation is relatively low, slow growing and at mature height, it is planned to design the line to span across mature vegetation with minimal clearance required where feasible. If this is not feasible, some clearance or lopping of trees may be required under the conductors in some areas. Preliminary calculations indicated that trees up to a height of approximately 8 m may be able to be spanned without trimming. This will be confirmed when detailed line design is undertaken. Clearance zones required under the EPVC Regulations are shown in Figure 7-18.

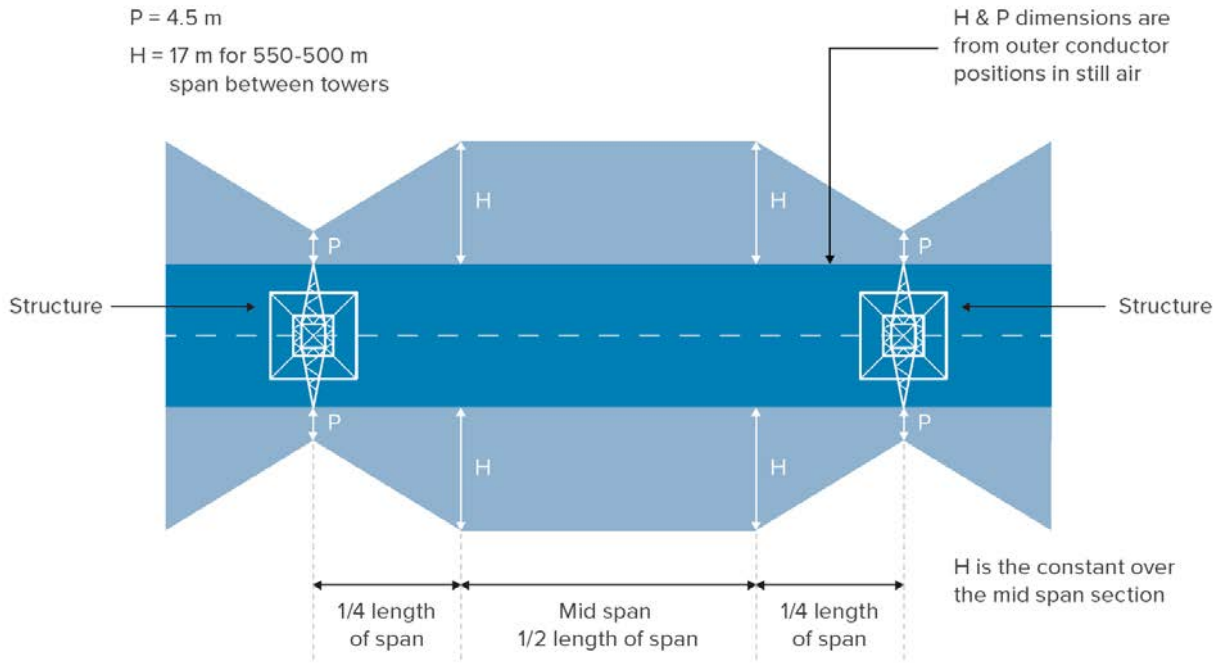


Figure 7-17: Vegetation clearance requirements for operation of the Project

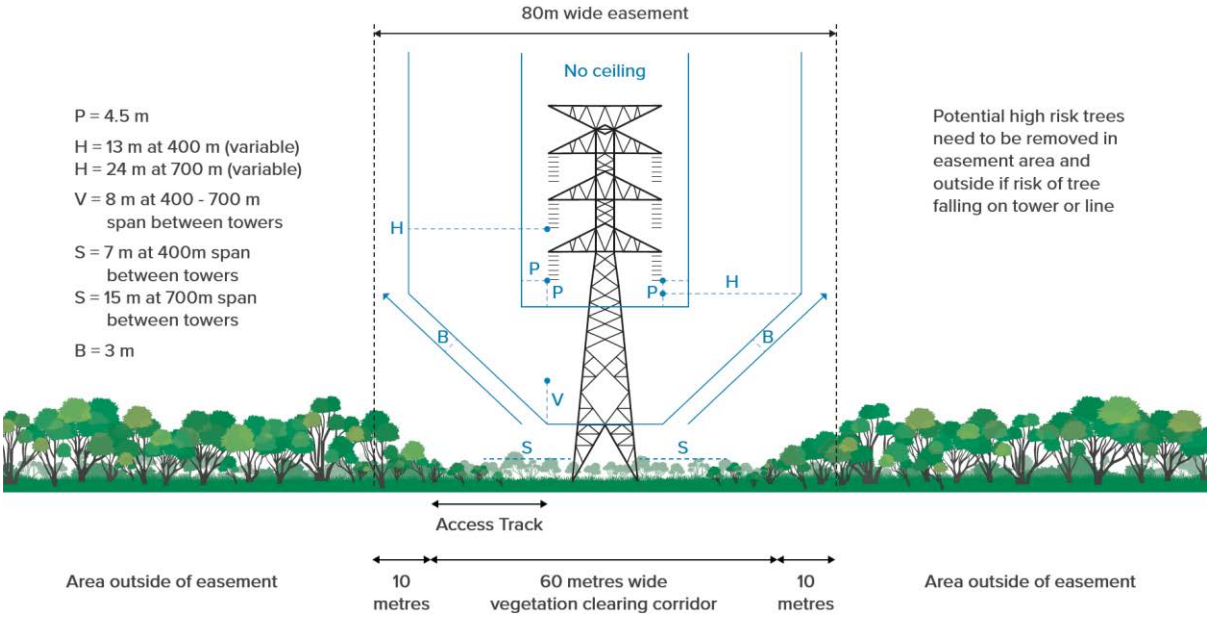


Figure 7-18: Requirements of *Electricity (Principles of Vegetation Clearance) Regulations 2010*

7.9. Resources and Materials

7.9.1. Borrow material

Imported borrow material, such as clay, crushed rock and aggregate would be required for construction. The material will be used in the development of access tracks in some areas such e.g. capping of dunes, and for tower pads in certain conditions. Borrow material and crushed rock (e.g. for concrete manufacture) would be obtained from a range of sources including commercial suppliers, existing approved borrow pits or new borrow pits with appropriate approvals in place (e.g. Extractive Minerals Leases) where required. Material from excavations may be suitable for re-use on site also. Quantities and sourcing locations will be confirmed following geotechnical investigations and during detailed design.

7.9.2. Water supply and use

Initial estimates have suggested approximately 27,500 kL of water will be required for construction. This estimate includes 220 kL of potable water for construction camps, 7,000 kL for concrete batching, 20,000 kL for dust suppression, and 300 kL for miscellaneous use such as wash bays. The water is likely to be sourced from local areas and may be carted in and out of site by tankers. Water for concrete batching must meet the requirements of A1379-1997.

During ECI, water supply options will be reviewed and selected. This could include but is not limited to purchasing water from pre-existing licensed users, including local landholders proximate to the route and local councils. There remains the opportunity to purchase water from council which have wastewater reuse programs. If required, bores maybe installed (subject to permitting requirements) to supply construction dust suppression water as well as water for concrete batching, where the water is of the requisite quality. There is potential for an on-site water treatment plant allowing bore water to be treated and utilised in the temporary workers camps, with the discharge from the treatment plant used for dust suppression.

7.9.3. Concrete batching

Concrete and / or dry concrete premix for the foundations is likely to be supplied by a concrete agitator / truck travelling between local concrete batching plants in Robertstown and Berri. Up to three mobile concrete batching plants will also be required at various locations along the transmission alignment, nominally, located at the laydown/ staging sites at the Bundey substation site, North West Bend substation and a location along the Wentworth-Renmark Road. Final locations will be determined during detailed design and in accordance with ElectraNet's site selection criteria detail in Section 7.5.6. Each batching plant will require a temporary disturbance footprint of approximately 100 m x 100 m. These will be determined during the detailed design process.

Each tower would require approximately 50 – 100 m^3 of concrete delivered to the site. This would require approximately 16 truckloads per tower. In areas where bored piers are not suitable, foundation footprints and volumes may be larger.

Following the completion of a foundation pour, concrete trucks will back up into a designated temporary washout bay (double lined) and any hardened concrete or residual slurry will be washed out. The washout bay will capture the waste and wastewater. This process will typically occur in the same location as brake and winch/ stringing pads, spaced approximately every 5 km. As such, no additional disturbance will be required. The waste will be transported off site once the wastewater has evaporated and the waste has solidified. The waste will then be disposed of at a licenced facility for reuse or disposal.

Temporary concrete batching and washout bays will not be sited within 350 m of residential premises.

The appointed EPC contractor will liaise with the EPA and will obtain all necessary licences for these temporary plants.

7.9.4. Hazardous materials and chemicals

During construction, typically only fuels and lubricants are stored on site for the operation and maintenance of plant and equipment. Typical substances and use is provided in Table 7-4

Fuel usage estimates will be discussed with local suppliers during the detailed design and ECI phase to establish whether they can provide sufficient fuel for construction of the Project. Should local supply not be available, the appointed EPC contractor will store and manage its own fuel.

Should this be required the following will be provided / considered:

- Storage – Bunded containers with self-contained pumps. Where possible all equipment will use diesel fuel. Bunded areas will be constructed to contain potential spills.
- Permitting – permits will be obtained for bulk fuel storage.
- Delivery will be from Adelaide via bulk carrier.
- Records will be kept of usage to enable forecasting of delivery requirements.

Table 7-4: Typical chemicals used during construction

Substance	Storage Areas	Use
Diesel	Bunded container	Mobile plant fuel
	Fuel trailer	Refueling plant in field
	Refueling trucks, cranes and other plant	Refueling plant and heavy vehicles in field
Unleaded	Bunded container	Small petrol tools
Aviation fuel	Bunded container	Refueling helicopters
Oils	Bunded container	Maintenance, equipment and tools use
	Bunded container	Drilling, lubrication, rust
Paints	Bunded container	Painting conduits, cold galvanising steel
		Painting bases of steel work
		Mixing paints, clean up
Silicon	Flammables cupboard	Labels and sealing
Alminox	Flammables cupboard	Conductor grease
Herbicides	Bunded container	Weed management

Chemicals, oils and other waste substances will be collected, stored in designated waste storage areas for collection by an authorised contractor and disposed of off-site in accordance with EPA requirements. Waste management is further detailed in Chapter 19 Waste Management.

7.9.5. Plant and equipment

A variety of equipment will likely be used for the key construction activities detailed above.

Table 7-5: Indicative plant and equipment

Typical equipment type	Approximate number
D6 dozer	1
D10 dozer	1
Graders	2

Typical equipment type	Approximate number
Mulchers	2
Front end loaders	2
Drones	2
Cranes (ranging from 50 – 300 tonne)	3
Franna crane (20 / 25 tonne)	7
Air compressors	3
Backhoes	1
Concrete agitator	8
Generators	10
Stinging winches	8
Helicopter for tower transport (Kamov Ka-32A11BC or similar)	1 (if required)
Piling rigs	6
Pneumatic jackhammers	2 (if required)
Rollers (ranging from 10 – 15 tonne)	2
Small excavators	1 small excavator (5 t), 2 large (20 t)
Dump trucks	2
Transport truck (B doubles)	3 to 4 B-double deliveries per day. However, this can increase at peak time e.g. during reinforced steel cage deliveries, towers steel deliveries, conductor / OPGW drums deliveries etc.
Mobile concrete batching plants	2, potentially 3 in the summer (TBD in ECI)
Watercarts	4
Bob cats	6
Crawler crane with grab attachments	1
Flatbed trucks	9
Elevated working platforms	12
Scrapers	1
Helicopter for conductor stringing (Eurocopter AS350 Squirrel or similar)	1 (if required)

7.9.6. Traffic and transport

Vehicle types

Construction vehicle movements would comprise vehicles transporting infrastructure components, plant and equipment, borrow materials, spoil and waste as well as light vehicles associated with construction workers to and from construction sites.

Load deliveries to the site for large volumes are assumed to occur in the most economic vehicle type legally permitted to undertake the journey on the relevant road. For most deliveries this will be on 19 m semi-trailers. Where the quantity to be transported is much smaller than the load capacity of a semi-trailer, smaller rigid trucks or light commercial vehicles will be used. It is also expected there will be oversize loads required for the delivery of materials for the Bundey substation primary plant and control buildings.

Table 7-6 provides a summary of the anticipated vehicle types that are expected to be utilised during construction of the substation, towers and transmission line.

Table 7-6: Indicative vehicle types to be used for construction

Vehicle type	Use during construction phase
Semi-trailer (B-doubles)	Tower transport
	Transport of conductors, insulators, OPGW and other hardware
	Transport of materials and equipment for substation civil works
Cranes	General construction activities for both substation works and installation of towers and transmission lines
Concrete Truck	Supply of materials for substation and tower footings
General rigid trucks	General construction activities, including water supply, transfer of borrow pit materials and / or movement of camp supplies
Dozers	Substation civil works and transmission line construction
Graders	Substation civil works and transmission line construction
Excavators	Substation civil works and transmission line construction
Light vehicles	Trade vehicles, general inspection activity

Vehicle movements

Construction traffic will be greatest during the main earthworks and civil construction activities. Light vehicle movements associated with construction workers traveling to and from site from the temporary construction camps. In general vehicle movement will be scheduled outside peak periods wherever possible. Indicative traffic movements are summarised in Table 7-7. These vehicle movements are based on the expected typical peak construction period of the Project. These vehicle movements will be confirmed during detailed design and traffic management measures will be addressed in a Traffic Management Plan.

Table 7-7: Indicative construction traffic movements

Vehicle type	Total number of loads during construction phase (assumed 18 month duration)	Expected number of movements per day on the road network (note: 1 trip = 2 movements)
Semi-trailer (for towers, conductors, insulators, OPGW, hardware etc.)	990	Up to 20 (i.e. 10 trips / day)
Crane	-	Minimal – cranes will largely move about within construction areas and along access track between tower sites
Concrete trucks	2,780 (based on a total of 450 towers which is considered extremely conservative, 6 trucks per tower and 80 trucks for the Bundey substation)	16 (assuming all footings are constructed within the first 12 months)
General rigid trucks	Approximately 10 vehicles per day	20
Dozers, graders and excavators	Movements occur within the site only; these vehicles to be transferred to and from site via semi-trailer	-
Light vehicles and buses for transportation of workers	20 – 40 per day	40 – 60

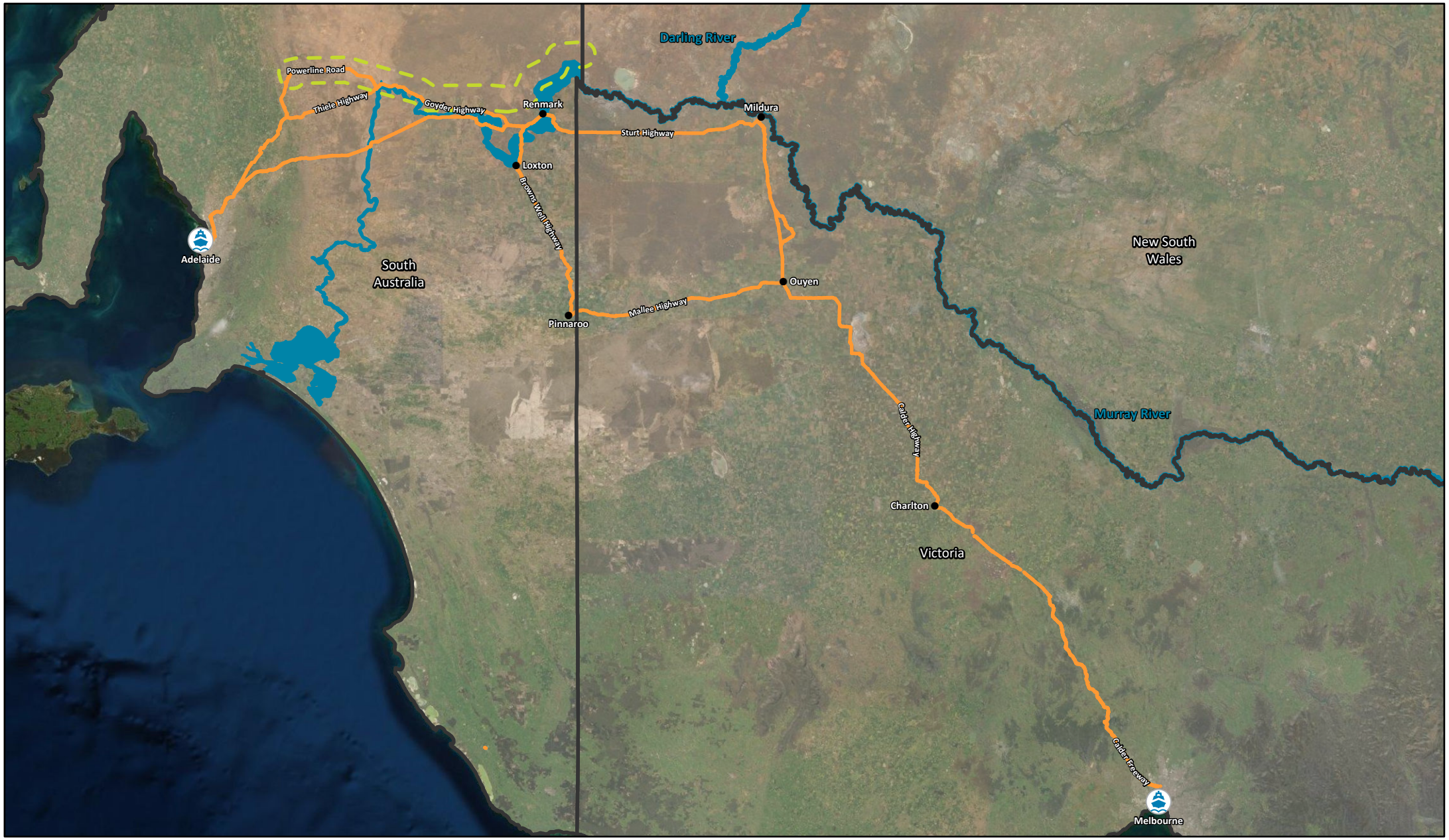
Construction haulage routes

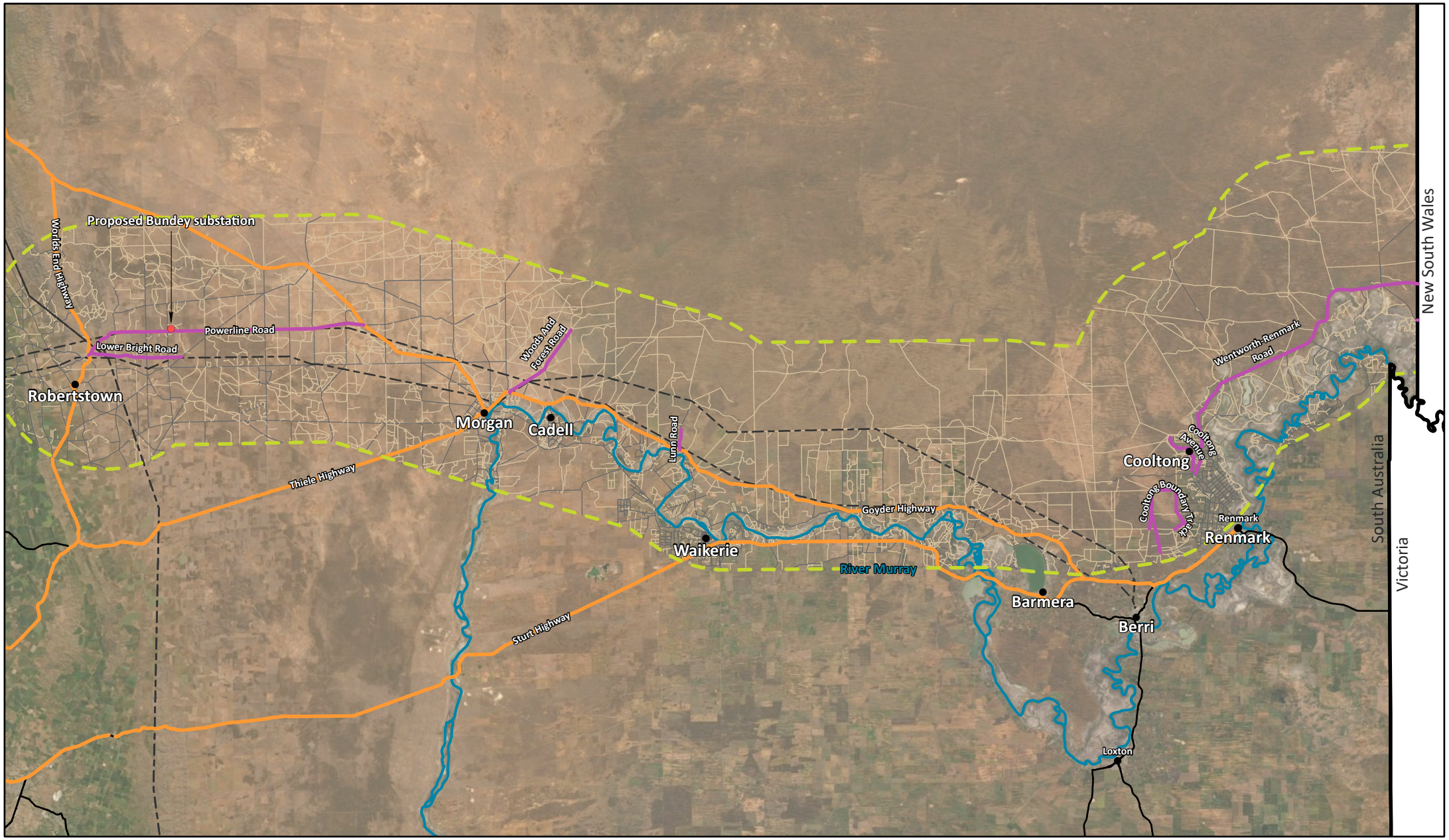
A large proportion of Project components will be imported. The port location(s) which would receive imported Project components are not confirmed at this stage. These will be confirmed following detailed design and procurement process. Locations being considered include Port Adelaide and Port

of Melbourne. The final long-distance haulage route from each of these locations will also be determined by the appointed EPC contractor. Expected long distance haulage routes are anticipated to include:

- **Port Adelaide** – Port River Expressway, Salisbury Highway, Port Wakefield Road, Northern Expressway, Sturt Highway, Thiele Highway, World's End Highway, Powerline Road
- **Port of Melbourne** – Calder Freeway, Midland Highway, Calder Highway, Calder Alternative Highway, Millewa Road, Werrimull North Road, Sturt Highway, Mallee Highway, Browns Well Highway, Old Sturt Highway

These long-distance haulage routes are illustrated in Figure 7-19. Local haulage routes will predominantly include Powerline Road, Lower Bright Road, Woods and Forest Road, Lunn Road, Cooltong Avenue, and the Wentworth-Renmark Road (see Figure 7-20). These preliminary haulage routes will be reviewed during detailed design and a final route assessment provided in the Traffic Management Plan.


Darling River
Powerline Road
Thiele Highway
Goyder Highway
Renmark
Mildura
Sturt Highway
Loxton
Browns Well Highway
Adelaide
South Australia
New South Wales
Ouyen
Mallee Highway
Pinnaroo
Murray River
Calder Highway
Charlton
Victoria
Calder Freeway
Melbourne
15 km investigation corridor
Main haulage route
Main road
Watercourse
Port location
Figure 7-19
Indicative port and haulage route locations
0
50
Kilometres
N
ElectraNet
energy connect
JBS&G



30 km investigation corridor
Local haulage route
Main haulage route
Existing ElectraNet transmission line
Main road
Road
Access track
Proposed Bundey substation

Figure 7-20
Indicative local haulage routes

0 20
Kilometres

N

ElectraNet
energy connect
JBS&G

Construction parking

Construction worker parking will be provided within the temporary construction camps and within the confines of the Bundey substation, as described in Section 7.5.6.

For the construction of the transmission line, given the transient nature of these construction works, and potentially long distances between construction camps and work sites, it is expected that workers would typically be transported by bus where possible. Where crews are smaller (3 – 4 people) light vehicles will be used. Where other light vehicles are used to access work sites, parking will generally be within 30 m of each tower location on the edge of access tracks within in cleared areas.

Emergency evacuation

An emergency response and evacuation management plan will be developed by the EPC contractor following award and prior to construction commencement. This plan will be developed in consultation with the Country Fire Service, ElectraNet and the local council (as appropriate).

7.9.7. Waste management

Solid waste

The majority of solid waste generation associated with the Project will be during construction. Sources of waste include excavated spoil, vegetation, construction materials, general waste at camps and yards / offices.

The management of waste will be in line with the Waste Management Hierarchy (EPA SA 2015) and will aim to avoid and reduce waste generation where possible. Excavated spoil will be reused on-site where appropriate, i.e. for capping of access roads and tower pads. Waste generated during construction will be separated into waste streams (such as metal, hydrocarbon, plastics, cardboard, and general waste) for later reuse, recycling or disposal to a suitable licensed facility by an appropriately licensed transport contractor, in line with EPA requirements.

Waste management is further detailed in Chapter 19 Waste Management.

Wastewater

The construction camp waste management is likely to be subcontracted out. It is likely that a collection tank will be set-up at the camp site by a professional installer then a qualified waste disposal contractor will be engaged to collect wastewater and sewage on a weekly or bi-monthly basis. An alternate option is for the sewage to be treated and then spray over the pre-approved area for disposal.

Portable toilet(s) will be serviced every week by a portable toilet supplier along the transmission line corridor.

Potential impacts associated with the management of waste are covered in more detail in Chapter 19 Waste Management.

7.10. Workforce and Working Hours

7.10.1. Workforce

The workforce engaged at any particular time is expected to vary throughout the course of the construction period and will depend on specific activities to be undertaken. The workforce may be as low as 20 during the early pre-construction phase, increasing up to approximately 160 – 250 during the later stages of pre-construction and peak construction when the full range of activities, including access and easement preparation, foundation installation, tower assembly and erection and conductor stringing are proceeding concurrently.

The workforce will include plant operators, excavators, riggers, linesman, labourers, mechanics, delivery and ancillary staff. Preference will be provided to local labour where appropriate but will depend on the availability of highly skilled workers required to fill many of the positions. Preliminary estimates for the construction crew requirements for the Project are outlined in Table 7-8.

Table 7-8: Indicative workforce numbers

Project activity	Indicative workforce (approximate)
Bundey substation	
• Enabling works	10 – 20
• Site establishment (including access track establishment)	10 – 20
• Access track construction	20 – 25
• Earthworks and civil construction	50 – 80
• Electrical works	50 – 80
• Pre-commissioning and commissioning	20 – 30
• Demobilisation	20 – 30
Robertstown to SA / NSW border transmission line	
• Enabling works	10 – 15
• Site establishment (including access track establishment)	10 – 20
• Earthworks and civil construction (foundations and earthing)	30 – 50
• Tower construction	
- Delivery	8 – 12
- Foundations and earthing	20 – 25
- Tower assembly and erection	30 – 50
- Stringing and tensioning	70 – 110
- Testing and commissioning	10 – 20
- Cleanup and reinstatement	20 – 30

7.10.2. Construction working hours

It is proposed that construction work would typically be carried out 12 hour shifts, seven days per week from 7:00 to 19:00.

The temporary workers construction camps will operate 24 hours per day, seven days per week for the duration of the construction phase.

Extended construction hours are proposed given the remote nature of the Project, distance to noise sensitive receptors and compressed construction timeframes.

These extended hours are considered acceptable as per Division 1 of the South Australian *Environment Protection (Noise) Policy 2007* (Noise EPP). The Noise EPP does not apply to construction activity related to public infrastructure, as stated in Clause 22(b).

However, where activities are proposed in close proximity to identified sensitive noise receptors (i.e. Cooltong), the hours of construction, including the delivery of materials to and from site may be as follows:

- between 7:00 am and 7:00 pm, Monday to Friday, inclusive
- between 8:00 am and 13:00 on Saturdays
- no work on Sundays and public holidays.

Depending on construction scheduling and weather conditions, some work may need to occasionally be undertaken outside these hours. For example, concrete pouring is restricted in high temperatures and conductor stringing in high winds.

7.11. Quality Assurance and Contingency Planning

ElectraNet own and manage South Australia's high-voltage transmission network. As such, ensuring the quality and reliability of its electrical infrastructure throughout its lifecycle is of paramount importance. There are several policies and procedures in place for employees, contractors, and subcontractors performing works on behalf of ElectraNet. Amongst these are the ElectraNet Safety and Sustainability Standards (ElectraNet 2020a). These Standards lay out minimum expectations of employees and contractors with respect to:

- work health safety management
- environmental operating requirements
- environmental management
- reporting and performance requirements
- audits and inspections
- corrective and preventative action plans.

Further detail on the Environmental Management Plans specific to the Project can be found in Chapter 20 Environmental Management.

Separately, ElectraNet has also developed a Quality Management Requirements document (ElectraNet 2020b) for contractors on the Project. This document requires that contractors implement an effective Quality Management System which addresses all activities related to the Project. Minimum requirements are discussed as they relate to:

- a Quality Management Plan prepared in accordance with AS/NZS 10005: Current – 'Quality Management Systems – Guidelines for Quality Plans
- Quality Assurance and Quality Control activities and personnel
- procurement control
- design control
- preparation, maintenance, protection, and preservation of quality records as per ISO 9001:2015 Quality Management Systems – Requirements.

EIS Volume 1 Chapter 8

Impact Assessment Methodology

JBS&G

project energy connect

Contents

8. Impact Assessment Methodology 8-1

8.1. Purpose of Impact Assessment 8-1
8.2. Relevant Environmental Matters 8-1
8.3. Overview of the Impact Assessment Process 8-1
8.4. Assessing Baseline Environmental Conditions and Identifying Environmental Values 8-2
8.5. Identifying Potential Impact Events 8-2
8.6. Control and Mitigation Measures 8-3
8.7. Assessing Expected Impacts 8-3
8.8. Addressing Uncertainty 8-7

List of Tables

Table 8-1: Categorisation of impact consequence – physical environment 8-4
Table 8-2: Categorisation of impact consequence – socio-economic environment 8-5
Table 8-3: Factors affecting level of certainty 8-7
Table 8-4: Description of likelihood 8-8
Table 8-5: Risk rating matrix 8-8

8. Impact Assessment Methodology

8.1. Purpose of Impact Assessment

The purpose of the impact assessment process is to determine whether ElectraNet can undertake the Project in a way that meets regulatory requirements and stakeholder expectations. Impact assessment addresses the questions of whether the biophysical, social and economic impacts (both positive and negative) of the Project will be acceptable to government regulators and community stakeholders, and what specific measures ElectraNet will need to take to ensure the Project is acceptable.

8.2. Relevant Environmental Matters

The assessment considered the following environmental and social matters:

- Land use and tenure
- Soil and landform
- Hydrology
- Terrestrial flora and fauna
- Cultural heritage (Aboriginal and non-Aboriginal)
- Visual amenity
- Air quality
- Noise and vibration
- Traffic and transport
- Socio-economic environment
- Hazard and risk
- Waste management.

These matters were either specified in the EIS guidelines or determined through preliminary environmental and social investigations by ElectraNet.

These matters are addressed in the relevant chapters of this EIS.

8.3. Overview of the Impact Assessment Process

The process of impact assessment incorporated the following for each environmental and social matter:

- Assessment of the baseline condition of the existing environment. This identified the environmental values for each matter that could be impacted by the Project, and their condition.
- Review of aspects of the Project design to determine the ways in which the Project could potentially affect the environmental values. These are called the 'potential impact events'.
- Description of the impacts that are expected to occur as part of the construction and operation of the Project. These are the impacts that are planned for, and a necessary consequence of carrying out the Project. These are described in conjunction with control and mitigation measures.

- Use of risk assessment tools to evaluate the uncertainty in the assessment of expected impacts, where appropriate.

These steps are discussed in more detail below.

8.4. Assessing Baseline Environmental Conditions and Identifying Environmental Values

Environmental values are the physical characteristics and qualities of the environment that contribute to biodiversity conservation, and the social, spiritual and economic health of individuals and society. Implicit in this definition is that an environmental value has some degree of significance. For example, a groundwater aquifer would not be considered a value if sufficient reliable data was available to conclude its water quality precluded any use, it did not support any groundwater dependent ecosystems or stygofauna, or it had no cultural significance. If data gaps meant the significance of a value was uncertain, the assessment used a precautionary approach and the value was included in the assessment.

Values that could be impacted by the Project were identified through desktop reviews of existing information, technical studies including field surveys, and as a result of stakeholder engagement. Views of affected stakeholders are described in Chapter 6 Stakeholder Engagement and Consultation. Legislative or regulatory criteria were also used to define environmental values where appropriate.

The values considered were those within the area of influence of the Project. The boundary for this varies for each environmental and social element depending on the type and severity of the impact being considered. It could for example, comprise the air shed, water catchment or bioregion.

8.5. Identifying Potential Impact Events

The Project may impact directly or indirectly on environmental values in many ways. These are called the potential impact events. They include both events that are expected and are certain to occur, and those that are not certain but may potentially occur.

Both direct and indirect impacts were considered. Direct impacts are those that are caused directly by the proposed activities (e.g. clearing of vegetation). Indirect impacts are those where a secondary event occurs that is substantially caused by activities associated with the Project (e.g. dust deposition from Project activities on agricultural land, which may result in reduced productivity).

Impact events were initially identified for the Project at a workshop which generated a broad range of potential impact events. These were subsequently refined into a list of credible and realistic potential impacts as Project detail was developed, and detailed investigations and stakeholder consultation were undertaken.

For an impact to occur there must be a connection between a source and a receptor:

- **Source** of the potential impact event means the source which alone or in combination has the potential to cause harm to an environmental or social receptor.
- **Receptor** is an environmental value that may reasonably be expected to be adversely impacted by the source.

Potential impact events were not considered further if the initial assessment demonstrated that an environmental receptor could not be adversely affected by a source. In the event that there remained a perceived link (or assigned value) from the perspective of stakeholders, an impact assessment was carried out.

8.6. Control and Mitigation Measures

Control measures are used to prevent or minimise adverse environmental or social impacts. They can include physical controls (design measures) and procedural controls (management controls). ElectraNet has considered both in the assessment process.

The impact assessment was an iterative process that considered each identified impact event and determined how it would affect environmental values. Where an impact on an environmental value was expected, the assessment considered whether there was an opportunity to redesign the Project to avoid the impact or use control measures to prevent or minimise the impact.

The route selection process is detailed in Chapter 4 Route Selection. The transmission line corridor, proposed alignment, access track alignment and transmission structure placement are the principal design controls used to reduce environmental impacts. They have wherever possible been selected to follow existing infrastructure corridors; avoid areas of high cultural significance, high value conservation areas, and important habitat for threatened species. As discussed in Chapter 7 Project Description, the exact placement of each tower will be confirmed closer to construction as towers are micro-sited to further mitigate impacts and risks associated with land access, species habitat and cultural heritage-related matters. The uncertainty around tower location has been conservatively addressed by nominating a 500 m wide buffer on a nominal transmission line alignment (1 km corridor) as the 'transmission line corridor' for the purposes of the impact assessment.

Specific design measures for each aspect are detailed in the chapters of this report, together with management controls to further reduce the potential for impact as a result of Project activities. Controls are also collated in the attached draft Construction Environmental Management Plan (Volume 3 Appendix P).

8.7. Assessing Expected Impacts

An environmental impact is any change, positive or negative, to environmental, social and economic values expected as part of planned activities associated with the construction and operation of the Project. Unlike environmental risks, environmental impacts are certain to occur if the Project proceeds.

The impact assessment considered the scale, intensity, duration and frequency of impacts and the sensitivity of the receptor. Impacts were assessed with reference to the descriptors in Table 8-1 and Table 8-2.

Predicted impacts were reviewed to identify whether they were acceptable for the relevant environmental matters, taking into account the proposed control measures. Impacts were considered to be acceptable if they were in the 'Negligible' category as set out in in Table 8-1 and Table 8-2, while impacts that were in the 'Minor' category were generally considered acceptable if they were as low as reasonably practicable. This process was iterative and additional controls were considered, as necessary, to ensure impacts were as low as reasonably practicable.

In carrying out the assessment, realistic worst-case assumptions were made in order to provide a conservative assessment.

Table 8-1: Categorisation of impact consequence – physical environment

Category	Air quality	Listed flora and fauna species	Other flora and fauna	Habitat	Contamination	Soil quality and quantity	Ground and surface water	Landform
Physical Environment								
Negligible	Air quality standards met at all times	Insignificant effect	Local short-term decrease in abundance of some species without reduction in local community viability	Insignificant effect	Insignificant effect	Minor soil disturbance with low erosion potential.	Minimal change with no significant loss of water quality or quantity	Insignificant effect
Minor	Isolated and localised exceedance of air quality standards. Complaints received about air quality that are resolved within days	Local short-term decrease in abundance with no lasting effects on local population	Local long-term decrease in abundance of some species resulting in little or no change to community structure	Disturbance of well-represented landforms / habitats	Local contamination that can be immediately remediated	Some soil disturbance with minor implications for offsite erosion which can be readily rectified with no significant loss of land capability	Local minor short-term reduction in water quality or quantity.	Minor change in geomorphology within localised portions of landform
Moderate	Local minor ongoing exceedance of air quality standards. Widespread minor short-term exceedance of air quality standards Ongoing air quality complaints	Local long-term decrease in abundance without reduction in regional population viability	Regional long-term decrease in abundance of some species and / or local loss of some species diversity resulting in some change to the community structure	Local loss of well-represented landforms / habitats.	Local contamination that can be remediated in less than 12 months. Widespread contamination that can be remediated in short-term	Soil disturbance with a high risk of offsite erosion potentially requiring months of remediation with short-term loss of land capability	Local minor long term or widespread short-term reduction in water quality or quantity.	Widespread minor changes in geomorphology Localised major changes in geomorphology
Major	Widespread major short-term exceedance of air quality standards resulting in hospitalisation of	Regional long-term decrease in abundance and / or local loss resulting in	Regional long-term decrease in abundance of numerous species and / or some loss of species	Local loss of a unique or critical landform / habitat.	Widespread contamination that requires a regional incident response and more than 12	Soil disturbance with a high risk of erosion potentially requiring years of remediation with	Widespread (regional) major short-term reduction in water quality or quantity	Major changes in geomorphology resulting in effects beyond footprint.

Category	Air quality	Listed flora and fauna species	Other flora and fauna	Habitat	Contamination	Soil quality and quantity	Ground and surface water	Landform
	members of the public	reduction in regional viability	diversity resulting in significant changes to community structure		months to remediate	long-term loss of land capability		
Catastrophic	Public exposed to a major exceedance of air quality standards that results in severely debilitating chronic health impacts or life-threatening hazards	Regional extinction of the species	Regional long-term loss of numerous species resulting in the dominance of only a few species	Regional loss of unique or critical landforms / habitats	Widespread contamination that requires a State-level incident response with rehabilitation expected to take several years or more	Extensive impacts to surface soils with irreversible soil erosion and significant and widespread permanent decline in land capability	Regional major long-term reduction in water quality or quantity	Widespread and ongoing major changes in geomorphology, resulting in effects beyond footprint of landform and flow on instabilities

Table 8-2: Categorisation of impact consequence – socio-economic environment

Category	Public health and safety	Heritage	Socio-economic	Land use
Socio-economic environment				
Negligible	No injury or illness	No impact to items of cultural significance	No impact or minor reparable socio-economic impacts on local population	No measurable impact to current or future land uses
Minor	An injury or illness that does not require first aid or medical treatment	Isolated damage to locally significant natural, cultural or historic heritage that is readily rectified	Short-term impacts on local businesses and / or wellbeing of local communities	Minor repairable damage to land or disruption to land use with no compromise to ongoing or future land use
Moderate	Injury or illness requiring first aid or medical treatment	Damage to State or national listed / significant natural, cultural or historic heritage that does not alter its heritage significance	Ongoing impacts on a limited number of local businesses and / or wellbeing of a limited number of local community members	Damage to land and infrastructure that results in remediation costs and / or loss of income of up to $1 million.
Major	Injury or illness that results in hospitalisation or disablement	Permanent damage to State or nationally listed / significant natural, cultural or historic heritage that results in a loss of heritage significance	Ongoing impacts on the wellbeing of regional communities that results in a significant proportion of the community leaving the	Damage to land and infrastructure that results in remediation costs and / or loss of income of up to $10 million.

Category	Public health and safety	Heritage	Socio-economic	Land use
			area and / or serious mental health issues across the affected communities. Ongoing impacts to regional businesses that result in closures and (direct and indirect) loss of employment for up to 100 people. Suspension of important community services (e.g. transport, telecommunications, energy) for several days or more.	
Catastrophic	Injury or illness that results in fatality	Permanent damage to State or nationally listed / highly significant natural, cultural or historic heritage site resulting in the site no longer meeting the listing criteria where applicable	Ongoing impacts to regional businesses that result in closures and (direct and indirect) loss of employment for more than 100 employees and / or towns in the region becoming unviable. Suspension of important community services (e.g. transport, telecommunications, energy) for several weeks or more.	Extensive damage to land or disruption to land use that results in remediation costs and / or loss of income of over $10 million

8.8. Addressing Uncertainty

Risk assessment tools were used to evaluate the uncertainty in the assessment of expected impacts.

Sources of uncertainty create a risk that the impacts on environmental values may be greater than expected. Uncertainties in the impact assessment can derive from:

- quality of site-specific data available
- the reliability of any modelling undertaken in the impact assessment
- control measures not being as effective as expected.

Table 8-3 describes the factors that can affect the level of certainty in relation to each of these sources.

Table 8-3: Factors affecting level of certainty

Level of certainty	Quality of data	Extent to which modelling has been validated	Effectiveness of design measures	Effectiveness of management measures
High	Comprehensive data. Further studies are unlikely to generate additional information that would change the conclusions reached in the impact assessment.	Excellent baseline data available. Model has been run and provides accurate predictions over different seasons. Model has been extensively used and is regarded by discipline experts as leading practice and/or the impact assessment does not rely to any significant extent on the use of a model.	Widely used and demonstrated to be effective at a range of infrastructure sites including sites with similar topographical / climatic conditions. Requires minimal checking and failure risk has been shown to be low.	Management measures are considered routine and used effectively throughout industry. Reduction in the level of impact from an unmitigated level does not rely primarily on the management measures.
Medium	Some site-specific information available to provide ground-truthing of regional desktop information. Further studies could change some of the conclusions reached in the impact assessment.	Some baseline data available. Model shows a reasonable approximation of real conditions but relies on a number of assumptions and sufficient data not available to demonstrate the model accurately portrays seasonal conditions.	Has been used at sites with similar conditions but requires regular checking or maintenance to ensure performance. Has only been used at limited sites. OR Effectiveness has not been established in the long term or at sites similar to the Project site.	Management measures have been effectively used at a limited number of sites and have not been demonstrated at similar sites or in the long term and / or reduction in the level of impact from an unmitigated level relies primarily on the management measures.
Low	Minimal site-specific data available. Reliance on regional desktop studies that may not accurately reflect site conditions. Low level of confidence in the impact assessment.	Minimal baseline data. Model is unable to be validated with current data.	Measures are novel and have not been demonstrated in the field.	Management measures are novel and / or heavily reliant on specialised technical expertise.

The level of certainty for each impact event was classified using the factors outlined in Table 8-3. Risk assessment tools were then used to evaluate impact events with a 'Low' or 'Medium' level of certainty, and in all cases where there was no expected impact but a material impact could potentially occur.

The risk assessment considered the credible worst-case consequence (as defined in Table 8-1 and Table 8-2) that could occur if assumptions made in the impact assessment were found to be incorrect, as well as the likelihood of such a consequence occurring (as described in Table 8-4). The level of risk was then categorised using the matrix in Table 8-5.

This process was also iterative. 'Low' risks were generally accepted, and 'medium' and 'high' risks were reviewed to determine if each risk was as low as reasonably practicable. Where necessary, changes were made to the Project design and control measures or further studies undertaken to ensure risks were adequately minimised. 'Extreme' risks were regarded as unacceptable; however, no such risks were identified.

The evaluation of uncertainty (using the risk assessment tools) is discussed for each impact event (where relevant) in the impact assessment chapters (chapters 9 – 17) in this EIS. A summary of the evaluation of uncertainty for all impact events is contained in Volume 2 Appendix O.

In addition, a number of potential impact events that have no expected impact but have a perceived or material level of risk (e.g. fire, electromagnetic fields) have been specifically addressed in Chapter 18 Hazard Management, with cross-referenced discussion in the relevant impact assessment chapter where appropriate.

Table 8-4: Description of likelihood

Descriptor	General description	Probability per year
Almost certain	This event is expected to occur in most circumstances.	> 80%
	Expected to occur at least once each year.	
Likely	This event may occur in some given circumstances.	50 – 80%
	May occur during any given year.	
Possible	This event might occur at some time.	10 – 50%
	Not likely to occur in any given year but is possible.	
Unlikely	This event could occur at some time.	0.5 – 10%
	Very unlikely to occur in any given year.	
Rare	This event may only occur in very exceptional circumstances.	< 0.5%
	Examples of this have occurred historically but are not anticipated.	

Table 8-5: Risk rating matrix

Likelihood	Consequences				
	Negligible	Minor	Moderate	Major	Catastrophic
Almost Certain	Low	Medium	High	Extreme	Extreme
Likely	Low	Medium	High	Extreme	Extreme
Possible	Low	Low	Medium	High	Extreme
Unlikely	Low	Low	Medium	High	High
Rare	Low	Low	Low	Medium	High

EIS Volume 1 Chapter 9

Land Use and Tenure

JBS&G

project energy connect

Contents

9. Land Use and Tenure 9-1

9.1. Key Findings 9-1
9.2. Setting the Context 9-1
9.2.1. EIS Guidelines 9-2
9.2.2. Requirements in legislation and other standards 9-3
9.2.3. Views of stakeholders 9-3
9.2.4. Assessment method 9-4
9.3. Description of Existing Environment 9-4
9.3.1. Land uses in the Project region 9-5
9.3.2. Land uses on the transmission line corridor 9-3
9.3.3. Land tenure 9-16
9.3.4. Native title and agreements with traditional owners 9-20
9.3.5. Acquisition of transmission line easement 9-23
9.3.6. Acquisition of land for Bundey substation 9-24
9.3.7. Compensation to landholders 9-24
9.4. Impact Assessment 9-25
9.4.1. Construction 9-25
9.4.2. Operations 9-29
9.4.3. Summary of key mitigation measures 9-34
9.5. Conclusion 9-35

List of Tables

Table 9-1: EIS Guidelines relating to land use and tenure 9-2
Table 9-2: Aspects of assessment requirements addressed in other chapters 9-3
Table 9-3: Mineral Exploration Licences and applications across the area of the Project 9-16
Table 9-4: Native title interests in the Project region 9-20
Table 9-5: Permitted activities within transmission line easements 9-23
Table 9-6: Key mitigation measures – land use 9-34

List of Figures

Figure 9-1: Conservation and game reserves and the Riverland Biosphere Reserve 9-1
Figure 9-2:Land uses along the transmission line corridor 9-4
Figure 9-3: Land tenure on the transmission line corridor 9-18
Figure 9-4: Vegetation Heritage Agreements on the transmission line corridor 9-19
Figure 9-5: Native Title in the region of the Project 9-22

List of Plates

Plate 9-1: Robertstown substation and surrounding land uses (looking south-east) 9-5
Plate 9-2: Transmission line (existing 132 kV) north of Robertstown substation (looking north-east) 9-6
Plate 9-3: Powerline Road and existing ElectraNet transmission line (132 kV) (looking east) .. 9-6
Plate 9-4: Existing transmission line along Powerline Road 9-7

Plate 9-5: Existing track and transmission line within the White Dam Conservation Park west of crossing of Goyder Highway 9-8
Plate 9-6: Existing transmission line on Goyder Highway (looking south-east)..... 9-8
Plate 9-7: Existing transmission line traversing pastoral land north of boundary of White Dam Conservation Park (looking south-east)..... 9-9
Plate 9-8: Existing transmission line and easement approximately 6 km west of Taylorville Station (looking south-east)..... 9-9
Plate 9-9: Existing transmission line on southern boundary of Taylorville Station 9-11
Plate 9-10: Existing transmission line easement on boundaries of Taylorville Station and Pooginook Conservation Park (looking east) 9-11
Plate 9-11: 132 kV line easement on Hawks Nest Station (looking south-east)..... 9-12
Plate 9-12: Boundary tack between Calperum Station and Cooltong Conservation Park (looking east) 9-12
Plate 9-13: Boundary track between Calperum Station and Cooltong horticultural area (looking south)..... 9-13
Plate 9-14: Proposed transmission line corridor – Calperum Station off Wentworth-Renmark Road 9-14
Plate 9-15: Wentworth-Renmark Road (looking north)..... 9-14
Plate 9-16: Wentworth-Renmark Road looking north-east at Chowilla Game Reserve..... 9-15
Plate 9-17: Wentworth-Renmark Road SA-NSW border (looking east)..... 9-15

9. Land Use and Tenure

This chapter discusses how construction and operation of the Project has the potential to impact existing land uses within the transmission line corridor. The current land uses, existing categories of land tenure (including native title) and other land-based agreements are also described.

9.1. Key Findings

- Disruption to landholder operations during the construction phase will be limited to the short period when construction is undertaken at each tower location along the alignment. Timing and location of construction activities will be planned in consultation with landholders.
- The transmission line corridor has been selected to follow existing road reserves, existing infrastructure and / or property boundaries wherever possible to limit the impact on properties and to ensure access to land is retained.
- Land to be cleared for temporary construction purposes will be reinstated within 3 months after construction activities have concluded and will be undertaken in accordance with the agreement with the affected landholder and the Project CEMP.
- Disruption to land uses from the increased presence of construction crews and equipment will be short term and localised and will be managed in consultation with landholders.
- Compensation is payable to landholders for use of their land for easement purposes. Consultation with landholders in determining the location of the easement and the micro-siting of the towers will take into consideration potential long-term impacts on landholder activities.
- Lasting economic disadvantage is not expected for landowners directly affected by the Project and no impacts to the value of affected properties are expected.
- The risk of tower / conductor strike by low flying aircraft will be mitigated through marker balls, consultation with CASA and operation of air safety regulations as appropriate.
- Interference to communication networks is expected to be limited to within the easement line and will be momentary while passing underneath the transmission line.
- The cumulative impact of renewable energy generation facilities enabled by the Project on the availability of land for primary production purposes is expected to be negligible. This is due to the significant extent of land available for agricultural purposes in the broader region (when compared to the area of land potentially taken out of production by future infrastructure project developments). Positive economic benefits for landholders and communities from the resulting investment in appropriately sited renewable energy projects facilitated by Project EnergyConnect are expected to offset any economic impact from loss of land for primary production.

9.2. Setting the Context

This section provides the context for the impact and risk assessment. It describes:

- the relevant EIS Guidelines
- relevant requirements in legislation and other standards
- views of stakeholders and the environmental and social outcomes they would like the Project to meet
- the assessment methodology used to identify baseline environmental values and to undertake the impact assessment.

9.2.1. EIS Guidelines

The EIS Guidelines (Table 9-1) require an assessment of the effect of the Project on the main land uses in the area of the Project, impacts to activities and landholders.

Table 9-1: EIS Guidelines relating to land use and tenure

EIS Guidelines and Assessment Requirements	Assessment level
Land Use and Economic Effects *Assessment requirement 2: The proposal will have an impact on the State's economy during construction and operation and may result in immediate and long-term effects on landowners and surrounding uses.*	
• 2.1: Identify the types and extent of land tenure in broad terms, including reference to Crown land. Outline any implications for Native Title and Native Heritage Agreements along the proposed route.	Critical
• 2.2: Identify the main land uses in the area (e.g. conservation, Bookmark Biosphere Reserve, Heritage Agreements, mining, agriculture, pastoralism, tourism, recreation, existing infrastructure).	Critical
• 2.3: Identify the level of interference to landowners, land uses and activities in the immediate and surrounding environs.	Critical
• 2.4: Describe the implications, if any, of securing any easements.	Critical
• *2.5*: Describe the potential effects on property values.	Critical
• 2.6: Outline any mitigation measures to alleviate or avoid impacts on landowners and land uses and refer to any compensation programmes.	Critical
• 2.7: Assess any cumulative impacts of the proposal in relation to other infrastructure projects proposed for the region (such as the increase in renewable energy generation anticipated) and discuss the effect of loss of land for primary production purposes.	Critical
Effect on Cultural Heritage Values *Assessment Requirement 6:* The proposed development has the potential to impact on sites / locations of Indigenous or Non-indigenous heritage through disturbance during construction.	
• 6.3*:* Outline measures adopted to avoid or minimise impacts on Aboriginal and European sites of archaeological or anthropological significance.	Critical
Effect on Communities *Assessment Requirement 9:* The proposed development has the potential to affect the local community during construction and through the establishment of a large linear structure.	
• 9.6: Identify any potential effects on TV and radio reception, telecommunication, broadband and mobile phone networks.	Medium
• 9.7: Identify any potential effects on airfields and aircraft movements and consult with the Civil Aviation Safety Authority Australia, the Renmark Paringa Council (Renmark Aerodrome) and Loxton Waikerie Council (Waikerie and Loxton Aerodromes) about the requirements for structures within the vicinity of airfields.	Medium
Hazard Risk *Assessment Requirement 10:* The construction and operation of a high voltage powerline involves a range of general and specific risks.	
• 10.4: Outline any risks to farming and horticultural practices, including those arising from irrigation, aerial spraying and night operations.	Medium
Introduction / spread of exotic plant and animal species *Assessment Requirement 13*: The proposed development has the potential to establish a corridor for the spread of introduced nuisance plants and animals.	
• 13.2: Identify the potential for the introduction or dispersal of new exotic plant and animal species and the associated implications for native species, habitat and agricultural land	Medium

Aspects of assessment requirements identified in Table 9-1 which are not addressed in this chapter are listed in Table 9-2 together with the applicable chapter.

Table 9-2: Aspects of assessment requirements addressed in other chapters

Assessment requirement	Chapter
2.6 Mitigation measures for air quality impacts to landowners	Chapter 14 Air Quality
2.6 Mitigation measures for noise impacts to landowners	Chapter 15 Noise and Vibration
2.6 Mitigation measures for traffic impacts to landowners	Chapter 16 Traffic and Transport
6.3 Outline measures adopted to avoid or minimize impacts on Aboriginal and European sites of archaeological or anthropological significance	Chapter 12 Cultural Heritage
13.2 Implications for native species and habitat of introduction of exotic plant and animal species	Chapter 11 Flora and Fauna

9.2.2. Requirements in legislation and other standards

An easement typically 80 m wide within the transmission line corridor will be acquired under the *Land Acquisition Act 1969* over the affected freehold properties. The *Crown Land Management Act 2009* allows the Crown to issue easements over pastoral leases and other Crown land. This is discussed further in Sections 9.3.5 and 9.3.7.

Calperum and Taylorville Stations within the transmission line corridor are subject to Native Vegetation Heritage Agreements under section 23 of the *Native Vegetation Act 1991*. Native vegetation heritage agreements are for conservation areas on private land which are established between a landholder and the Minister for Environment and Water. Under the Act, the registered VHAs will need to be varied to remove the area required for the proposed transmission line easement (see Section 9.3.3).

The area of the Project comprises four separate native title areas as provided for under the *Native Title Act 1993* (Cth) and *Native Title (South Australia) Act 1994.* The Commonwealth Act also provides for Indigenous Land Use Agreements (ILUA), which are voluntary agreements made between native title parties and other parties, including Government, in relation to the use and management of land and waters. There is a registered ILUA in place between the Crown of South Australia and the First Peoples of the River Murray and Mallee Region which is discussed further in Section 9.3.4.

The State Planning Policies which apply to the Project are described in Table 5-7 in Chapter 5 Legislative and Planning Framework.

A range of legislation including the *Civil Aviation Act 1988*, *Civil Aviation Safety Regulations 1998, Airspace Act 2007* and *Airspace Regulations 2007* regulate airfield operations and aircraft safety. There are two registered airfields and two private unregistered airstrips in the vicinity. Aircraft undertaking agricultural (e.g. spraying), firefighting or other aerial activities may be present in the vicinity of the transmission line during construction and operation.

Other South Australian and Commonwealth Government legislation and other standards relate to land use and tenure in the transmission line corridor are identified and described in Table 5-2 and Table 5-3 in Chapter 5 Legislative and Planning Framework.

9.2.3. Views of stakeholders

Stakeholder and community engagement for the Project, including consultation with impacted landholders and Traditional Owners, commenced in late 2018 and continued throughout 2019 and 2020. Comments on land use and tenure related to:

- reduction of impacts to land wherever possible by locating the corridor close to existing roads and infrastructure
- reduction of impacts to towns and productive land by keeping the alignment north of the River Murray

- avoiding impacts to areas of Aboriginal heritage significance
- avoiding areas currently used, or earmarked for use, by landholders for development (e.g. airstrips, buildings / structures)
- impacts to existing land uses including agricultural activities and conservation areas
- disruption to property access points and potential damage to access roads
- unauthorised access to land by construction workers
- environmental impacts to native vegetation, including large intact stands of old-growth mallee vegetation
- environmental impacts to birdlife, particularly the Black-eared Miner
- potential impacts to local endangered wildlife during construction, particularly malleefowl and their habitats.

Details of community consultation are set out further in Chapter 6 Stakeholder Engagement.

9.2.4. Assessment method

An initial desktop review was undertaken which considered the EIS Guidelines, legislative requirements and an assessment of publicly available information from the following sources:

- Department of Environment and Water (DEW), NatureMaps Version 3.4.1, viewed online via https://data.environment.sa.gov.au/NatureMaps
- Location SA MapViewer, viewed online via https://location.sa.gov.au/viewer/
- South Australian Property and Planning Atlas, viewed online via https://maps.sa.gov.au/SAPPA/
- South Australian Resources Information Gateway, viewed online via https://map.sarig.sa.gov.au/
- Bureau of Meteorology, viewed online via http://www.bom.gov.au/climate/

Following desktop assessment, a number of field surveys were conducted, mainly relating to the ecology of the transmission line corridor (focusing on threatened and migratory species and their habitats), cultural heritage and visual amenity. Detailed information on the results of those surveys are set out in Chapter 11 Flora and Fauna, Chapter 12 Cultural Heritage and Chapter 13 Visual Amenity respectively.

Site visits to the transmission line corridor by ElectraNet staff, Project consultants and contractors were also valuable in obtaining relevant information to supplement and ground-truth the desktop assessment. Stakeholder engagement undertaken with the local community provided the opportunity for landholders, Traditional Owners and other stakeholders to share information on existing land uses and activities with potential to be affected by the construction and operation of the Project.

9.3. Description of Existing Environment

This section provides a general description of the existing land uses and land tenure categories in the broader region of the Project.

Land uses in townships and settled areas on the southern banks of the River Murray (e.g. Morgan, Cadell and Waikerie) and the towns of Barmera, Berri and Renmark (which are more than 7 km from the proposed transmission line corridor) will not be impacted by Project construction and operation activities. Accordingly they have not been specifically included in the description of land uses in this section. Socio-economic impacts of the Project on the broader region (including local towns) are described in Chapter 17 Socio-economic Environment.

9.3.1. Land uses in the Project region

Primary production

The broader region is recognised for producing high quality fruit and nuts, vegetables, grains, wine grapes and livestock such as sheep, cattle and pigs. Primary production is the major economic activity, accounting for one in five jobs and 34% of gross regional product (RDAMR 2018).

Grazing of modified pastures and dryland cereal cropping (primarily wheat and barley) occurs mainly in the region at the western end of the transmission line corridor (SAMDBNRM 2015). Pastoral activity on pastoral leases in the rangelands region (i.e. north of the transmission line corridor) generally comprises grazing of domestic stock on almost exclusively native vegetation.

In recent times, changes to agricultural land uses have been introduced by landholders to counter lower than average rainfall and higher mean maximum temperatures (coupled with cold, dry conditions during winter) across the region. As a result, there has been a reduction in the number of crops being sown and while grazing continues, a lack of pasture feed has required farmers to supplement the feeding of their livestock. Some landholders have reduced the number of livestock held to ensure sufficient feed is available to maintain their livestock in adequate condition while other farmers have needed to sell or seek agistment due to the ongoing costs which have exhausted financial resources (PIRSA 2020).

The Riverland area of the broader region has substantial acreage utilised for irrigated horticulture and is a major producer of South Australia's grapes, citrus fruit, stone fruit, almonds, cherries, olives and vegetables. These areas of high value intensive horticulture are generally located well south of the transmission line corridor (with the exception of Cooltong) and will not be impacted by Project construction and operation.

Conservation areas / Riverland Biosphere Reserve and Ramsar wetland

The Riverland Biosphere Reserve[1], formerly known as the Bookmark Biosphere Reserve, comprises 18,000 hectares of wetlands and floodplains which are an important refuge for waterbird populations. Part of the Biosphere Reserve overlaps with the Riverland wetland complex which is a Wetland of International Importance, recognised and declared under the Ramsar convention (DAWE 2020a). The Biosphere Reserve hosts one of the largest remaining continuous stands of ancient mallee left in Australia and comprises critical habitat for the nationally threatened Black-eared Miner.

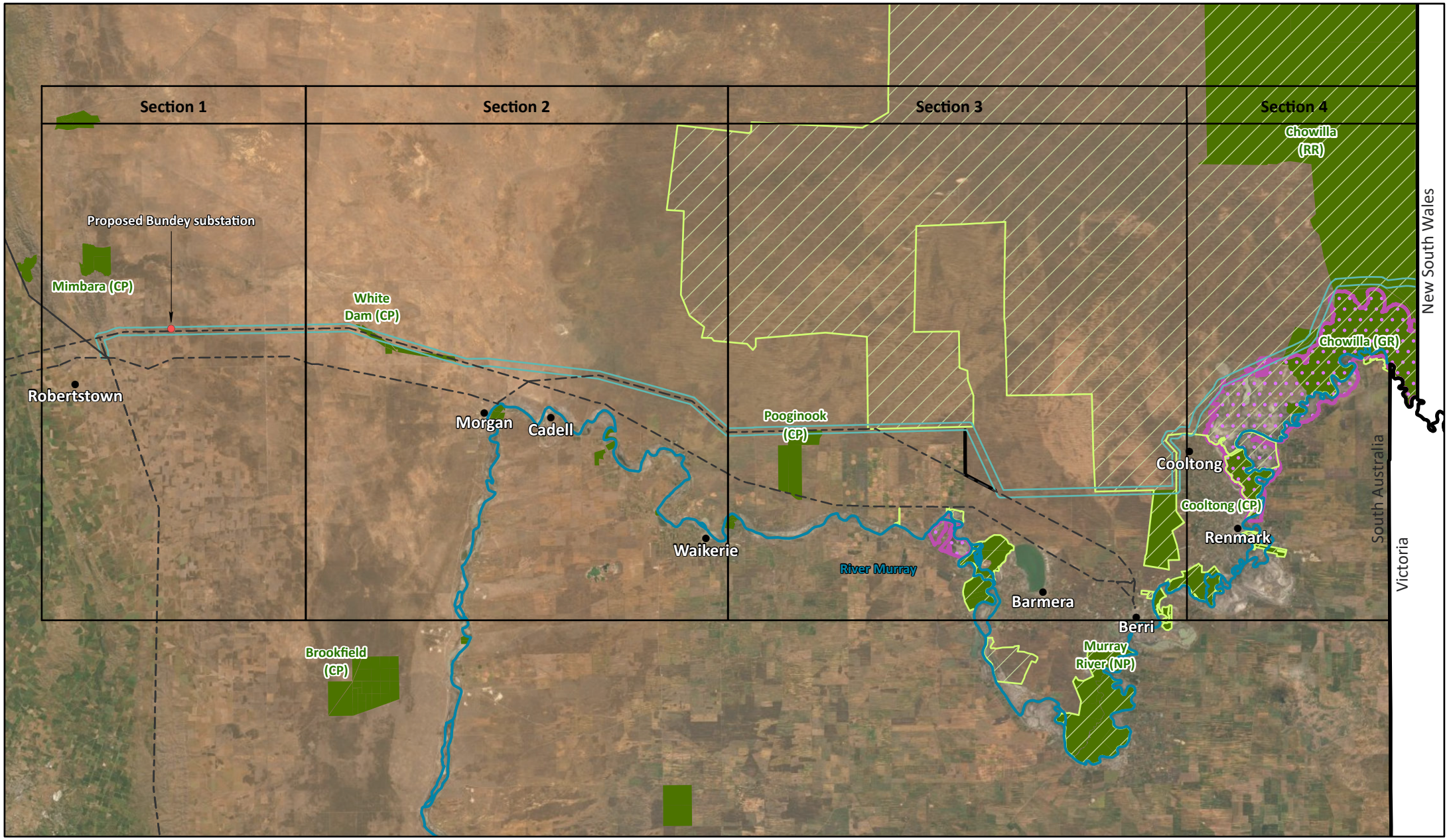
The Biosphere Reserve spans several pastoral leases including Calperum and Taylorville Stations which are privately managed for conservation by Australian Landscape Trust (ALT), and these properties also include critical habitat for the Black-eared Miner (DAWE 2020b).

There are several smaller areas in the region of the Project for reserved conservation purposes including White Dam Conservation Park, Pooginook Conservation Park and Cooltong Conservation Park.

Areas reserved for conservation purposes, the Riverland Biosphere Reserve and Ramsar wetland are shown in Figure 9-1. Further detail on conservation areas and threatened species in the region of the Project is provided in Chapter 11 Flora and Fauna.

The region also contains important Aboriginal cultural landscapes associated with historical occupation by the Traditional Owners of the River Murray floodplain in the eastern sections of the alignment and the Ngadjuri Nation in the western section (refer Chapter 12 Cultural Heritage).

[1] A biosphere reserve is an international designation made by the United Nations Educational, Scientific and Cultural Organisation (UNESCO) based on nominations by countries. A biosphere reserve incorporates one or more protected areas and surrounding lands that are managed to combine both conservation and sustainable use of natural resources.



Transmission line corridor
Parks and reserves
Riverland Biosphere Reserve
Ramsar wetland
Cultural heritage avoidance alignment
Existing ElectraNet transmission line
River Murray
Proposed Bundey substation

Figure 9-1
Conservation and game reserves and the Riverland Biosphere Reserve

0 20
Kilometres
N

ElectraNet
energy connect
JBS&G

Data sourced from: Ramsar - https://data.sa.gov.au/data/dataset/ramsar-wetland-areas-south-australia; Parks and reserves - https://data.sa.gov.au/data/dataset/conservation-reserve-parcels; Conservation Biosphere - http://location.sa.gov.au/lms/Reports/ReportMetadata.aspx?p_no=981&pa=dewnr

Tourism, recreational and research-based land uses

Tourism and recreation-based land uses in the region of the Project are largely centred on appreciation of and recreation in the natural environment, particularly the River Murray and associated conservation reserves. Recreational and tourism-based land uses include utilising waterways and bushland for activities such as walking trails, bird watching areas, boat hire and launch facilities, campgrounds, golf clubs and go-karts. Other emerging tourist related land uses in the Project region include wineries, heritage tours, farmers markets and farm stays.

The Chowilla Game Reserve (which is part of the Riverland Biosphere Reserve) is popular with tourists for camping and recreational purposes, including canoeing, kayaking, bushwalking, fishing, mountain biking and bird watching. Other areas reserved for recreation purposes include Loch Luna and Moorook Game Reserves near Barmera (DEW 2018).

The general Riverland region is a tourist destination with many businesses offering houseboat holidays, riverboat cruises, fishing trips and camping experiences. The region offers numerous accommodation options including hotels, caravan parks, houseboats and camping grounds.

The parks and reserves also provide opportunities for scientific research and educational programs on the natural environment and indigenous cultural heritage. Locations of particular importance to the scientific and educational objectives within Calperum Station have been identified through consultation with ALT and DEW.

Further information on the economic significance of tourism in the region is provided in Chapter 17 Socio-Economic Environment.

Renewable energy

One of the drivers for Project EnergyConnect is the need to improve network capability in the existing Renewable Energy Zones[2] (REZ) in the region of the Project.

The western end of the transmission line corridor falls within the Mid North South Australia REZ which supports major wind farms including Hallett, Hornsdale, North Brown Hill and Waterloo (AEMO 2020a). The Goyder Renewables Zone is a large hybrid renewable energy project proposed for an area extending north of Robertstown and Burra which will combine existing and proposed wind and solar generation with battery storage. The plan proposes a total of 1,200MW of wind energy, 600MW of solar PV, and 900 MW / 1800 MWh of battery storage, delivered in three stages, each with 400MW wind, 200 MW solar and 300 MW / 600 MWh of battery storage. The first stage (the Goyder South Renewable Energy Facility) will be designed and sited to complement Project EnergyConnect (GHD 2020). The second and third stages are likely to be contingent on the completion of the Project.

Other approved projects proposed in the Mid North REZ include the Solar River Project Phase 1 and 2 (200MW PV array and 100MW battery) located 30 km from Robertstown, and the 500MW Robertstown Solar project located approximately 5 km north-east of Robertstown.

The eastern end of the Project is located in the Riverland REZ, which has a greater focus on the potential for solar generation. There is no existing or committed wind generation in this REZ and currently limited existing renewable generation in the zone overall, however there is a significant projection for solar generation in the REZ which will be enabled by Project EnergyConnect (AEMO 2020a). Potential projects include the 330 MW Riverland Solar Storage Project (approved) and the

[2] A Renewable Energy Zone is a geographic area with high quality variable renewable energy resources, such as wind and solar, suitable topography and land use designations for development, and demonstrated interest from project developers. These areas can be used to identify new transmission lines that enable the development of cost-effective, grid-connected renewable energy. (Greening the Grid 2020).

Morgan Solar Farm Project (120 MW) located 8 km east of Morgan, and the Monash Solar Farm (100MW) located 3.5 km east of Monash which are both currently undergoing planning assessment.

Further discussion of renewable energy and the REZs is provided in Chapter 2 Project Justification and Chapter 17 Socio-Economic Environment.

Existing infrastructure

Existing infrastructure within the vicinity of the Project includes electricity substations, high voltage overhead transmission lines, State and Council-maintained roads, regional aerodromes, telecommunications lines, water pipelines and gas pipelines.

With the exception of Robertstown (which hosts the existing Robertstown substation and is the commencement point for the Project), the Project is not in close proximity to any towns or other settlements.

The main State roads in the region are World's End Road, Goyder Highway and the Wentworth-Renmark Road. The transmission line corridor crosses the Goyder Highway (B64) north of Morgan. A number of smaller, sealed and unsealed locally maintained roads occur in the area of the Project including Lower Bright Road, Powerline Road and Pooginook Boundary Track. Various unsealed roads and tracks are located on and maintained within private land and pastoral stations.

The bulk of rural traffic movements in the region are for freight transport and commuter travel. The region has a low population density resulting in low traffic volumes (well below road capacity thresholds) even on some rural highways. Other users of the road network include tourists, goods and service providers and other non-agricultural industries.

Airfields

Two airfields are located in the vicinity of the transmission line corridor. Renmark Aerodrome is CASA registered and located approximately 7 km to the south and operated by Renmark Paringa Council. The airfield is used by private users and the Royal Flying Doctor Service (RFDS). Waikerie Aerodrome is located approximately 13 km south of the transmission line corridor and is operated by the Loxton Waikerie District Council, and is primarily used by RFDS, other powered aircraft and gliders.

Two private unregistered airfields have been identified through desktop review located within 5 km of the transmission line corridor (refer Section 9.4.2 for further discussion).

Mining and energy resources

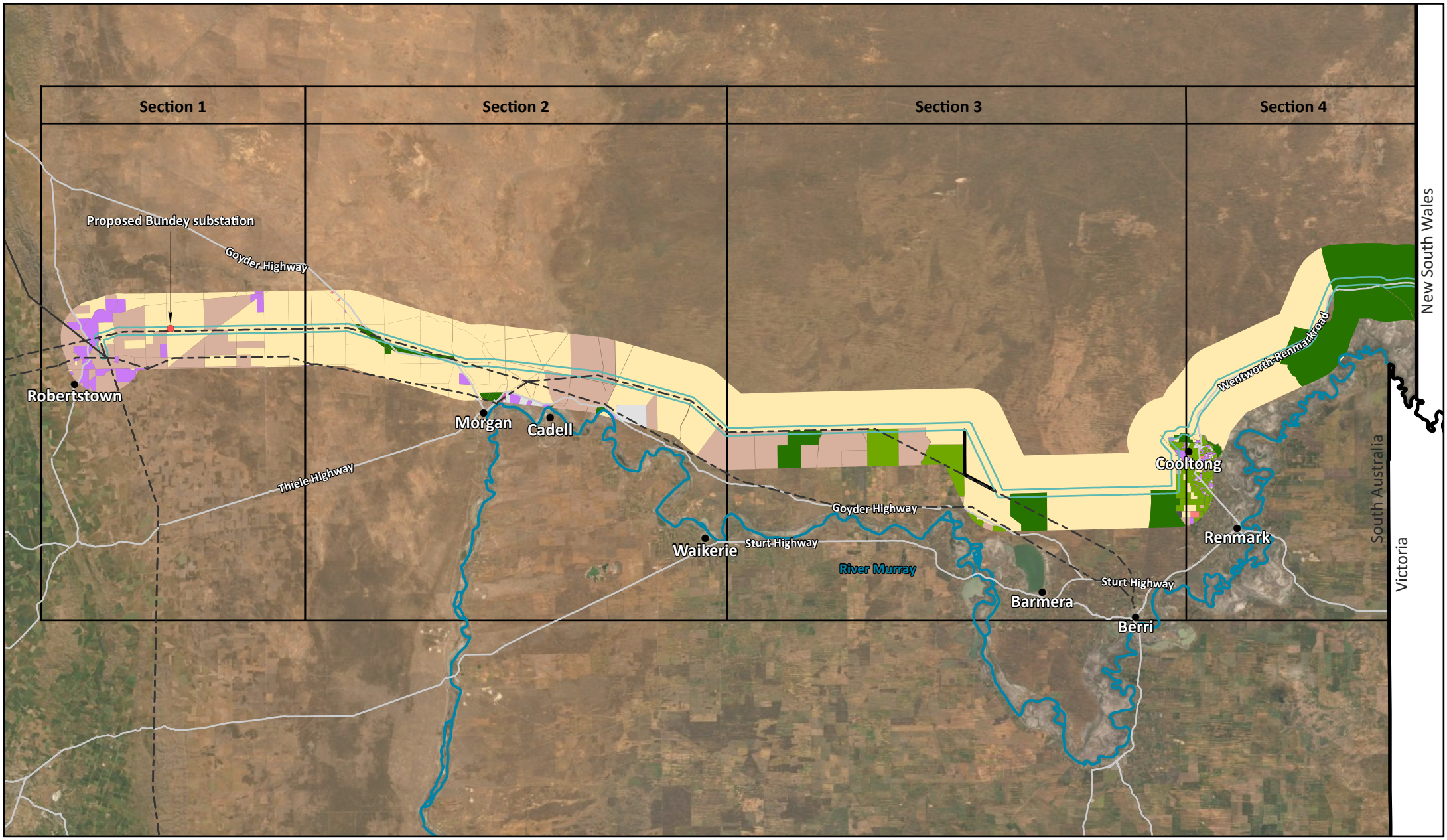
Land within the transmission line corridor and in the general vicinity is also utilised for mineral exploration and extractive minerals production. There are several Exploration Licences issued under the *Mining Act 1971* within 10 km of the corridor (refer Table 9-3), however, there are no active mining leases within the transmission line corridor. There are no registered petroleum or geothermal interests in the area.

9.3.2. Land uses on the transmission line corridor

Land use along the transmission line corridor can be described in terms of the four corridor sections shown in Figure 4-17 in Chapter 4 Route Selection:

- Corridor Section 1 – Robertstown substation – Powerline Road – Goyder Highway
- Corridor Section 2 – Goyder Highway to Taylorville Station
- Corridor Section 3 – Taylorville Station to Wentworth-Renmark Road
- Corridor Section 4 Wentworth – Wentworth-Renmark Road to SA-NSW border.

Land use categories mapped within the corridor sections are shown in Figure 9-2. A 5 km buffer for the transmission line corridor has been mapped to assist in the land use descriptions.



Transmission line corridor
Cultural heritage avoidance alignment
Main road
Existing ElectraNet transmission line
River Murray
Proposed Bundey substation

Land use generalised
Utilities industry
Mine / quarry
Public institution
Livestock
Education
Agriculture
Golf
Horticulture
Reserve
Retail commercial
Vacant
Rural residential
Vacant residential

Figure 9-2
Land uses along the transmission line corridor

0 20
Kilometres
N

ElectraNet
energy connect
JBS&G

Data sourced from: Land Use Generalised - https://data.sa.gov.au/data/dataset/land-use-generalised/resource/98a4aae3-54df-4381-8f98-a39fa4f30b4e

Section 1 Robertstown substation Powerline Road – Goyder Highway

The transmission line corridor commences at the existing Robertstown substation before heading north, then east towards the Goyder Highway. In this corridor section, significant clearing for agricultural purposes (primarily cropping) has confined remnant native vegetation primarily to hills, watercourses and roadsides. Paddocks are generally open and semi cleared / sparsely vegetated due to grazing and the impacts of drought. Land use is primarily agricultural with scattered farm residences. Plate 9-1 to Plate 9-4 show the Robertstown substation, existing electricity infrastructure and surrounding agricultural land uses in this section.

As discussed in detail in Chapter 4 Route Selection, the proposed alignment in corridor Section 1 largely has been located to follow the existing 132 kV transmission line along Powerline Road in order to reduce impacts to sensitive social and environmental receptors and existing land uses.

Plate 9-1: Robertstown substation and surrounding land uses (looking south-east)

Plate 9-2: Transmission line (existing 132 kV) north of Robertstown substation (looking north-east)

Plate 9-3: Powerline Road and existing ElectraNet transmission line (132 kV) (looking east)

Plate 9-4: Existing transmission line along Powerline Road

Section 2 Goyder Highway to Taylorville Station

The transmission line corridor continues to follow the existing 132 kV transmission line easement towards the south-east corner of Taylorville Station.

Land uses in this section transition from cropping to the pastoral and grazing land uses typical of the rangelands of this part of the region. The terrain is generally flat with no significant waterbodies present. The proposed transmission line corridor traverses a section of the western end of the White Dam Conservation Park, utilising the existing track through the park (refer Plate 9-5) wherever possible to reduce impacts to the surrounding environment. The conservation park was historically part of a stock route and functions as a wildlife corridor being on average less than 1 km wide.

The transmission line corridor crosses the Goyder Highway (refer Plate 9-6) and continues in a south-easterly direction, traversing the eastern end of White Dam Conservation Park, deviating to the north of existing 132 kv transmission lines across pastoral land for approximately 18 km before returning to that alignment to Taylorville Station (refer Plate 9-7 and Plate 9-8).

Plate 9-5: Existing track and transmission line within the White Dam Conservation Park west of crossing of Goyder Highway

Plate 9-6: Existing transmission line on Goyder Highway (looking south-east)

Plate 9-7: Existing transmission line traversing pastoral land north of boundary of White Dam Conservation Park (looking south-east)

Plate 9-8: Existing transmission line and easement approximately 6 km west of Taylorville Station (looking south-east)

Section 3 Taylorville to Wentworth-Renmark Road

Conservation is the dominant land use in Section 3 as this portion of the transmission line corridor primarily traverses the boundaries of the two Riverland Biosphere Reserve properties – Taylorville and Calperum Stations. These properties are largely managed for conservation and scientific research. The Pooginook and Cooltong Conservation Parks are also in this section of the corridor.

The transmission line corridor follows the existing track and 132 kV transmission line easement along the southern boundary of Taylorville Station. Approximately halfway along the boundary, the existing 132 kV transmission line easement deviates to the south-east towards Monash, while the proposed Project corridor continues east along the existing Taylorville Station boundary track for approximately 12 km. The Pooginook Conservation Park is located on the southern boundary of the existing transmission line easement in this area (refer Plate 9-10). The northern section of the conservation park comprises dense mallee scrub providing habitat for a range of wildlife and will be avoided by the transmission line alignment (refer Chapter 11 Flora and Fauna).

At the intersection of the southern boundary of Taylorville Station and the western boundary of Hawks Nest Station, the proposed alignment turns south following the property boundary to the point it intersects with the existing 132 kV transmission line easement, and following the easement to the south-east for approximately 5 km before turning east along the southern boundary of Hawks Nest Station and approaching the southern boundary of Calperum Station. The main land uses on Hawks Nest Station are grazing and recreational hunting.

The proposed alignment in this section is an adjustment to the January 2021 alignment to avoid Aboriginal cultural heritage sites identified on Hawks Nest Station during cultural heritage surveys. The adjusted alignment maximises the use of previously disturbed areas along the station boundary and the existing 132kV transmission line easement, and has the advantage of further minimising impacts to areas of higher quality habitat on the property identified in ecological surveys for the Project (refer Chapter 11 Flora and Fauna).

The transmission line corridor continues along the southern boundary of Calperum Station and the northern boundary of the Cooltong Conservation Park (the ‘Cooltong Track’) avoiding impacts to critical habitat of the Black-eared Miner, and other mallee bird species that frequent the area on these adjoining properties (refer Plate 9-12). The corridor then turns north to follow the eastern boundary of Calperum Station to the intersection with the Wentworth-Renmark Road. In this portion the transmission line corridor passes through the irrigated horticulture area of Cooltong, which is characterised by irrigated orchards of citrus and other fruits and grapevines, and associated rural residential properties (refer Plate 9-13).

Plate 9-9: Existing transmission line on southern boundary of Taylorville Station

Plate 9-10: Existing transmission line easement on boundaries of Taylorville Station and Pooginook Conservation Park (looking east)

Plate 9-11: 132 kV line easement on Hawks Nest Station (looking south-east)

Plate 9-12: Boundary tack between Calperum Station and Cooltong Conservation Park (looking east)

Plate 9-13: Boundary track between Calperum Station and Cooltong horticultural area (looking south)

Section 4 Wentworth-Renmark Road to SA-NSW

Section 4 of the transmission line corridor follows the existing Wentworth-Renmark Road to the SA-NSW border, through Calperum Station and the Chowilla Game Reserve and passing to the north and west of the Riverland Ramsar wetland (refer Plate 9-14 to Plate 9-17).

The corridor runs adjacent to (north and west) of the Wentworth-Renmark Road to avoid the introduction of new impacts in previously undisturbed areas. A short portion of the corridor has been deviated slightly further north of the Wentworth-Renmark Road to avoid the potential for cultural heritage impacts and a DEW revegetation trial area.

Plate 9-14: Proposed transmission line corridor – Calperum Station off Wentworth-Renmark Road

Plate 9-15: Wentworth-Renmark Road (looking north)

Plate 9-16: Wentworth-Renmark Road looking north-east at Chowilla Game Reserve

Plate 9-17: Wentworth-Renmark Road SA-NSW border (looking east)

9.3.3. Land tenure

The transmission line corridor and surrounds are subject to several categories of land tenure and registered agreements including freehold title, pastoral leases, mining tenements, and Crown Record (managed for conservation purposes). Native vegetation heritage agreements are also in place along the eastern sections of the transmission line corridor.

The categories of land tenure traversed by the transmission line corridor are shown in Figure 9-4 with a 5 km buffer. A complete list and copies of all Certificates of Title, Crown Leases and other tenure documents is provided in Volume Two Appendix F.

Freehold title

The majority of the land parcels traversed by the transmission line corridor are held in freehold. Fifty-nine individual land parcels are held by twenty-one individual landholders. Cropping, grazing and irrigated horticulture are the primary land uses on these properties.

Pastoral leases

Seven pastoral leases vested under the *Pastoral Land Management and Conservation Act 1989* are located along the eastern end of the transmission line corridor including Calperum, Taylorville and Hawks Nest Stations. These properties are largely utilised for conservation purposes including native vegetation management and the protection of flora and fauna (refer Chapter 11 Flora and Fauna). Taylorville Station is also subject to two separate underleases for easements to ElectraNet and Transmission Lessor Corporation, with current expiry dates of 29 June 2023 and 16 November 2024 respectively.

Mineral and petroleum tenements

The proposed transmission line corridor traverses five mineral Exploration Licences as at (March 2021) (refer Table 9-3). There are no petroleum tenements in the corridor.

Table 9-3: Mineral Exploration Licences and applications across the area of the Project

Tenement	Holder and commodity sough	Expiry Date
Exploration Licence 5744 (ELA2020/00212)	SeeSaw Resources Pty Ltd Gold; Rare Earths; Zinc; Copper; Lead	21 February 2021 (subsequent EL in progress)
Exploration Licence 5881	Ausmex SA Pty Ltd Gold; Industrial Minerals: Copper; Phosphate	3 November 2021
Exploration Licence 6101	Ausmex SA Pty Ltd Gold; Industrial Minerals: Copper; Phosphate	24 January 2023
Exploration Licence 6201	Ausmex SA Pty Ltd Cobalt; Gold; Copper	19 July 2020 (renewal application submitted 16 May 2020)
Exploration Licence 6276	Murray Zircon Pty Ltd Rutile, Ilmenite; Zircon	3 July 2022
ELA2020/00187	Sheer Gold Pty Ltd	N / A

ElectraNet will contact each of the Exploration Licence holders prior to the commencement of construction activities to advise of upcoming works and ensure that the location of the towers and associated facilities will not sterilise any known or potential deposits of mineral resources.

Crown Record

Crown Record is land owned and managed by the State Government. Crown Record land traversed by the transmission line corridor is vested in the Minister for Environment and Water for conservation or other purposes. Five Crown Records are traversed by the transmission line corridor, covering White

Dam Conservation Park, Chowilla Game Reserve, Chowilla Recreation Reserve and Chaffey Irrigation Area.

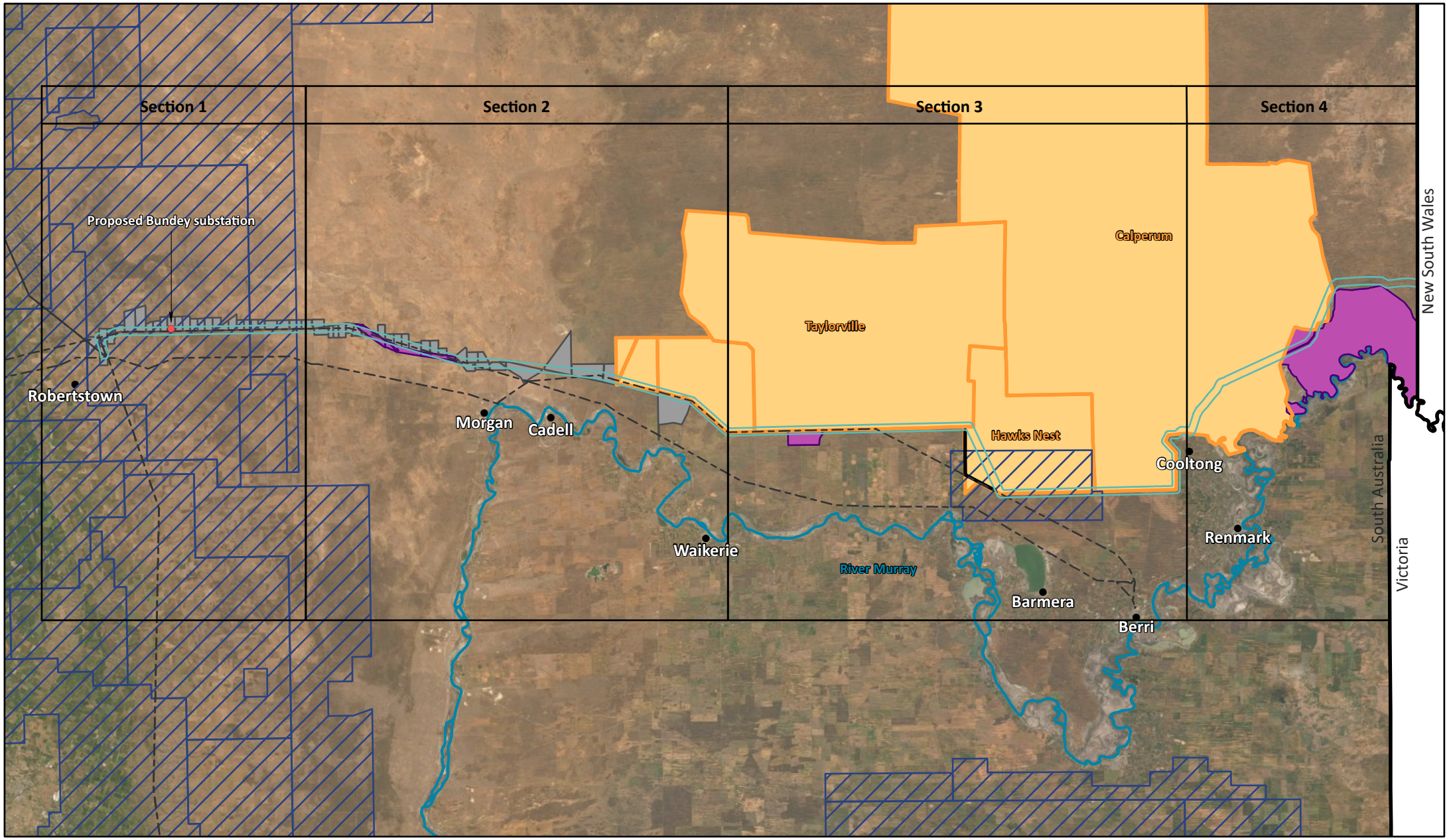
Native Vegetation Heritage Agreements

Vegetation Heritage Agreements (VHAs) may be entered into if the Minister considers that native vegetation should be preserved or enhanced, or land has been revegetated with plants or other species indigenous to the area. VHAs are attached to the land (i.e. registered on the land title) and binding on the current landholder, irrespective of whether that landholder was the person with whom the agreement was originally made.

Both Calperum and Taylorville Stations within the transmission line corridor, have registered VHAs which must be varied in order to remove the area required for the proposed transmission line (refer Figure 9-4). This would require the VHAs to be varied the exclude the impacted areas, which would need the approval of the Minister, with the consent of the NVC and the agreement of the landholder.

The process to vary the existing VHAs is progressing in parallel to the environmental approval process. The variations will only include the area required for an easement from the relevant VHAs.

Chapter 11 Flora and Fauna provides further detail on the potential impact of the proposal on VHAs and native vegetation generally.

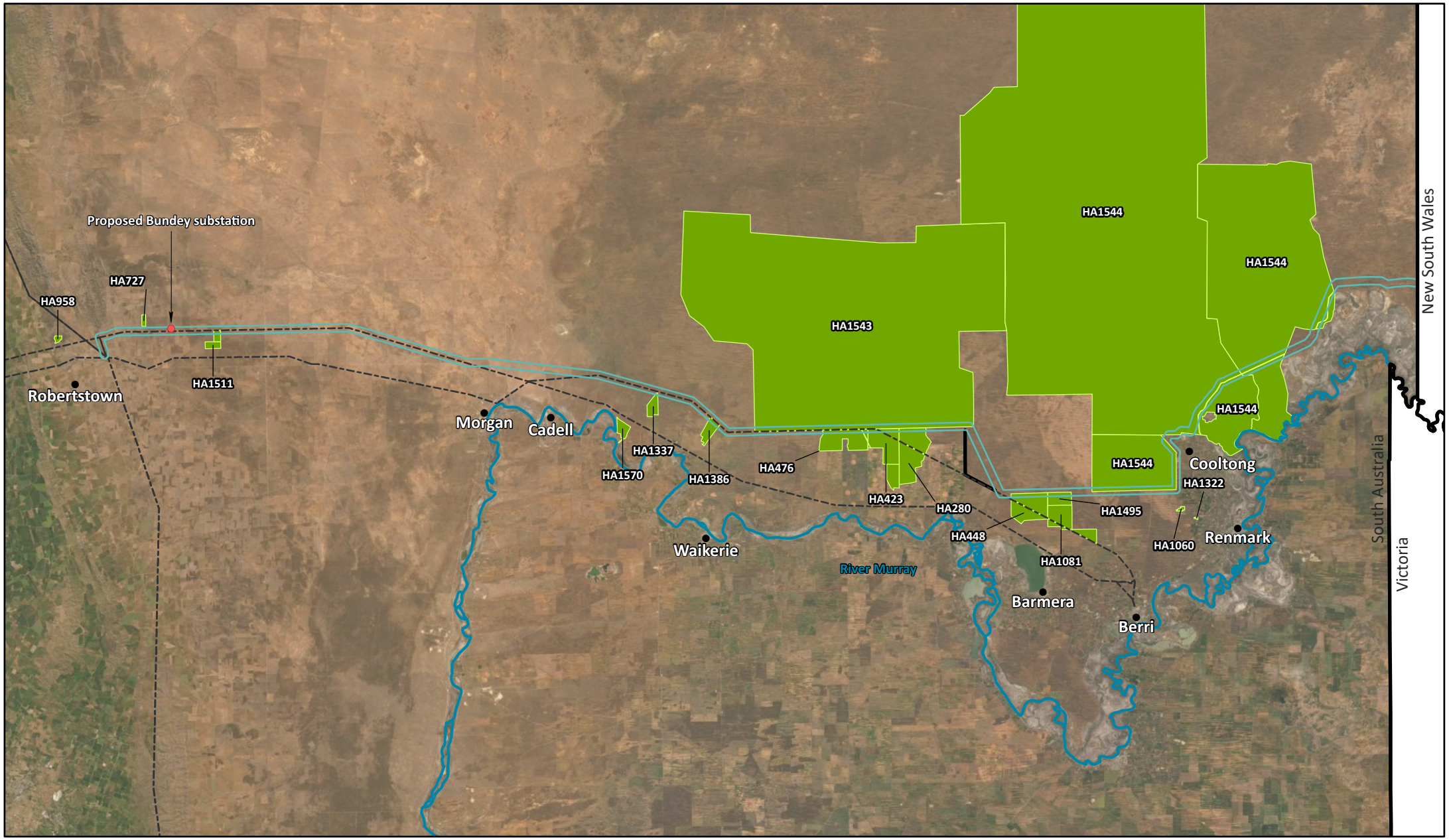


Transmission line corridor
Crown land
Freehold land
Mineral exploration licence
Pastoral Leases
Cultural heritage avoidance alignment
Existing ElectraNet transmission line
River Murray
Proposed Bundey substation

Figure 9-3
Land tenure on the transmission line corridor

0 20
Kilometres
N

ElectraNet
energy connect
JBS&G



Transmission line corridor
Vegetation heritage agreement
Cultural heritage avoidance alignment
Existing ElectraNet transmission line
River Murray
Proposed Bundey substation

Figure 9-4
Vegetation Heritage Agreements on the transmission line corridor

0 20
Kilometres

N

ElectraNet
energy connect
JBS&G

9.3.4. Native title and agreements with traditional owners

Native title

The area of the Project comprises four separate native title areas as listed in Table 9-4 and shown in Figure 9-5.

Table 9-4: Native title interests in the Project region

Native title claim / determination / ILUA	Native title party
Native title consent determination (SCD2011/002)	The River Murray and Mallee Aboriginal Corporation RNTBC
The River Murray and Crown Lands Indigenous Land Use Agreement (SI2011/025)	The Crown of South Australia and the First Peoples of the River Murray and Mallee
Ngadjuri Nation #2 Native Title Claim (SC2011/002)	Ngadjuri Nation #2
First Peoples of the River Murray and Mallee Region #2 (SC2019/001)	First Peoples of the River Murray and Mallee

Native title consent determination

At a hearing at Lake Bonney on 18 November 2011, the Federal Court of Australia determined that native title exists in parts of the native title claim area submitted by the First Peoples of the River Murray and Mallee Region (FPRMM). The native title determination was made by consent agreement and has general limitations, for example, the native title rights and interests do not include commercial use or the resources from the land, and do not confer possession, occupation etc to the exclusion of other parties (National Native Title Tribunal 2011).

The consent determination recognised the First Peoples non-exclusive rights and interests to parts of the traditional land in areas of the River Murray including around Renmark, Berri, Barmera, Waikerie and Morgan. It recognises the First Peoples' right to undertake cultural activities, conduct ceremonies and meetings, protect places of cultural and religious significance and to access, hunt, fish, camp, gather and use natural resources (PBC n.d.). The registered native title body corporate is the River Murray and Mallee Aboriginal Corporation.

River Murray and Crown Lands ILUA

The National Native Title Tribunal (NNTT) registered an ILUA between the Crown of South Australia and the FPRMM on 16 May 2012. The ILUA sets out procedures in relation to community, access, co-management and a consultation protocol (National Native Title Tribunal 2012a). The ILUA extends over an area from the SA-NSW border west through to an area north of Morgan.

Ngadjuri Nation #2 Native Title Claim

The NNTT registered the Ngadjuri Nation #2 native title claim (SC2011/002) on 20 January 2012. This claim, which includes a small portion of the western-most part of the proposed alignment (National Native Title Tribunal 2012b), is yet to be determined.

First Peoples of the River Murray and Mallee #2 Native Title Claim

The NNTT registered native title claim SC2019/001, known as the First Peoples of the River Murray and Mallee Region #2, on 1 November 2019. The claim covers the 'gap' between the First Peoples ILUA and area of interest and the Ngadjuri Nation #2 claim (refer Figure 9-5).

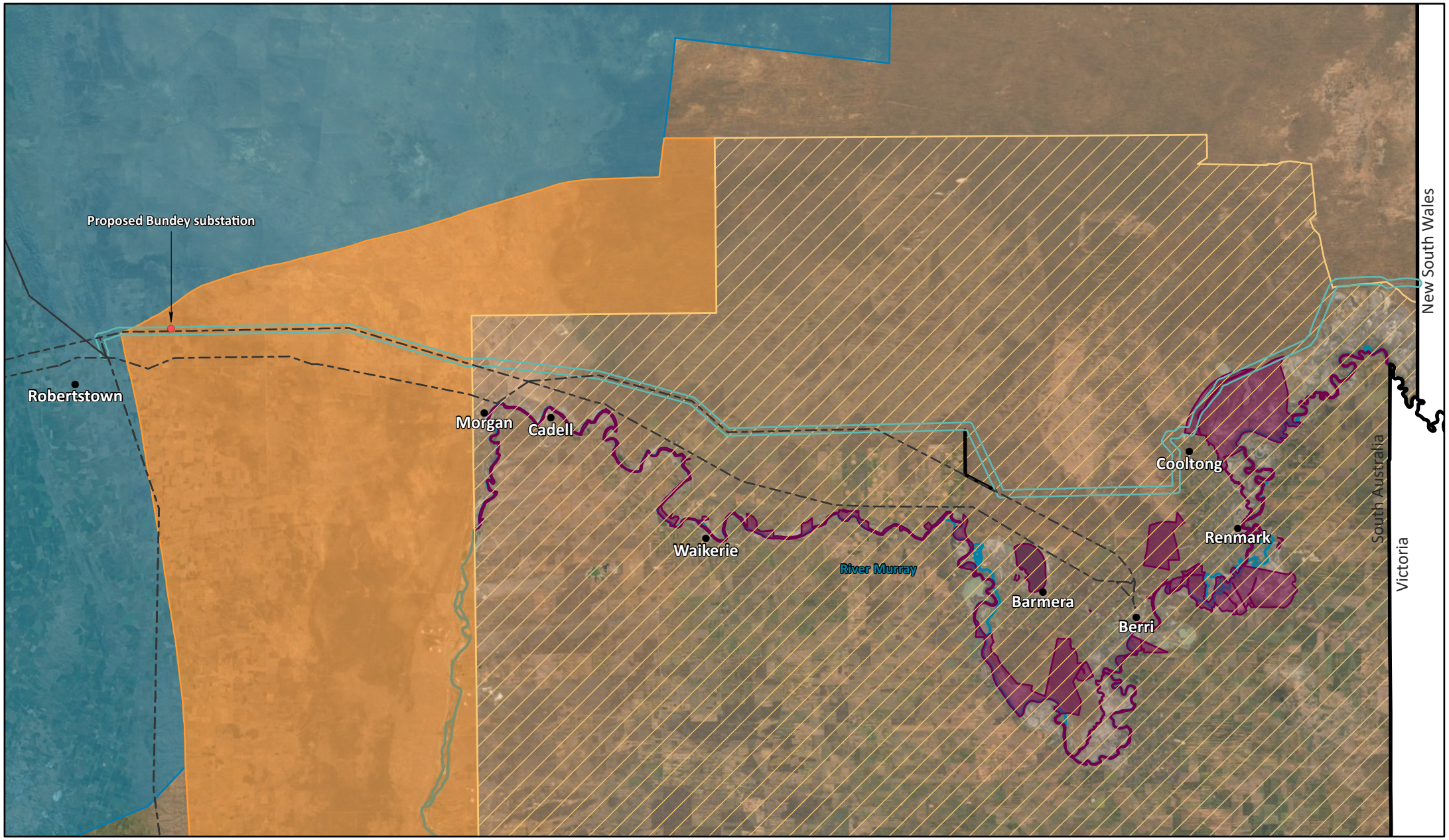
The majority of the transmission line corridor is located within existing road reserves or within portions of freehold land, both of which have extinguished native title rights and interests.

The remainder of the proposed transmission line corridor traverses seven pastoral leases and five Crown Record parcels, all of which may be considered 'native title land'. However, as the proposed Project is a 'facility for services to the public', Section 24KA of the *Native Title Act 1993* (Cth) applies,

thereby the construction of the transmission line is a valid 'future act' and a native title agreement or ILUA is not required to enable the development to proceed.

Aboriginal heritage agreements

Aboriginal heritage surveys have been undertaken with the relevant Traditional Owners to ensure that no element of the Project will damage, disturb or interfere with sites, objects or remains of Aboriginal significance. ElectraNet is in the process of negotiating appropriate agreements with each of the relevant Traditional Owners that will be impacted by the Project. Further information is provided in Chapter 12 Cultural Heritage, including a summary of topics included in the heritage agreements.



The River Murray and Crown lands Indigenous land use agreement

First Peoples of the River Murray and Mallee Region #2 - Native title claim

Ngadjuri Nation #2 - Native title claim

First Peoples of the River Murray & Mallee Region - Native title consent determination area

Transmission line corridor

Cultural heritage avoidance alignment

Existing ElectraNet transmission line

River Murray

Proposed Bundey substation

Figure 9-5
Native Title in the region of the Project

0 20
Kilometres

N

ElectraNet

energy connect

JBS&G

Data sourced from: National Native Title Tribunal - http://www.nntt.gov.au/assistance/Geospatial/Pages/DataDownload.aspx

9.3.5. Acquisition of transmission line easement

The transmission line easement provides a safety clearance margin between the high-voltage transmission lines and surrounding structures and vegetation, and access for ElectraNet for ground-based inspections and transmission tower repairs and maintenance. The loss of land to the easement is considered during the valuation process and reflected in the offer of compensation made to landholders during easement acquisition negotiations.

The transmission line will be situated within an easement typically 80 m wide that allows for the construction, operation and maintenance of the transmission line. The easement is a permanent legal right to use and access land which is registered on the land title and remains part of the title regardless of changes in ownership. Where possible, the easement will be aligned with existing infrastructure easements, road reserves, existing tracks and disturbed areas to minimise the need for new disturbance.

There may also be a requirement for 'overhang' easements over properties on which the transmission line is not physically located which provide for conductor blowout[3] onto neighbouring properties. Discussions with landholders are ongoing and agreements will be in place to enable those overhang easements to be put in place prior to construction, where appropriate.

While existing land uses will be able to continue across much of the easement, and most existing vegetation will remain undisturbed, the easement will also restrict certain landholder activities. The following activities are permitted within easements are based on ElectraNet (2013) and applicable legislation:

Table 9-5: Permitted activities within transmission line easements

Activity	Permitted / not permitted
Grazing	• Permitted
Fences and gates	• Fences and gates may be constructed or maintained across transmission line easements, provided they are not greater than 2 m in height and do not prevent access for transmission line inspection / maintenance
Access tracks	• Permitted
Vegetation	• Vegetation is required to be cleared to a height of 3 m within 12.5 m of the centreline and cleared to a height of 6 m between 12.5 and 25 m of the centreline of the transmission line
Permanent annual plantings	• Orchards, vineyards and vegetable growing are permitted provided they meet the clearance restrictions. Irrigation and chemical spraying activities are required to be controlled through management guidelines to avoid exposure of transmission lines to water or chemicals
Buildings and structures	• Sheds, yards, pump houses and housing are permitted outside minimum clearance distances of the transmission lines (i.e. the easements) and must not prevent access to infrastructure for maintenance or inspection
Storage of materials	• Not permitted within easement
Excavation / filling of land	• Excavation which impacts on the footings of transmission lines is not permitted

The exact location of easements will be determined following detailed design, micro-siting and survey activities. Compensation payable to landholders for acquisition of their land for easement purposes is discussed in Section 9.3.7.

[3] Conductor blowout is the horizontal sag in a transmission line conductor (wire) due to wind forces and is an important consideration in determining easement width.

ElectraNet and its Project consultants have been working with each of the affected landholders for more than 12 months, discussing land uses, locations of sensitive receptors and landholder priorities. The formal process for securing easements by negotiation commenced with freehold landholders in late 2019, with Option deeds prepared and provided to each landholder for discussion. The deeds included a plan of the land required by ElectraNet for an easement, details of an Option fee payable, the amount of compensation payable to the landholder and timelines for completion.

The Option deeds remain valid until either 31 December 2021 or 22 February 2022, depending on the time they were entered into with the respective freehold landholders. The option must be triggered by ElectraNet on or before those dates to enable acquisition of the land subject to the easement to progress.

The pastoral leases and Crown Record properties are subject to a slightly different process to secure an 80 m wide easement. Pastoral leases require preparation of an Easement deed, which is registered against the pastoral lease and compensation paid to the pastoral lessee. Crown Record requires issue of a construction licence based on survey plans which will be approved by DEW before the licence is issued.

9.3.6. Acquisition of land for Bundey substation

ElectraNet is finalising the acquisition and subdivision of a land parcel on Powerline Road Bundey, for the proposed 330 – 275 kV substation.

The site measures approximately 80 ha, however only 400 m by 250 m (9 ha) is required for the development of the Bundey substation, allowing room for future expansion. The final area required for the Project will be confirmed during detailed design. As described in 9.3.2, the land in this area has been significantly cleared of vegetation and has been long used for cropping and grazing purposes.

9.3.7. Compensation to landholders

Compensation is payable to landholders for use of their land for easement purposes. In order to achieve this, valuations of each required parcel of land were undertaken by an independent, licenced valuer and an estimate of compensation made in relation to the 80 m wide easements.

The determination of compensation was made with reference to the *Land Acquisition Act 1969* which sets out the various principles of compensation including the following:

- number of towers per property
- impact of the proposed easement on the remaining use of the land
- loss of privacy due to easement access by ElectraNet and its contactors to construct and maintain the transmission line
- negative perception about electro-magnetic field generated by transmission lines and potential bias by potential purchasers of land with transmission line easements
- market value, based on a review of land sales in the general area
- loss of land by reason of severance, disturbance or injurious affection[4].

The compensation amount has been provided to each of the impacted landholders in the relevant agreement (e.g. Option deed) with an explanation as to how it was calculated. Compensation will be payable to the landholders following ElectraNet triggering the Option deeds.

[4] Injurious affection is defined as those losses suffered as a consequence of what is constructed on the acquired land. This includes consideration of the potential long-term impacts on landholder activities.

9.4. Impact Assessment

The following aspects of the Project have been identified as sources of impacts to land use:

Construction

- timing and location of construction activities
- use of property access tracks
- establishment of new access tracks, temporary construction camp and staging / laydown areas
- presence of construction crews, vehicles and equipment
- movement of Project vehicles through the area of the Project.

Operations

- the presence of the transmission line (including changes to land use, and effects on airfields and aircraft movements and communication networks)
- other infrastructure projects proposed for the region as a result of the Project.

The potential impact events resulting from these aspects of the Project are discussed below.

9.4.1. Construction

Disruption to usual landholder operations

Prior consultation with landholder will ensure minimise the potential for disruption to landholder operations during the construction phase.

If not adequately planned for, there is potential for day-to-day operations of landholders to be temporarily disrupted by the location and timing of construction activities.

As detailed in Chapter 7 Project Description, construction duration at each tower location will be short-term and restricted to defined locations. Landholders will be consulted regarding the location, timing and management of proposed activities and notified in advance of planned construction activities with the aim of minimising disturbance to property operations. Timely prior notification will assist landholders to adjust regular or seasonal activities (e.g. harvesting, seeding, mustering, spraying) in the vicinity of the easement before construction commences. This equally applies to consideration of tourism, recreation, scientific and other activities within Calperum and Taylorville Stations.

Discussions with landholders will ensure Project design and construction activities avoid primary locations such as residences, buildings, water tanks and other facilities which are required to continue primary production activities.

The process for notification of landholders will be detailed in the Construction Environmental Management Plan (CEMP). Timely negotiation and cooperation with landholders, and the short-term nature of construction activities is expected to result in only minor and temporary disruption of landholder activities from Project construction.

The predicted impacts are in the **Minor** category. Uncertainty in the predicted impact (based on uncertainty in location and timing of construction activities) has been evaluated in Appendix O and the level of risk is **Low.**

Disruption to landholder amenity

Ongoing engagement with affected landholders will seek to minimise impacts to lifestyle amenity of landholders as a result of construction activities.

A loss of amenity may be experienced by some landholders whose normal lifestyle and usually private property will be subject to construction activities. These effects are expected to result from exposure to construction activities, vehicles and workforce, including temporary construction camps.

Requirements for property access for construction activities and the presence of temporary construction camps on some properties may raise concerns for those landholders about their personal safety and property security, and the potential for crime / anti-social behaviour and misuse of alcohol and drugs. Landholders may also have concerns relating to their personal privacy and the ability to run their business without interruption / interference (Department of Regional Development and Lands 2011).

ElectraNet is consulting with directly affected landowners throughout the planning of the Project to discuss the potential effect of the transmission line on the use and enjoyment of their properties, possible design alternatives and options, management issues, continuity of current operations, access arrangements and compensation.

Consultation undertaken with landholders along the alignment has identified a willingness to host temporary construction camps on properties. Temporary camp site locations on private property will be determined in consultation with affected landholder and will take into account landholder concerns around access, property security, privacy and other matters. Landholders will be compensated and use of the land for the purpose of temporary construction camps will be in accordance with agreed rights and responsibilities.

All ElectraNet employees, contractors and visitors who interact with members of the local community are expected to adhere to ElectraNet policies requiring respect for the cultural environments of the communities in which ElectraNet operates. The workforce accommodated at the temporary construction camps will be provided with guidance on expected standards of behaviour and conduct which will take into account any specific requirements of the landholder.

Strict policies on the use of alcohol and other drugs affecting fitness for work will be implemented on construction sites and the temporary construction camps to ensure workplace safety. Vehicles entering and leaving the temporary camps will be subject to entry and exit policies and procedures.

The predicted impacts are in the **Minor** category. Uncertainty in the predicted impact (based on uncertainty in camp locations and implementation of control measures) has been evaluated in Appendix O and the level of risk is **Low.**

Impacts to visual amenity are discussed further Chapter 13 Visual Amenity.

Loss of access or damage to property access tracks

Property access tracks used during construction will be managed in consultation with affected landholders.

The preferred primary access to the Project easement will be via the use of existing public and private roads, and existing tracks on the properties traversed by the Project (and adjacent properties subject to landholder agreement) These will include the existing access tracks and easement used to maintain ElectraNet's 132 kV transmission lines.

Access for construction requires an approximately 5 m cleared track to access tower construction footprints and temporary stringing access corridors approximately 5 m wide between tower locations to allow stringing of the conductors. Tracks will be designed to take the shortest route with as little impact as possible to native vegetation, existing land uses and landholders. As the Project is aiming to

utilise existing tracks wherever possible, there is potential for disruption to landholder activities through track closures or damage to tracks.

Impacts to property operations from delays to travel times due to short-term closure of property access tracks are generally expected to be negligible, however more extended delays may occasionally occur which may temporarily impact landholder operations. If full track closures are necessary (e.g. for safety reasons) it is possible that some sections of properties may become temporarily inaccessible if alternate routes are not available. Use of alternate routes may also result in increased travel times for the duration of construction or access track closure.

The Project also has the potential to affect the condition of unsealed access tracks on properties traversed by the proposed alignment through road wear / damage caused by additional Project construction traffic (particularly heavy loads) and through unplanned events (e.g. Project vehicle accidents or bogging). These impacts (if they occur) may result in disruption to property activities through time delays or the need to use alternative routes if access tracks become unusable / impassable or nuisance to landholders (e.g. discomfort from using tracks in poor condition).

ElectraNet will negotiate use of existing access tracks with landholders to ensure impacts to land uses and landholder operations from closure of tracks and any requirement to use alternative routes are minimised. Property access tracks which may be at risk of deterioration from Project transport activities will be identified and measures to mitigate impacts will be put in place if required. These could include identifying alternative routes, upgrading access tracks prior to Project use, repairing access tracks during and after Project use and managing driver behaviour of Project contractors.

Landholders may also benefit from the requirement for construction access which could involve the repair and upgrade of existing property tracks both before and after construction activities. Damage to existing assets or infrastructure, such as property fences and gates, is considered unlikely. Should any damage to property assets result from Project activities, this would be rectified by ElectraNet and its EPC contractors as soon as practicable and at its expense.

The predicted impacts are in the **Minor** category**.** Uncertainty in the predicted impact (based on uncertainty in location and timing of activities) has been evaluated in Appendix O and the level of risk is **Low.**

Land and vegetation disturbance

Impacts from temporary land disturbance will be minimised by reinstatement immediately after construction activities have concluded. Locations for permanent clearance will be selected to minimise impacts to landholder operations.

Construction activities will require both temporary and permanent land and vegetation disturbance which has the potential to impact short and long-term land use. There is also potential for impacts through discovery of previously unknown cultural heritage (refer Chapter 12 Cultural Heritage). Vegetation clearance impacts are also discussed further in Chapter 11 Flora and Fauna.

Temporary disturbance will be required on some properties during construction to accommodate the stringing access corridor, upgraded / new access tracks, and for temporary worker camps, laydown and staging areas. Land to be cleared for temporary construction purposes will be reinstated immediately after construction activities have concluded and will be undertaken in accordance with the agreement with the affected landholder and the Project CEMP (refer Appendix P).

Land disturbance of the stringing access corridor between tower locations will typically be undertaken using a dozer with blades raised to remove larger trees (while keeping shrubs, grasses and topsoil largely intact), or rolled where possible. Rootstock of larger trees may be left intact to allow regeneration rather than being removed where practicable.

Up to four temporary self-contained worker camps to accommodate up to approximately 250 people will be required along the transmission line corridor during the construction period. Locations for these camps will be determined during the detailed design phase of the Project and will be sited in areas already disturbed by development or with limited native vegetation, and which meet a range of other criteria (refer Section 7.5.6).

Camp site locations on private property will determined in consultation with affected landholders, taking into account landholder requirements for access, land use activities, privacy and other matters. Landholders will be compensated and use of the land for the purpose of temporary construction camps will be in accordance with agreed rights and responsibilities.

The temporary worker camps will be rehabilitated immediately after use in accordance with the Project Draft CEMP (refer Appendix P). As detailed in Chapter 7 Project Description, reinstatement of these sites would involve removal of construction material, foundation spoil and waste, surface contouring and scarifying where required, and respreading of topsoil and cleared vegetation to encourage natural recruitment of vegetation.

Up to four laydown / staging areas will be required for the construction phase, and where possible will be co-located with the temporary worker camps. These areas are used to store heavy vehicles, equipment and bulk materials needed to construct the transmission line. Location of these sites will be determined in accordance with the same criteria and under the same land access / use arrangements for compensation and reinstatement as for workers camps (refer Section 7.5.6).

Some permanent clearance of native vegetation within the transmission line easement will be required for tower pads and access tracks. Areas where native vegetation is degraded or has been previously cleared will be utilised in preference to permanently clearing vegetation wherever practicable. New access to the tower locations may be required where there are no existing tracks and will be designed to take the shortest route (potentially using short spur tracks off existing roads or access tracks) to minimise impacts. Micro-siting of towers and easement access will be the subject of consultation with landholders as part of easement negotiations.

Chapter 12 Cultural Heritage and the Cultural Heritage Management Plan Framework (Appendix R) provide information on ElectraNet's commitment to working with Traditional Owners to protect cultural heritage values during all phases of the Project, including strategies that will be utilised to avoid sites and manage heritage generally.

The predicted impacts are in the **Minor** category. Uncertainty in the predicted impact (based on uncertainty in final definition of clearance areas and the potential for excursions outside designated clearing areas) has been evaluated in Appendix O and the level of risk is **Low.**

Movement of construction workers, vehicles and equipment in local areas

Disruption to land uses from the increased presence of construction crews and equipment will be minor, short term and localised.

Construction activities will result in a temporary increased level of activity in the generally sparsely populated rural and remote areas traversed by the transmission line corridor. The presence of workers camps and laydown / staging areas and movement of equipment will lead to a short-term increase in traffic with the potential to cause delays to the usual flow of local traffic or disruption to the use of local roads for agricultural activities. Construction of access tracks or failure to secure gates may lead to unauthorised access to private land. Noise issues from the increase in the number of people in the area also have the potential to impact on land uses and landholders.

Vehicle movements will generally be scheduled outside peak periods wherever possible and it is expected that workers would typically be transported by bus from the temporary workers camp to construction sites to minimise the number of additional vehicles on local roads. Where other light vehicles are used to access these sites, parking will generally be within 30 m of each tower location on

the edge of access tracks within in cleared areas. Vehicle movements (including heavy vehicle movements) will be confirmed during detailed design and traffic management measures will be addressed in a Traffic Management Plan. Potential impacts of traffic are discussed further in Chapter 16 Traffic and Transport.

Due to the remote nature of the Project, extended construction hours are proposed. However where activities are proposed in close proximity to identified sensitive noise receptors (e.g. residences), hours of construction, including the delivery of materials to and from site will include restricted hours on Saturdays and no work on Sundays and public holidays. Engagement with sensitive residential receptors will enable early notification of activities and for input to be provided before works begin, allowing works to be scheduled in a way that minimises the nuisance to receptors. Management of potential noise impacts is discussed further in Chapter 15 Noise and Vibration.

Land access protocols will be established with each landholder where construction activities are planned. Appropriate and agreed access instructions will be set out in the CEMP and standard ElectraNet operating procedures and provided to all contractors and construction crews.

The predicted impacts are in the **Minor** category. Uncertainty in the predicted impact (based on uncertainty in the location and timing of activities and implementation of control measures) has been evaluated in Appendix O and the level of risk is **Low.**

Introduction or spread of weeds, pests and pathogens

Project activities are not expected to result in introduction or spread of weeds, pest or pathogens.

The movement of Project vehicles and personnel into and within the area of the Project and between properties has the potential to introduce or spread weed and pests or pathogens (e.g. phylloxera, fruit fly and stock diseases) in agricultural land.

Liaison with landholders will be ongoing prior to and during construction, and ElectraNet and its contractors will ensure that any specific weed, pest or pathogen requirements are communicated and implemented. As noted in Chapter 11 Flora and Fauna, standard practices in the CEMP and OEMP will be implemented to manage potential impacts during construction and operation. Pre-construction inspections would be undertaken to identify any areas of weed infestation requiring specific management measures. Any weed or pest management would be carried out in consultation with landowners and the Landscape Board or relevant government agency (e.g. PIRSA). Restrictions on movement of fruit and vegetable material (e.g. by the construction workforce) would be in accordance with PIRSA requirements at the time.

The predicted impacts are in the **Negligible** category. Uncertainty in the predicted impact (based on uncertainty the presence of weeds, pests and pathogens at the time of construction and implementation of control measures) has been evaluated in Appendix O and the level of risk is **Low.**

9.4.2. Operations

Restriction on land use and property activities due to the presence of the transmission line

Consultation with landholders in determining the location of the easement and the micro-siting of the towers will take into consideration potential long-term impacts on landholder activities and property values.

The presence of the transmission towers and access tracks on affected properties has the potential to impact:

- permitted current and future land uses (particularly on the transmission line easement) including fragmentation of land
- transmission line clearance requirements which may disrupt landholder operations by limiting vehicle access below the transmission line

- conservation values, tourism and recreation experiences in areas managed for conservation purposes and other tourist locations
- property values through exclusion of land on the easement.

Current land uses

Agricultural or horticultural land uses within the transmission line easement are not expected to be significantly impacted by the Project, as a wide range of activities and infrastructure are generally compatible with transmission line easements. These include grazing, permanent and annual plantings (e.g. orchards and vegetables) and native vegetation which meet height clearance restrictions, and access tracks, fences and gates (refer Table 9-5).

Design of the transmission line is planned to span across areas of mature native vegetation to minimise the requirement for clearance or lopping where possible (i.e. vegetation potentially up to a height of 8 m). As mallee in areas surveyed on the transmission line corridor is rarely greater than 8 – 9 m height, clearance or trimming requirements are likely to be very limited along most of the alignment. Native vegetation clearance is discussed further in Chapter 11 Flora and Fauna.

As grazing is permitted on the easement it is not anticipated that the Project will cause a reduction in stocking rates on affected properties. There are no permanent orchard plantings on the proposed alignment.

Management of irrigation and chemical spraying activities will be agreed with landholders to avoid exposure of transmission towers and conductors to excessive water or chemicals. Restrictions may be required on location of infrastructure (e.g. sheds or yards) or activities which would impede access to the easement or transmission line for maintenance or inspection. Storage of materials and excavations which impact on the footings of transmission lines will not be permitted. Land management requirements within the easement will be agreed with landholders as part of easement negotiations.

The transmission line easement has the potential to bisect paddocks or other infrastructure which may restrict access or otherwise constrain landholder activities. This potential impact will be addressed through the consultation process with each landholder in relation micro-siting of towers and the location of the easement. Fragmentation of land uses will be further mitigated where possible based on Project studies and engagement with stakeholders.

There is also potential for increased or unauthorised public access to properties facilitated by the presence of access tracks to the easement for maintenance purposes. Uncontrolled public access to the easement by the public will be restricted via locked gates to prevent potential impacts on land use, property security and landholder amenity. Land access protocols will be established with each landholder during the acquisition of property or easement interests, including landholder access requirements where necessary.

Future land uses

As discussed above, the Project may lead to restriction of some landholder activities for some properties within the Project transmission line corridor, leading to an actual or perceived constraint on future developments by landholder enterprises.

The majority of potential landholder development restrictions are only required in the Project easement (a width of 80 m). This relatively small Project footprint within each property reduces the likelihood of actual development constraints occurring and, although consultation with affected landholders is still in progress, it is estimated that the majority of potential development restrictions would apply to less than 0.6% per property within the Project transmission line corridor (BDO EconSearch 2020).

The transmission line corridor largely utilises existing transmission lines, roads and other cleared areas, and material changes or additions to existing levels of fragmentation and access are not expected to result from the Project for the majority of the properties along the proposed alignment.

Alignment of the transmission line corridor with property boundaries and existing roads and tracks where possible, and consultation with landholders in determining the location of the easement within properties will minimise potential long-term impacts on landholder activities and property values. It is considered unlikely that constraints on future land uses will be result from the Project.

Non primary-production land uses

The transmission line corridor has been selected to follow existing infrastructure corridors, avoid areas of high value conservation and cultural significance, and is located away from scenic tourism locations as far as possible. For most of the proposed alignment, the Project will be constructed alongside an existing transmission line which will result in only a minor additional impact on visual amenity values and remote landscape experiences for the small number of visitors to the area.

Impacts to tourism and conservation land uses are expected to be minimal due to the effects of vegetation height and topographic variation at most locations used for camping, fishing, hunting and other recreational activities, shielding views of the transmission line from receptors.

Due to the nature of their visitation, the low number of visitors to Calperum and Taylorville Stations are potentially sensitive to the presence of the transmission line on the southern boundaries of these properties. Views of the Project infrastructure will only be possible from the far southern extent of the stations, will be infrequent and will be mitigated by the height of the vegetation. Alignment of the transmission line on the station boundaries has been selected to minimise impact to their high conservation values and the presence of the transmission line is not predicted to significantly impact scientific and recreational land uses on the properties.

Overall the predicted impacts of the permanent presence of the transmission line infrastructure on landholder operations are in the **Minor** category. Uncertainty in the predicted impact (based on uncertainty in the final location of infrastructure) has been evaluated in Appendix O and the level of risk is **Low.**

Effect on property value

The requirement for an approximately 80 m wide easement for the full length of the proposed alignment has the potential to negatively impact the land value of affected properties.

As noted above, current land uses will largely be able to continue along the easement and permanent economic impacts from a loss of productivity are not expected.

All landholders whose properties will be accessed by the transmission line easement have been extensively engaged with as part of easement and compensation negotiations. The loss of land to the easement is considered during the valuation process and reflected in the offer of compensation made to landholders during easement acquisition negotiations.

ElectraNet operates from the position that compensation is awarded on the basis that no directly affected property owners are financially disadvantaged as a result of having the transmission line on their property. Option deeds for an easement have been signed over multiple properties and all landholders will be compensated in accordance with an independent valuation and appropriate market value.

The predicted impact of permanent exclusion of areas along the proposed transmission line on property value is in the **Negligible** category.

The presence of the transmission line in low-flying air space

The potential for wire strike or other collision with transmission lines by low flying aircraft will be mitigated through marking of transmission line conductors, consultation with CASA and operation of air safety regulations.

The construction and presence of the transmission towers and conductors has the potential to impact the conduct of aerial activities such as mustering, baiting, spraying, firefighting or other activities. Transmission line conductors have low visibility from the air (i.e. with a land background) when compared to conductors viewed from the ground with a sky background. Night flying and low cloud also create the potential for collision with either towers or conductors.

There are two airfields in the vicinity (Renmark Aerodrome and Waikerie Aerodrome) which are managed by the local councils, and two private unregistered airstrips within 5 km of the transmission line corridor, one north of the White Dam Conservation Park and one south of Taylorville Station and west of Hawks Nest Station.

ElectraNet will undertake ongoing consultation with the Civil Aviation Safety Authority Australia, the Renmark Paringa Council and the Loxton Waikerie Council about their requirements for structures within the vicinity of airfields (refer Chapter 6 Stakeholder Engagement). Relevant authorities will be advised of the commencement of construction of the transmission line, and the final GPS coordinates of towers will be provided.

Pilots undertaking aerial operations are generally specialists trained in low-level flying and must be appropriately licenced by the Civil Aviation Safety Authority (CASA). Pilots also undertake risk assessments prior to flight which would include ascertaining the location of powerline structures. Pilots using local and private airfields in and around the transmission line corridor are required to adhere to aviation rules and regulations which would mitigate against potential collision with new and existing infrastructure.

Transmission line markers, which are typically made of fibreglass, will be attached to the conductors in areas of the transmission line corridor that are close to known airstrips to provide visual warning to aircraft of the location of the conductors.

It is noted that there is an unregistered airstrip on the property west of Hawks Nest Station and within approximately 500 m of the proposed alignment. ElectraNet have engaged with the landholder and are working to ensure potential impacts on the use of the unregistered airstrip are suitably managed.

The predicted impacts of the permanent presence of the transmission line infrastructure on aerial activities and local airfields are in the **Minor** category. Uncertainty in the predicted impact (based on uncertainty in the final location and design of infrastructure) has been evaluated in Appendix O and the level of risk is **Low.**

Interference with communication networks and radio frequencies

Interference to communication networks is expected to be limited to within the easement line and will be momentary while passing underneath the transmission line.

Disruption to UHF radio and mobile phone reception could potentially impact communications and safety measures for farming businesses, and disrupt access to entertainment during long hours of farm equipment operation.

The SNI EIS (SKM 2002) indicates that interference with UHF and AM / FM radios may occur within 20 – 30 m of the transmission line. As the transmission line will have an 80 m wide easement, interference is therefore most likely to occur when users are located within that easement. Most radio usage on farms or other locations in the vicinity of the transmission line would be expected to occur outside of this area, with only minor and brief interference occurring while the user passes underneath the transmission line or is in the immediate vicinity of a crossing point beneath the transmission line.

Corona discharge produces an audible noise and can affect television, radio, CB, broadband and mobile phone reception. It is possible that momentary fading of radio reception in a motor vehicle may occur in areas immediately below a transmission line, particularly if the radio signal is weak to begin with (SKM 2002). Corona discharge effects are further discussed in Chapter 15 Noise and Vibration.

Telecommunications for operation of the transmission line will be provided by an optical ground wire, consisting of an optical fibre core within the earth wire, and by radio links. A radio tower of approximately 50 m high will be constructed at the site of the Bundey substation to connect into the existing network boost telecommunications and reduce negative impacts that may otherwise be experienced.

ElectraNet will ensure that the transmission line is designed in accordance with all national standards for electromagnetic interference. Regular patrols of the transmission line will occur and any damaged insulators or other hardware which have the potential to cause interference will be repaired or replaced.

Any disruption to communication networks from the transmission line is expected to be transitory and limited to specific locations (i.e. within the easement). The predicted impacts of presence of the transmission line on the communication network and devices are in the **Negligible** category. Uncertainty in the predicted impact (based on uncertainty in final location of infrastructure) has been evaluated in Appendix O and the level of risk is **Low.**

Cumulative impacts on availability of land for primary production

Cumulative impact of other infrastructure projects (e.g. renewable energy generation facilities enabled by the Project) on land available for primary production purposes is expected to be negligible.

The encouragement of renewable energy generation in the area of the Project (which is one of the stated objectives of Project EnergyConnect), has the potential to impact the availability of land for primary production purposes through the change in land use. Recent renewable energy projects proposed within the Renewable Energy Zones that are traversed by Project EnergyConnect have considered the compatibility of these projects with existing land uses and the potential impacts of power generation on land use.

The Robertstown Solar project is expected to convert around 1,800 hectares of agricultural land from dry cropping and grazing to solar energy generation (Robertstown Solar 2019). As grazing is considered as a possibility once the project is operational, there is potential for the land to continue to be used for primary production, although with some constraints on possible uses.

The Goyder South project (GHD 2020) which is being designed and sited to complement Project EnergyConnect, also proposes controlled sheep grazing by landowners to assist with vegetation management. The project proposal notes that land under solar panels typically retains at least 80% of its pre-solar carrying capacity in dry sheep equivalent (DSE) and that the wind, solar and transmission components of the project are compatible with shared land use arrangements, including ongoing grazing (GHD 2020).

Other proposed renewable energy projects in the region (e.g. the Riverland Solar and Storage project (Lyon Group 2019) located south of the transmission line corridor near Morgan) have indicated that grazing would not be possible during operation of the solar farm due to potential damage to equipment from stock. However it was noted that the change in land use for the solar farm is reversible and that current pastoral land use activities could resume at the end of the project (or other land uses could be considered) once all above ground infrastructure is removed as part of project decommissioning.

The change in land use from primary production to renewable energy land uses should also be balanced against the other positive impacts such projects can have on farm diversification and the local economy. These infrastructure projects in the area of the Project will tend to be located on grazing properties (rather than irrigated agriculture) where the cost of foregone agricultural production is likely to be lower. These landowners may also benefit financially from a second source of income which is not dependent on agricultural commodity markets and seasonal weather variations, and which can supplement farm income on a more sustainable basis.

The Infrastructure and Renewable Energy Facilities provisions of the Planning and Design Code encourage the efficient provision of infrastructure to support renewable energy facilities in a manner that minimises hazard, is environmentally and culturally sensitive and manages adverse visual impacts. These objectives are also consistent with State-wide initiatives to support renewable energy facilities and associated infrastructure, as highlighted in the relevant Region Plans (refer Table 5 11), and the zone and policy provisions within the Code which generally also envisage or accommodate energy generation from renewable sources. (refer Table 5 13).

Ultimately the extent of the cumulative impact of these projects on the availability of primary production land over time, will be dependent on the number and success of renewable energy generation projects, the rigour of the planning assessment and approvals process, ongoing policies of the State government which facilitate appropriate development in the Renewable Energy Zones, and the support of local landowners and communities most directly affected by the resulting changes in land use.

A **Negligible** impact is expected from the loss of land for primary production (or constrained activities) due to investment in renewable energy in the area of the Project. This is considered in the context of the vast amount of land used for grazing in the broader region, when compared to the area of land potentially taken out of production or where activities are constrained (potentially temporarily) by future infrastructure project developments.

9.4.3. Summary of key mitigation measures

Table 9-6: Key mitigation measures – land use

Mitigation measure	Construction	Operation
Implementation of principal design controls that seek to reduce impacts as a result of Project activities including: • follow existing infrastructure corridors • avoid areas of high cultural significance • avoid high value conservation areas and wetlands • avoid important habitat for threatened species • minimise the potential for disturbance	✓	✓
Investigation through technical studies and landholder discussions will confirm the exact placement of infrastructure to mitigate impacts and risks associated with land access	✓	✓
Implement fruit fly management protocols in accordance with PIRSA requirements	✓	✓
Implement weed hygiene procedures such as vehicle wash-downs and inspections in consultation with landholders, where appropriate	✓	✓
Control weeds on ElectraNet owned land in accordance with the Landscape South Australia Act	✓	✓
Undertake adaptive weed management, monitoring and control where required if weeds are detected, particularly following rainfall events and disturbance events.	✓	✓
Monitor stockpiles for weed outbreaks	✓	
Appropriately dispose of any declared weeds cleared as part of the Project (with any necessary notification/permits under the Landscape South Australia Act in place for moving / relocating vegetation containing declared plants).	✓	✓

Mitigation measure	Construction	Operation
Maintain property / landholder database with details of special access requirements including weeds, biosecurity, washdown etc.		✓
ElectraNet is consulting with directly affected landowners (including neighbouring properties or where properties affected by access) throughout the planning of the Project to discuss the effect the transmission line will have on their properties, design alternatives and options, management issues, continuity of current operations, access arrangement and compensation.	✓	✓
ElectraNet will undertake measures to mitigate deterioration of access tracks (for example, but not limited to, identifying alternative routes, upgrading access tracks prior to Project use, repairing access tracks during and after Project use, managing driver behaviour of Project contractors).	✓	✓
If full closures of access tracks are required, ElectraNet would communicate this with potentially affected landholders to allow access through construction areas where possible or arrange alternate routes.	✓	✓
Install locked gates on easement where required and appropriate signage once construction is completed.		✓
Ongoing consultation to determine micro-siting of the towers, easement access and location, and management of temporary workers camps and laydown / staging areas (where this has been agreed). Location of the easement, towers and associated access, and management of land uses within the easement will take into consideration potential long-term impacts on landholder activities.	✓	✓
Register any complaints in ElectraNet's IMS and implement any necessary corrective action program.	✓	✓

9.5. Conclusion

Impact to properties, land uses and landholders will be limited due to designing the transmission line corridor to follow existing road reserves, existing infrastructure and / or property boundaries wherever possible.

All landholders whose properties will be accessed by the transmission line easement have been extensively engaged with as part of easement and compensation negotiations and there will be ongoing consultation with landholders to determine micro-siting of the towers, easement access and location and management of temporary workers camps and laydown / staging areas (where this has been agreed). Location of the easement, towers and associated access, and management of land uses within the easement has taken into consideration potential long-term impacts on landholder activities.

Overall, during the construction phase, disruption to landholder operations is expected to be limited to the short period when construction is undertaken at each tower location. Timing and location of construction activities will be planned in consultation with landholders and land cleared for temporary construction purposes will be reinstated immediately after construction activities have concluded and will be undertaken in accordance with the agreement with the affected landholder and the Project CEMP.

Impacts on activities at local airfields and airstrips and risks to aerial activities are not expected. The risk of conductor strike or other collision with transmission towers by low flying aircraft will be mitigated through consultation with CASA and operation of air safety regulations. Interference to communication networks is expected to be limited to within the easement line and will be momentary while passing underneath the transmission line.

Impacts from the loss of land for primary production due to investment in renewable energy are expected to be negligible when considering the amount of land available for grazing in the broader region, compared to the small area of land potentially taken wholly or partly out of production.

EIS Volume 1 Chapter 10

Physical Environment

JBS&G

project energy connect

Contents

10. Physical Environment 10-1
10.1. Key Findings 10-1
10.2. Setting the Context 10-1
10.2.1. EIS Guidelines 10-1
10.2.2. Requirements in legislation and other standards 10-3
10.2.3. Views of stakeholders 10-4
10.2.4. Assessment method 10-4
10.3. Description of Existing Environment 10-4
10.3.1. Climate 10-4
10.3.2. Soils and landform 10-8
10.3.3. Surface water 10-20
10.3.4. Groundwater 10-27
10.4. Impact Assessment 10-34
10.4.1. Erosion and sedimentation 10-34
10.4.2. Soil compaction 10-35
10.4.3. Soil stockpiling 10-36
10.4.4. Disturbance of acid sulfate soil 10-36
10.4.5. Alteration of drainage patterns 10-36
10.4.6. Groundwater use 10-37
10.4.7. Soil or water contamination 10-37
10.4.8. Summary of key mitigation measures 10-40
10.5. Conclusion 10-41

List of Tables

Table 10-1: EIS Guidelines addressed in the Physical Environment chapter 10-2
Table 10-2: Aspects of assessment requirements addressed in other chapters 10-3
Table 10-3: Summary of rainfall and temperature information 10-5
Table 10-4: Landform, soils and vegetation in IBRA regions and subregions 10-8
Table 10-5: Surface geology 10-14
Table 10-6: Hydrostratigraphic units in the Murray Basin and Quaternary alluvium 10-28
Table 10-7: Groundwater well data within 5 km of the proposed alignment 10-30
Table 10-8: Key mitigation measures – physical environment 10-40

List of Figures

Figure 10-1: Mean monthly rainfall 10-5
Figure 10-2: Wind roses for Eudunda and Gluepot meteorological stations 10-6
Figure 10-3: Wind roses Loxton and Renmark Aero meteorological stations 10-7
Figure 10-4: Locations of IBRA regions and subregions in relation to the Project 10-12
Figure 10-5: Elevation along the transmission line corridor 10-13
Figure 10-6: Surface geology in the region of the Project 10-16
Figure 10-7: Acid sulfate soil potential on the transmission line corridor 10-19
Figure 10-8: Surface water features in the vicinity of the transmission line corridor 10-22

Figure 10-9: Historic flood levels and areas of regular inundation 10-23
Figure 10-10: Watercourses at the western end of the transmission line corridor 10-25
Figure 10-11: Shallow groundwater depth on the transmission line corridor 10-31
Figure 10-12: Shallow groundwater salinity on the transmission line corridor 10-32
Figure 10-13: Groundwater wells within 5 km of the proposed alignment 10-33

List of Plates

Plate 10-1: Undulating hills in the east of the Broughton subregion north of Robertstown substation looking north 10-9
Plate 10-2: Undulating plain in the Murray Mallee subregion 10-10
Plate 10-3: Plains in the Braemer subregion (Northwest Bend substation) 10-10
Plate 10-4: Plains and dunes in the South Olary Plan region 10-11
Plate 10-5: Riverine plain in the Murray Scroll Belt Subregion 10-11
Plate 10-6: Burra Creek (approximately 1 km south of the proposed alignment) 10-26
Plate 10-7: Panorama of proposed Bundey substation site from south-west corner 10-26

10. Physical Environment

This chapter describes the existing physical environment of the Project and how construction and operation of the Project will affect soils, landform, surface water and groundwater.

10.1. Key Findings

- There is a low potential for soil erosion or sedimentation of surface waters which can be readily managed by infrastructure location and erosion and sedimentation controls.
- Soil compaction will be limited in extent and will be rehabilitated in areas of temporary disturbance following construction.
- Soil stockpiles will be appropriately managed to maintain soil viability and minimise loss of soil from wind and water erosion during construction.
- Acid sulfate soil is not expected to occur. If it is encountered, it will be appropriately managed and treated to prevent impacts to soil or water quality.
- Design and placement of infrastructure (including towers, access tracks and the Bundey substation) will avoid alteration of surface water flows.
- Groundwater abstraction (if required) will be assessed and managed so that it does not result in drawdown of aquifers and reduction in groundwater availability for flora, fauna and groundwater users.
- Wastewater disposal (e.g. temporary camp wastewater, washdown water) will be appropriately managed to avoid contamination of soil, surface water or groundwater.
- Groundwater will largely not be intersected by excavation and dewatering (if required) will be managed appropriately to ensure there are no impacts to soil and surface water quality.
- Existing contamination is not expected to be encountered or disturbed and procedures will be in place to prevent any additional contamination of soil, surface water or groundwater if it is encountered.
- Appropriate storage and handling of chemical and fuels will be undertaken and contamination of soil, surface water or groundwater is not expected occur as result of construction and operation.

10.2. Setting the Context

This section provides information to explain the context within which impact assessment is undertaken. It describes:

- the relevant EIS guidelines
- relevant requirements in legislation and other standards
- views of stakeholders and the environmental and social outcomes they would like the project to meet
- the assessment methodology used to identify baseline environmental values and to undertake the impact assessment.

10.2.1. EIS Guidelines

The EIS Guidelines require an assessment of the effect on the physical environment as set out in Table 10-1.

Table 10-1: EIS Guidelines addressed in the Physical Environment chapter

EIS Guidelines and Assessment Requirements	Assessment level
Effect on the Physical Environment *Assessment requirement 12:* The proposed development has the potential to disturb landforms and soils and to affect stormwater run-off	
• 12.1: Describe the nature and condition of the existing physical environment in the proposal's environs, including reference to geology, geomorphology, soils, hydrology and atmosphere	Medium
• 12.2: Identify any risks and implications of causing or exacerbating land degradation, especially soil erosion and the impacts of dust emissions during construction and ongoing maintenance	Medium
• 12.3: Identify the potential for pollution (including, but not limited to, sedimentation) of wetlands, watercourses, drainage channels and groundwater (especially at crossing points during construction), including the implications of this pollution	Medium
• 12.4: Describe potential changes to hydrology (e.g. drainage patterns or groundwater characteristics), including the implications of these changes	Medium
• 12.6: Outline mitigation measures and their likely effectiveness in minimising or avoiding disturbance to the physical environment (including surface and underground waters) during construction and maintenance	Medium
Construction, Operation and Maintenance Effects *Assessment Requirement 15*: The construction and operation of the proposal would require a range of impacts to be minimised, mitigated and monitored through an environmental management plan framework	
• 15.1: Describe construction techniques and the timing of construction, with reference to any climatic and temporal implications for the biophysical environment. This should include reference to potential land degradation, pollution and implications for the breeding seasons of native species	Standard
• 15.2: Outline the sources of waste and methods of disposing waste material, including reference to management of vegetation removed, indication of temporary and final locations for spoil and other waste and the possibilities for reuse or recycling of all waste streams. Provide details of a waste management plan.	Standard
• 15.4: Describe the location of surface water and groundwater infrastructure and the potential for groundwater interception when digging footings and how dewatering might be managed (if required)	Standard
• 15.6: Describe the impacts and proposed management of stormwater during construction and operation, including any opportunities for retention and reuse. Provide details of a soil erosion and drainage management plan	Standard
• 15.7: Identify the risks of contamination of surface and groundwater from spills of fuel (or other toxic substances). Describe measures for the prevention and containment of spills, describe the contingency plans to be implemented in the event of spills, and comment on their expected effectiveness	Standard
• 15.9: Outline the approximate size of the construction workforce including any need for any construction workers camps or accommodation. Describe the location and management of accommodation camps including sources of water and power, and the management of waste, wastewater and noise impacts.	Standard
• 15.11: Describe the location(s) where mobile concrete batching plants would be used and the management of wastewater, dust emissions and noise from such plant.	Standard
• 15.12: Describe the rehabilitation of the areas needed for construction including lay down, concrete batching and construction worker's accommodation areas.	Standard
Hazard Risk *Assessment Requirement 10:* The construction and operation of a high voltage powerline involves a range general and specific risks	
• 10.3: Describe any hazardous materials, with reference to storage, use, handling and disposal of these materials during construction and operation.	Medium
Specialist reports and details Details of any proposed wastewater management, including segregation, collection, treatment, storage, reuse and disposal of wastewater.	

Aspects of the assessment requirements identified in Table 10-1 which are not addressed in this chapter are listed in Table 10-2 together with the applicable chapter.

Table 10-2: Aspects of assessment requirements addressed in other chapters

Assessment requirement	Chapter
12.1 Nature and condition of the existing physical environment in reference to atmosphere	Chapter 14 Air Quality
12.2 Impacts of dust emissions during construction and ongoing maintenance	Chapter 14 Air Quality
12.2 Risks and implications of dust emissions on flora and fauna	Chapter 11 Flora and Fauna
15.1 Implications of construction for breeding seasons of native species	Chapter 11 Flora and Fauna
15.1 Describe construction techniques and the timing of construction	Chapter 7 Project Description
15.2 Management of removed vegetation , waste management	Chapter 7 Project Description
15.2 Outline the sources of waste and methods of disposing waste material	Chapter 19 Waste Management
15.9 Construction workforce size and location, and size of temporary construction camps	Chapter 7 Project Description
15.9 Noise impacts from construction camps	Chapter 15 Noise and Vibration
15.9 Size of the construction workforce and any need for any construction workers camps and accommodation	Chapter 17 Socio-Economic Environment
15.9 Waste from construction camps	Chapter 19 Waste Management
15.11 Location of concrete batching plants	Chapter 7 Project Description
15.11 Noise emissions from concrete batching plant	Chapter 15 Noise and Vibration
15.11 Dust emissions from concrete batching plant	Chapter 14 Air Quality
15.12 Rehabilitation of lay down, concrete batching and construction worker's accommodation areas	Chapter 7 Project Description
10.3 Storage, use, handling and disposal of hazardous materials during construction	Chapter 7 Project Description

10.2.2. Requirements in legislation and other standards

The *Landscape South Australia Act 2019* provides for the protection and management of the State's natural resources, including provisions relating to land management, water resource management and pest plant and animal control. Regional landscape plans and control policies are in force under the Act to guide management of water, soil and biological assets and define water affecting activities which require a permit. The western 20 km of the transmission line corridor is in the Northern and Yorke landscape management region, and the remainder is in the Murraylands and Riverland landscape management region.

The *Environment Protection Act 1993* creates a general environmental duty to take all reasonable and practical steps to prevent or minimise any resulting environmental harm. It outlines requirements and standards within Environment Protection Policies, including the *Environment Protection (Water Quality) Policy 2015* (Water Quality EPP), which provides the structure for regulation and management of surface water and groundwater quality and specifies relevant environmental values to be protected.

The *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC / ARMCANZ (2000) and revision (ANZG 2018)) are referenced by the Water Quality EPP and provide additional guidance on planning and managing water quality or sediment quality, including the derivation of guideline values.

The *National Environment Protection (Assessment of Site Contamination) Measure 1999* (as amended 2013) (NEPM), provides nationally consistent guidance on assessment and management of soil contamination

Other relevant legislation and guidelines that pertain to soil, landform and hydrology include:

- *River Murray Act 2003* and associated *River Murray Regulations 2017* establish broad management objectives and River Murray Protection Areas (RMPAs) which represent defined areas for regulating activities and policies.
- EPA SA guidelines including:
  - *Stormwater Pollution Prevention Code of Practice for the Building and Construction Industry (1999)*
  - *EPA 080/16 Bunding and spill management*
  - *EPA 517/16 Stormwater management for wash bays*
  - *EPA 1093/18 Environmental management of dewatering during construction activities*
  - *EPA 1095/19 Construction Environmental Management Plan (CEMP)*
- Australian Standard *AS 1940 The storage and handling of flammable combustible liquids*

10.2.3. Views of stakeholders

Consultation undertaken from December 2018 and ongoing through 2019 has highlighted the general position that the natural assets and ecosystem function of the area needs to be protected. There was a consistent view put forward by the majority of stakeholders that the proposed route should not traverse south of the Murray River for a variety of social, economic and environmental reasons (including number of landholders who would be impacted, number of productive agricultural and viticultural operations that would be impacted, potential impacts to tourism, proximity to the flood plains, and potential impacts to cultural heritage).

Details of community consultation are set out further in Chapter 6 Stakeholder Engagement.

10.2.4. Assessment method

The method of assessment has followed that set out in Chapter 8 Impact Assessment Methodology.

The description of the existing environment utilised publicly available information, supplemented by field observations and photographs undertaken by JBS&G and ElectraNet personnel between August 2018 and December 2020. Information sources are referenced in the text where relevant.

The assessment focussed on the 1 km wide transmission line corridor, with reference to the broader region where necessary. A 10 km wide corridor (5 km either side of the proposed alignment) has been used where appropriate (e.g. for mapping of features in and near the corridor and for assessment of aspects such as groundwater infrastructure).

Where there was uncertainty in the assessment of expected impacts, this was evaluated using risk assessment tools, as discussed in Chapter 8 Impact Assessment Methodology. This is discussed under each impact event where relevant. A summary of the evaluation of uncertainty for all impact events is contained in Appendix O.

10.3. Description of Existing Environment

10.3.1. Climate

The climate in the region traversed by the Project is broadly defined as temperate, characterised by warm to hot summers and mild, dry winters with cool to cold nights. Rainfall is variable throughout the region and rainfall frequency and intensity varies from year to year, with long periods of drought-like conditions evident in historical records. Rainfall exhibits seasonal variation with most rainfall occurring in winter and early spring. Average rainfall and the number of rainfall events in the region to the west of Morgan are typically higher than to the east.

Table 10-3 provides a summary of mean monthly temperatures and rainfall for five meteorological stations located in the region, from Eudunda near the western end of the transmission line to Renmark, near the eastern end.

Figure 10-1 shows the mean monthly rainfall data for these meteorological stations. The average annual number of rain days varies between 72 (Renmark) and 108 (Eudunda), although this can vary considerably from year-to-year.

Table 10-3: Summary of rainfall and temperature information

	Eudunda (#24511)	Robertstown* (#24528)	Gluepot (#20028)	Loxton (#24024)	Renmark Aero (#24048)
Annual mean min. – max. temperature (°C)	12.4 – 21.2	–	9.3 – 25.3	9.1 – 24.0	9.7 – 25.0
Highest mean monthly max. temperature (°C)	29.4	–	34.0	32.1	33.8
Lowest mean monthly min. temperature (°C)	5.1	–	3.6	3.9	3.8
Annual mean rainfall (mm)	446.0	338.0	263.9	256.0	232.9
Highest mean monthly rainfall (mm)	55.8	42.2	33.1	27.1	24.3
Lowest mean monthly rainfall (mm)	20.6	15.8	13.0	11.4	11.6

(Source: BoM 2020)
*Rainfall data only is available from Robertstown (Station 24528)

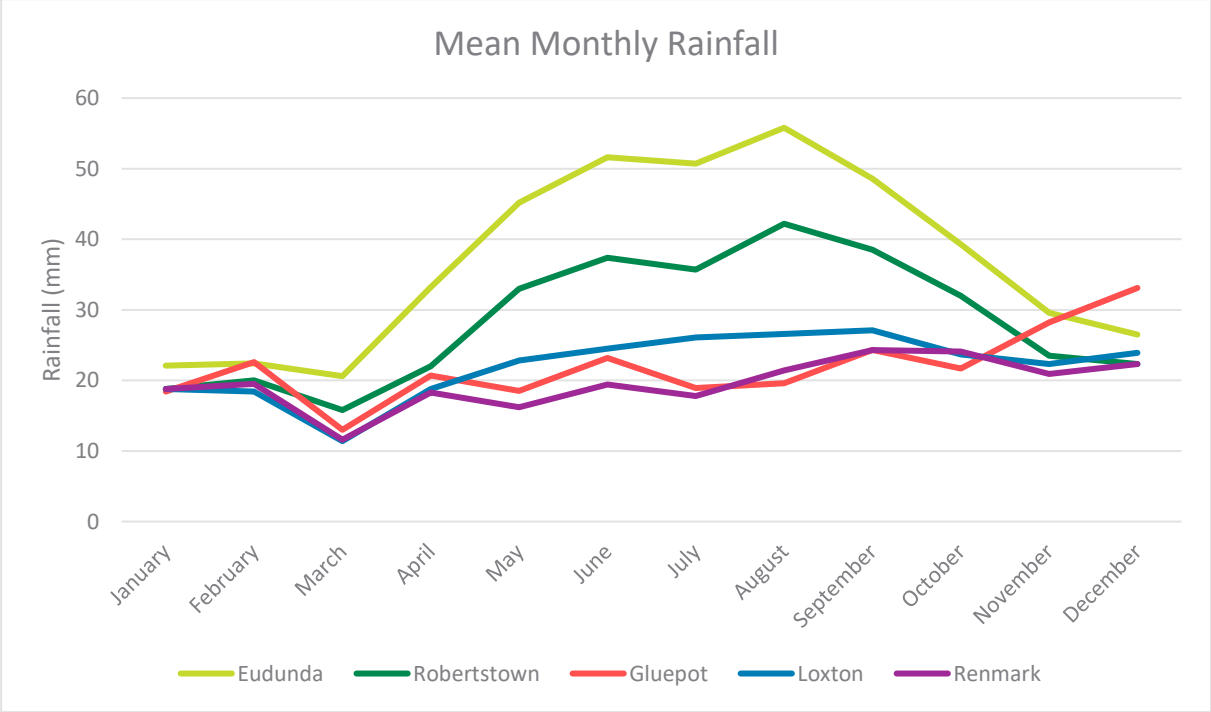


Figure 10-1: Mean monthly rainfall

The region is generally dominated by light to moderate southerly to westerly winds. Winds from the south and south east tend to dominate in summer and autumn, while in winter, westerly and northerly winds often prevail. The annual wind roses for the nearby meteorological stations are presented in Figure 10-2 and Figure 10-3.

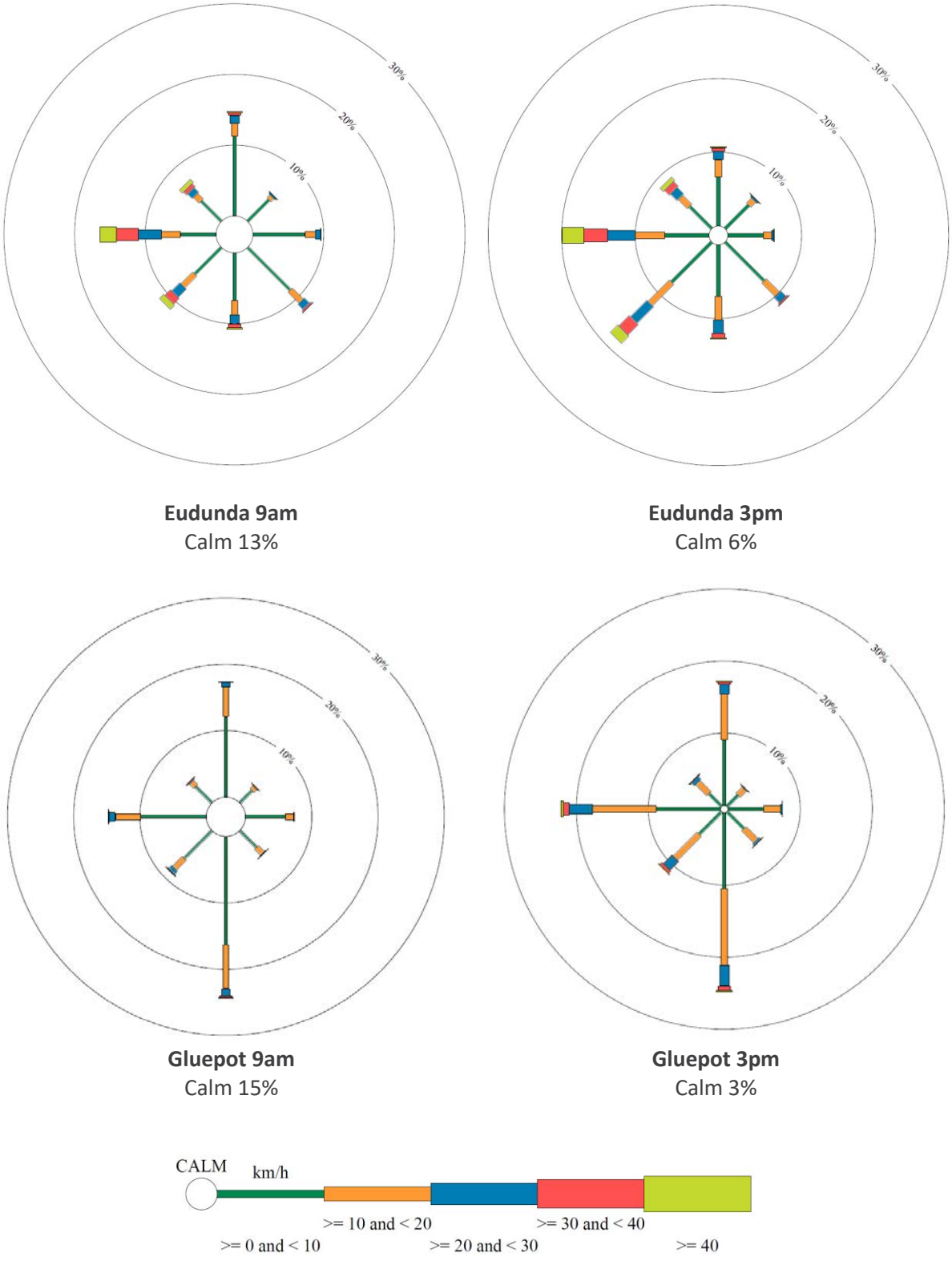


Figure 10-2: Wind roses for Eudunda and Gluepot meteorological stations

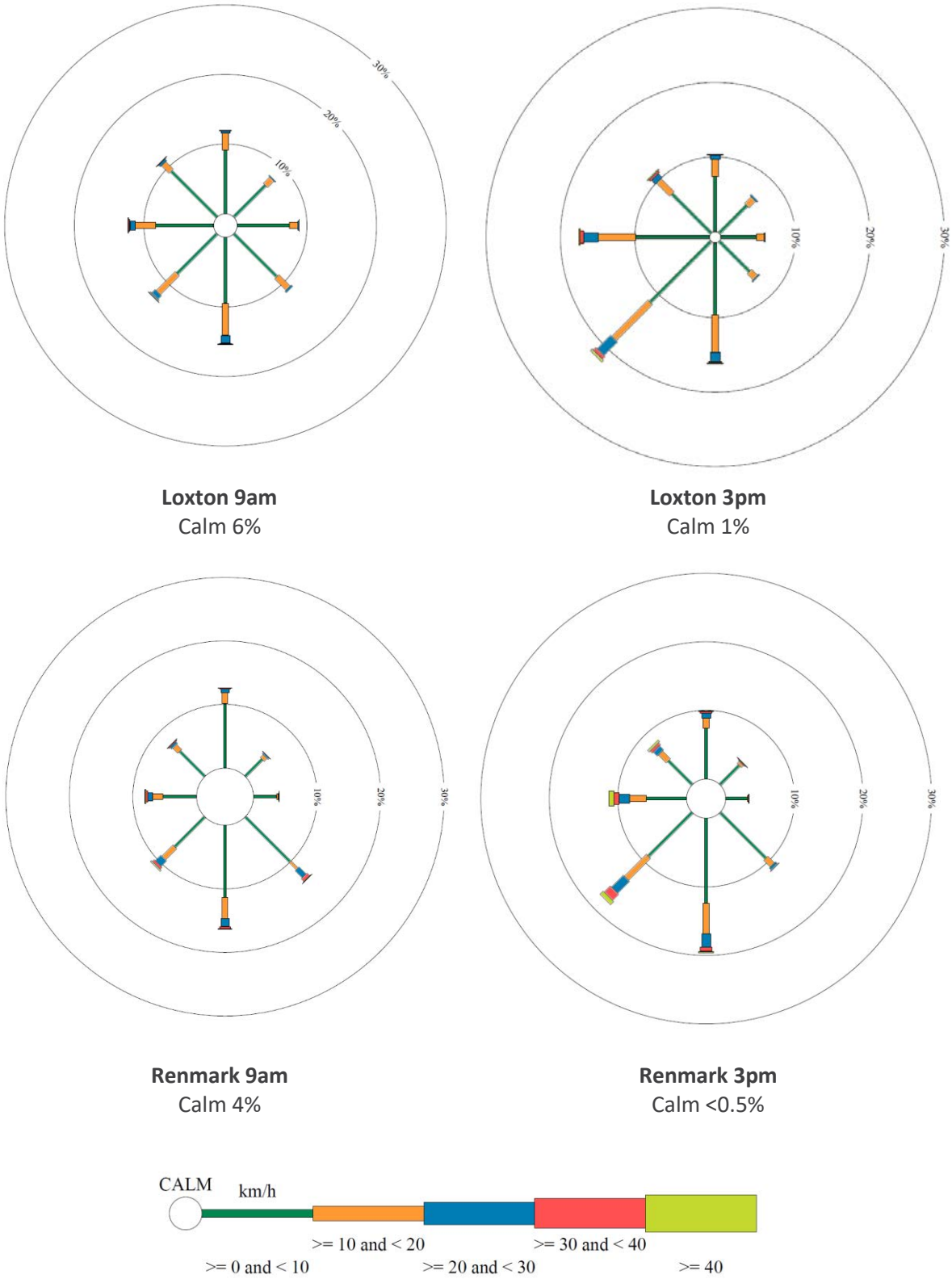


Figure 10-3: Wind roses Loxton and Renmark Aero meteorological stations

10.3.2. Soils and landform

Bioregions and landforms

Project EnergyConnect intersects three bioregions (as defined by the Interim Biogeographic Regionalisation for Australia (IBRA), which classifies Australia's landscapes into geographically distinct regions based on climate, geology, landform and vegetation): the Flinders Lofty Block, Riverina and Murray-Darling Depression bioregions.

Within these bioregions, the transmission line corridor crosses five IBRA subregions. The western extent of the corridor is located in the east of the Broughton subregion, then traversing eastwards, it crosses the Murray Mallee, Braemer and South Olary Plan subregions, then follows the edge of the Murray Scroll Belt subregion to the SA-NSW border.

The locations of IBRA regions and subregions in relation to the Project are shown in Figure 10-4 and descriptions of their landform, soils and vegetation are provided in Table 10-4. Further detail on the vegetation within each IBRA subregion is also provided in Chapter 11 Flora and Fauna.

Table 10-4: Landform, soils and vegetation in IBRA regions and subregions

IBRA Region	IBRA Subregion	Description
Flinders Lofty Block (FLB)	Broughton (FLB02)	**Landform:** Hills and valleys; alternating subparallel hilly ridges and valleys with a general N-S trend in north. In south, hilly dissected tableland. **Soils** are hard setting loams with red clayey subsoils, highly calcareous loamy earths, hard setting loams with mottled yellow clayey subsoil, coherent sandy soils, cracking clays. **Vegetation:** Native vegetation cover has been subject to widespread clearance for agriculture.
Murray-Darling Depression (MDD)	Murray Mallee (MDD02)	**Landform:** Very gently undulating, to flat aeolian sand covered depositional plain of the central-southern Murray Basin. **Soils** are brown calcareous earths, highly calcareous loamy earths, cracking clays, hard setting loamy soils with red clayey subsoils. **Vegetation** in the subregion consists of mallee heath and shrublands.
	Braemer (MDD07)	**Landform:** Plains with variable dune cover, from dune formations with relatively small plains between to plains with isolated tracts of dunes. Claypans, saline soils, swamps, and intermittent lakes in low-lying areas. **Soils** are brown calcareous earths, highly calcareous loamy earths, cracking clays, hard setting loamy soils with red clayey subsoils. **Vegetation** in the subregion consists of chenopod shrublands.
	South Olary Plain (MDD01)	**Landform:** Plains with variable dune cover, from dune formations with relatively small plains between to plains with isolated tracts of dunes. Claypans, saline soils, swamps, and intermittent lakes in low-lying areas. **Soils** are brown calcareous earths, highly calcareous loamy earths, cracking clays, hard setting loamy soils with red clayey subsoils. **Vegetation** in the subregion consists of mallee with and open shrubby understorey.
Riverina (RIV)	Murray Scroll Belt (RIV06)	**Landform:** An ancient riverine plain and alluvial fans composed of unconsolidated sediments with evidence of former stream channels. The Murray and Murrumbidgee Rivers and their major tributaries, the Lachlan and Goulburn Rivers flow westwards across this plain. **Soils** are cracking clays, brown sands. **Vegetation** in the subregion consist of eucalyptus woodlands with a shrubby understorey.

Plate 10-1 to Plate 10-5 provide examples of the landforms across the IBRA subregions. The plain and dune system of the South Olary Plain IBRA subregion is the dominant landform and comprises the majority of the central and eastern sections of the transmission line corridor.

The western extent of the transmission line corridor, on the eastern margin of the Mount Lofty Ranges, is dominated by a gentle easterly sloping landscape which mainly consists of outwash fans, with some defined creeks and other poorly defined drainage lines. Further to the east, the landform is characterised by an expansive, flat to gently undulating plain formed on Tertiary sediments of the central-southern Murray Basin and incised by the modern River Murray valley.

Gently undulating calcrete plains with stony rises and shallow depressions dominate the area to the west of Morgan while between Morgan and the State border, the calcrete plain tends to have a veneer of aeolian (wind-deposited) dunefields. Aeolian processes remain locally active within the region, and have been enhanced in some areas by land clearing since European settlement.

Elevation along the transmission line corridor varies from approximately 360 m in the western-most portion of the transmission line corridor to 20 – 80 m above sea level across the central and eastern portions of the proposed route. Elevation along the transmission line corridor is shown on Figure 10-5.

Plate 10-1: Undulating hills in the east of the Broughton subregion north of Robertstown substation looking north

Plate 10-2: Undulating plain in the Murray Mallee subregion

Plate 10-3: Plains in the Braemer subregion (Northwest Bend substation)

Plate 10-4: Plains and dunes in the South Olary Plan region

Plate 10-5: Riverine plain in the Murray Scroll Belt Subregion

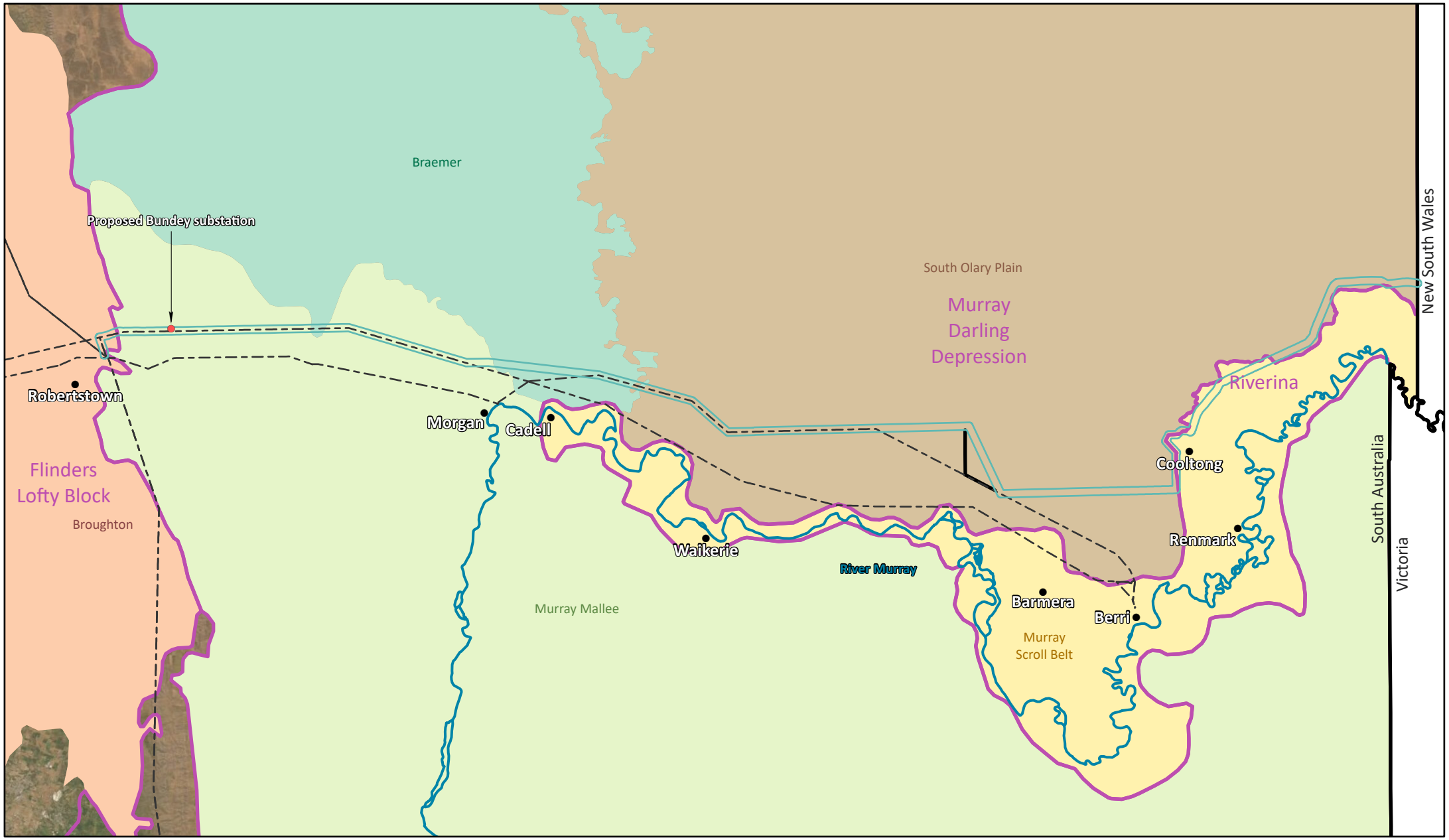


Figure 10-4
Locations of IBRA regions and subregions in relation to the Project

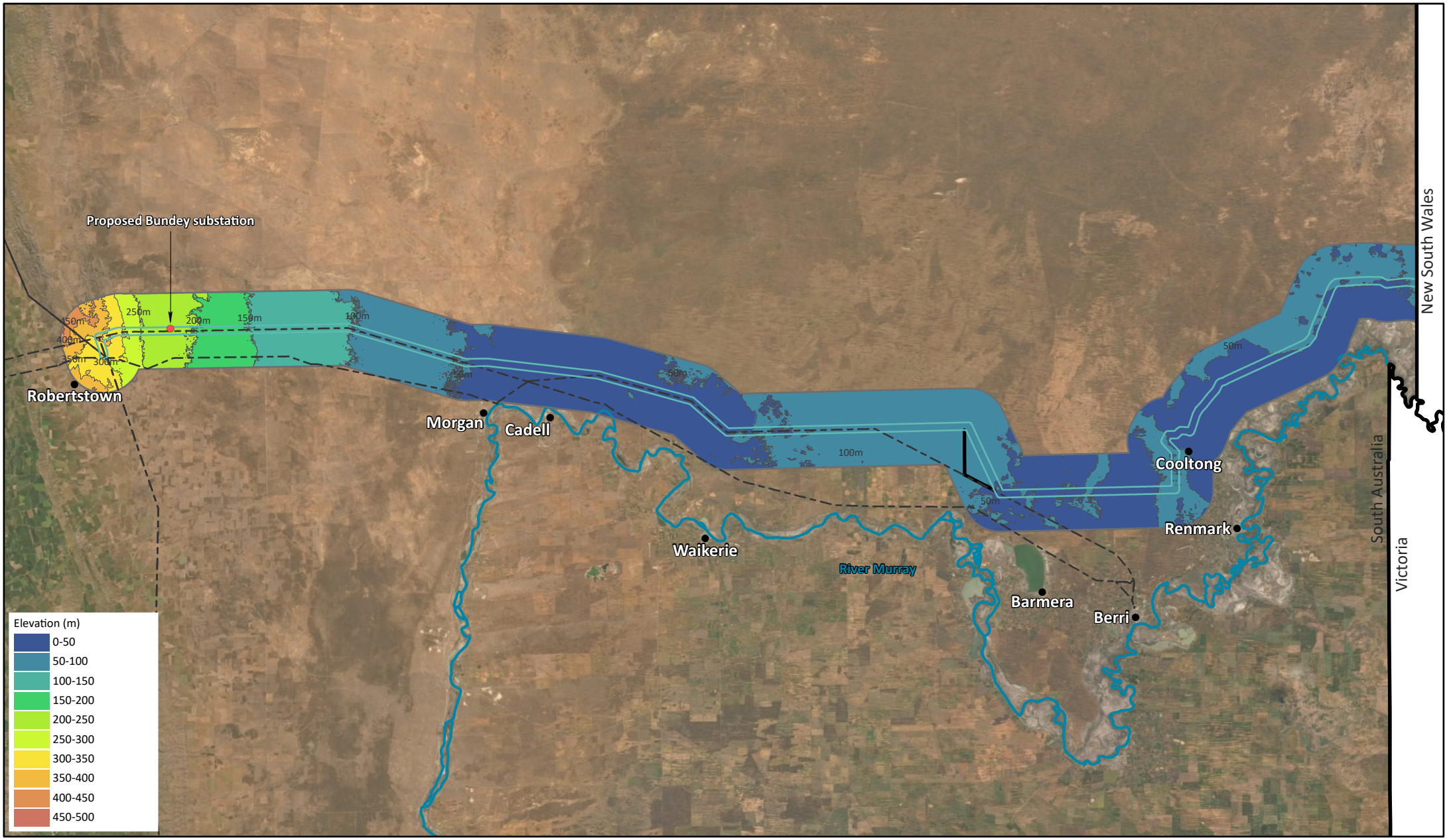


Figure 10-5
Elevation along the transmission line corridor

Geology and soils

The Project is situated almost entirely within the Murray Basin portion of the Murray-Darling Basin, one of Australia's largest sedimentary basins. The Murray Basin covers an area of approximately 300,000 km^2. The basin is bordered to the east and south by the subdued mountain ranges of the Lachlan Fold Belt, to the west by the Kanmantoo and Adelaide Fold Belts, and to the northwest by the Broken Hill and Willyama Proterozoic basement blocks.

The Murray Basin is a widespread sequence of Cenozoic consolidated and unconsolidated sediments, the oldest of which were laid down between 60 and 30 million years ago in the Tertiary geologic period. The Cenozoic sequence is mostly underlain by the Cambrian Kanmantoo Group which form poorly defined infrabasins preserved in graben-like troughs and depressions (Brown & Stephenson 1991) which contain sedimentary rocks ranging in age from Silurian to Cretaceous. (Barnett 2015).

The Murray Basin sediments are overlain by a blanket of more recently deposited Quaternary sediments.

The western end of the transmission line corridor is on the eastern edge of the Adelaide Fold Belt, a belt of rock units which extends from south of Adelaide to the northern Flinders and Olary Ranges. These sediments were laid down over 500 million years ago and in this region are dominated by the Umberatana and Burra Groups, which consist mainly of siltstone, shale, slate, sandstone and quartzite.

The recent geological history has a strong influence over the surface geology and subsequent landscape characteristic of the region. Aeolian (wind deposited) and colluvial (deposited by debris flows, landslides and water) have dominated the region for the past 500,000 years or so (EDSCB 2002).

The surface geology of the transmission line corridor east of Cadell is dominated by the Woorinen Formation, which comprises red-brown silty siliceous sand, calcareous clay and sandy clays. West of Cadell, shallow calcareous loam over calcrete dominates, with interspersed areas of Quaternary alluvium and Blanchetown Clay. Calcareous loam over the older rocks of the Yudnamutana Subgroup and Burra Group are present on the slopes of the Mount Lofty Ranges at the western extent of the transmission line corridor.

Surface geology is shown in Figure 10-6 (based on Geoscience Australia 2012) and the main units present on or near the transmission line corridor (ordered from west to east) are described in Table 10-5.

Table 10-5: Surface geology

Name	Map unit	Description[1]
Yudnamutana Subgroup	Nsuu	Diamictite, siltstone, pebbly dolomite and orthoquartzite. Glaciomarine. Soils in the transmission line corridor predominantly calcareous loam on rock.
Burra Group	Nsbr	Siltstone, laminated; shale; sandstone, heavy mineral lamination, quartzose to feldspathic, cross bedding; dolomite, blue-grey to pale pink, lenticular. Soils in the transmission line corridor predominantly calcareous loam on rock.
Colluvium	Qrc	Colluvium and / or residual deposits, sheetwash, talus, scree; boulder, gravel, sand. May include minor alluvial or sand plain deposits, local calcrete and reworked laterite. Predominantly sandy loam at the surface in the transmission line corridor.
Alluvium	Qa	Channel and flood plain alluvium; gravel, sand, silt, clay. May be locally calcreted. Occurs predominantly in association with Burra Creek near Morgan and in the east of the Project region, where the coarse-grained fluvial and finer grained flood plain sediments of the Coonambidgal Formation comprise much of the present-day River Murray floodplain, along with more recent sediments associated with modern activity of the river.

Name	Map unit	Description[1]
Calcrete	Czk	Shallow calcareous loam on calcrete. Strongly cemented pale grey massive sheet calcrete, calcrete rubble, friable white and cream nodular calcrete; includes intraclasts of various lithologies set in calcrete matrix. Locally forms massive resistant sheets; elsewhere, calcrete rubble underlies much of the aeolian landscape in the west, and calcrete glaebules and rhizoliths occur in many soil profiles throughout the basin.
Pooraka Formation	Qrcp	Unconsolidated red-brown poorly-sorted clayey sand, gravel, conglomerate, breccia. Occurs as colluvial sheet wash, alluvial fan and residual lag. Forms extensive, coalesced, low-angle fans, high-angle talus cones and scree slopes.
Blanchetown Clay	Qtb	Consolidated to friable well laminated greenish-grey and red-brown clay; locally silty, sandy and calcareous and gypsiferous, minor quartz sand. Mainly concealed but is locally exposed in artificial excavations, river cliffs, gullies and lake margins.
Bungunnia Limestone	Qtbu	Well-cemented, flaggy, dolomitic limestone, thin-bedded, micritic. Lacustrine. Locally interfingers with underlying Blanchetown Clay. Locally developed calcrete cap, particularly north of North West Bend. Calcareous loams.
Woorinen Formation	Qdwr	Unconsolidated red-brown medium to fine silty sand, red calcareous silty clay, sandy clay, clay pellet aggregates. Forms extensive dune fields with subdued crests separated by swales and sand plains. The sands range in depths of between 1 – 3 m thickness in swales and up to 10 m at dune crests. In places, typically within gullies or in depressions, wind erosion has exposed the underlaying Blanchetown Clay.
Lake Deposits	Qt	Lake and swamp deposits; mud, silt, evaporites, limestone; minor sand, peat. Includes wetland lakes on the River Murray floodplain and salt lakes north of the floodplain where gypsiferous sediments of the Yamba Formation occur.
Lunette Dunes	Qdlu	Quartz and gypsum dunes and mounds (kopi); may include minor silt, sand, gravel, and clay flats adjacent to salt lakes; locally includes some playa sediments.
Parilla Sand	Czswp	Sand, fine to medium-grained, unfossiliferous, non-marine, clayey, quartz rich; sandy clay. Aeolian, lacustrine and fluvial deposits.

[1] Derived from Geoscience Australia (2012), DEM (2020), Brown and Stephenson (1991), SKM (2002), Barnett (2015), Geoscience Australia(2020), DEW (2009f).

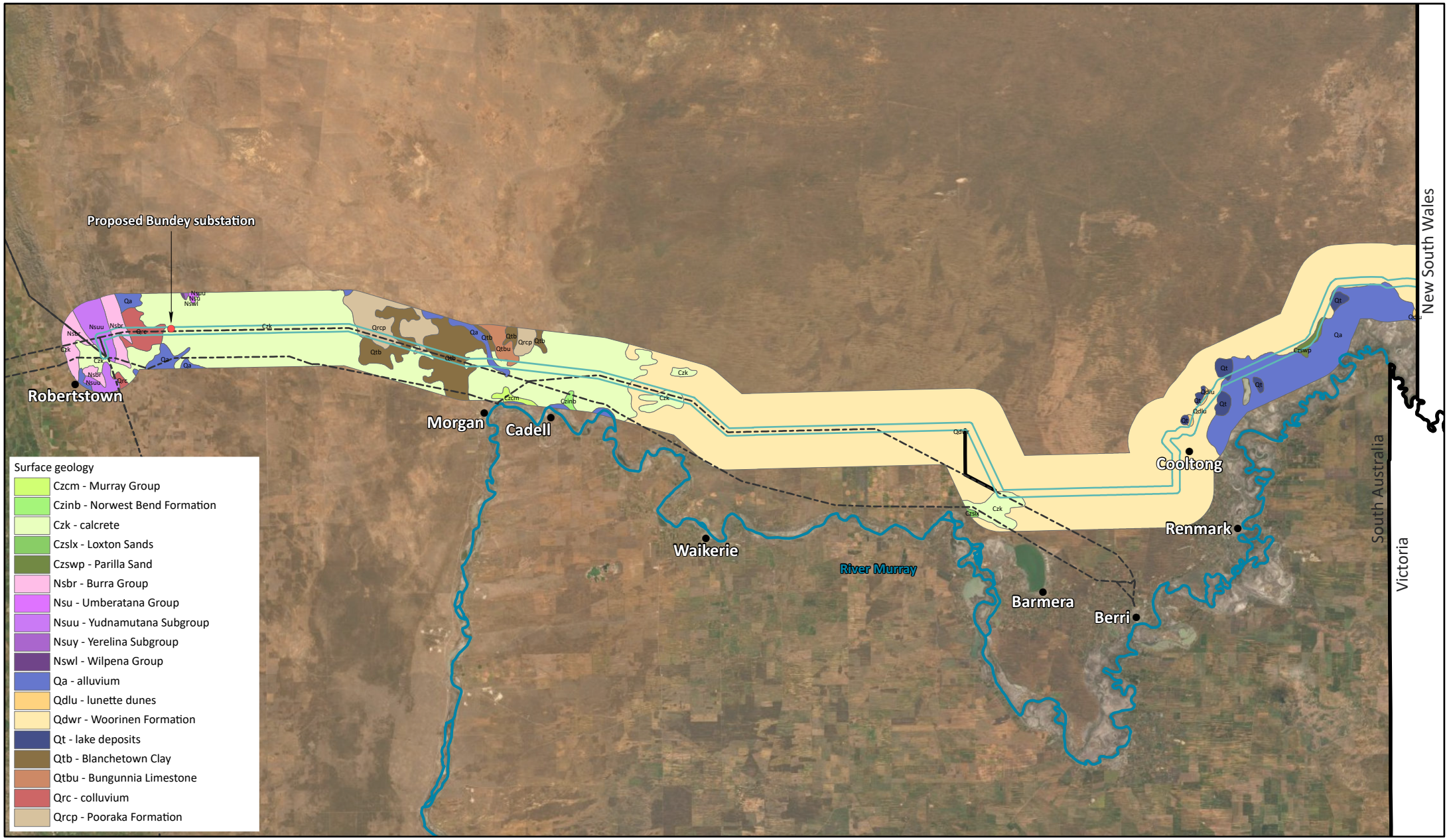


Figure 10-6
Surface geology in the region of the Project

ElectraNet
energy connect
JBS&G

Soil characteristics

Water erosion potential

Water erosion potential mapping (DEW 2009a[1]) along the transmission line corridor indicates that water erosion potential is predominantly classified as low. This classification is based on inherent slope and soil erodibility characteristics and excludes the influence of vegetation and other protective cover (it assumes land is in a bare, cultivated state).

At the western end of the transmission line corridor, some areas of higher water erosion potential are present, as follows:

- for the most western 6 km of the transmission line corridor (in the slopes of the Mount Lofty Ranges), water erosion potential is classified by DEW mapping as moderate, with short sections of high erosion potential (approximately 1 km) on slopes south of Powerline Road
- for the next 6 km to the east, water erosion potential is classified as moderately low as the slopes transition to the plains
- between the eastern slopes of the Mount Lofty Ranges and the vicinity of Morgan near larger drainage lines (e.g. Burra Creek and Emu Gully), water erosion potential is classified as moderately low.

Some localised gullying is present in the immediate vicinity of Burra Creek (see Figure 10-6 in Section 10.1.1).

Wind erosion potential

Wind erosion potential (where wind erosion could be a problem under particular soil disturbance and weather conditions) has been classified as low to moderately low along the transmission line corridor to the west of Morgan (DEW 2009b).

The central portion of the transmission line corridor has been classified mostly as moderately high wind erosion potential, with some sections classified as moderately low. Within the moderately high areas, the mapping data generally indicates that there is a small proportion (less than 20%) of high wind erosion potential present. This higher wind erosion potential in this portion of the transmission line corridor is typically associated with the dune field and sand plains of the Woorinen Formation, which are inherently sensitive to wind erosion.

The eastern portion east of Renmark presents a low to moderately high potential for wind erosion.

Soil salinity

Soils within the proposed transmission corridor are characterised by low to moderate salinity and negligible acidity (DEW 2009e). However, the Yamba Formation salt lakes and the Blanchetown Clay can be hypersaline (more than 35,000 ppm) and saline (8,000 ppm) respectively.

Acid sulfate soils

Acid sulfate soils have elevated concentrations of metal sulfides and generate acidic conditions when exposed to oxygen. If incorrectly handled, these soils may potentially impact on human health and the environment, and may also result in damage to infrastructure constructed on acid sulfate soil material.

Acid sulfate soil mapping (DEW 2009c, CSIRO 2011) indicates that acid sulfate soil potential in the transmission line corridor is predominantly negligible (see Figure 10-7). Calcareous soils and limestone

[1] Water and wind erosion potential mapping (DEW 2009) covers approximately 75% of the length of the transmission line corridor. Landform and soil characteristics of sections of the alignment outside the limits of mapping (in the pastoral zone) have been used to interpret soil erosion potential for these areas, based on mapped soil erosion of adjacent areas with similar characteristics.

are common along the transmission line corridor and the alkalinity of soils present is reported as being alkaline to strongly alkaline (DEW 2009d).

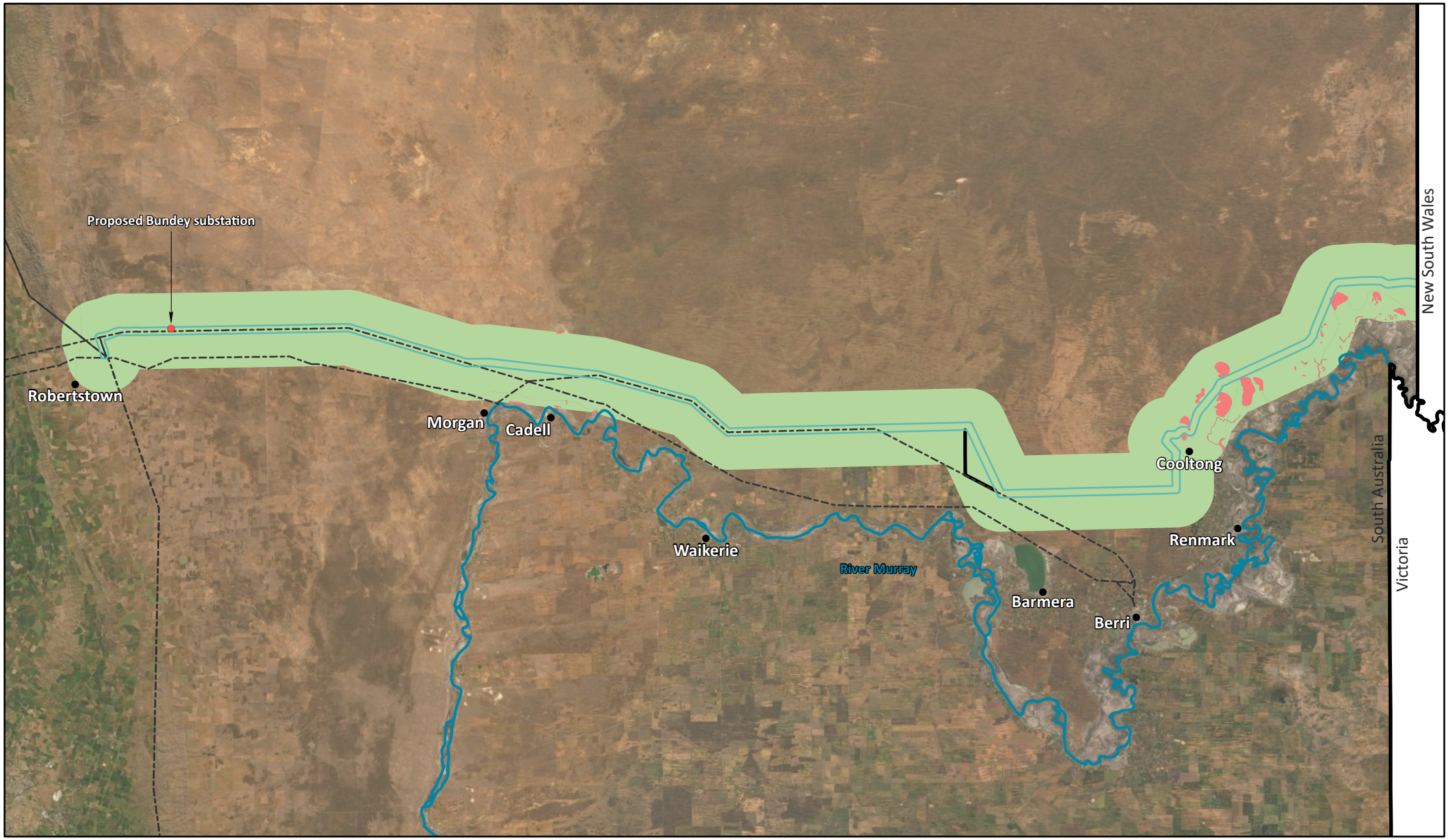
The ephemeral lakes in the Riverland Ramsar site (which are adjacent to the proposed alignment at its eastern end but are not intersected by it) are mapped as having a high probability of occurrence of acid sulfate soils (see Figure 10-7). Lake Woolpolool and Lake Merreti are characterised as having more than 60% of land susceptible to the development of acid sulfate soils (DEW 2009c) and other lakes in the Riverland Ramsar site (which are outside the limits of the DEW 2009c mapping) are also categorised as having a high probability of occurrence of acid sulfate soil (CSIRO 2011). The Riverland Ramsar site was assessed as medium acidification hazard (MDBA 2011).

Soil contamination

The South Australian EPA Public Register contains no records of environmental authorisations, orders and applications for the transmission line corridor, and are there also no notifications on the Site Contamination Index for the corridor. One parcel of land intersected by the transmission line corridor is listed on EPA Licence 2157, which covers scheduled activity 5(4) 'Piggeries'. The piggery infrastructure is located approximately 4 km south of the proposed alignment on a separate land title.

The transmission line corridor traverses largely undeveloped land which has been used predominantly for agricultural and pastoral purposes (refer Chapter 9 Land Use and Tenure). Soil contamination is not considered likely to be present on the proposed alignment, however contaminants of potential concern which could possibly occur, based on these land uses, include:

- organochlorine and organophosphorus pesticides associated with agricultural chemicals
- nutrients (phosphorous and nitrogen) associated with fertiliser application
- heavy metals such as arsenic, associated with animal husbandry treatments
- hydrocarbons associated with farm refuelling and other activities.



Acid sulfate soil probability
- High probability of occurrence
- Low probability of occurrence
- Extremely low probability of occurrence
- Transmission line corridor
- Cultural heritage avoidance alignment

- Existing ElectraNet transmission line
- River Murray
- Proposed Bundey substation

Figure 10-7
Acid sulfate soil potential on the transmission line corridor

0 20
Kilometres

N

ElectraNet
energy connect
JBS&G

10.3.3. Surface water

The Project is located within the Lower Murray catchment of the Murray-Darling Basin, which makes up approximately 95,300 km^2 (approximately 9%) of the total area (1.1 million km^2) of the Murray-Darling Basin (MDBA 2020).

Due to the semi-arid climate and generally sandy soils, there is limited development of surface water features in the region (apart from the River Murray).

The principal surface water features in the vicinity of the transmission line corridor are:

- the River Murray and its floodplain, which are located to the south of the corridor
- the small ephemeral watercourses in the western part of the corridor; these flow generally eastwards from the slopes of the Mount Lofty Ranges and only the largest of them (e.g. Burra Creek) reach the River Murray, with flow into the Murray occurring only in exceptionally wet years (Barnett 2015).

These features are discussed further below.

The transmission line corridor is not located in any surface water or water resource management prescribed areas under the *Landscape South Australia Act 2019* and does not cross any prescribed watercourses. The proposed alignment traverses outside the eastern edge of the River Murray Prescribed Watercourse Area (the boundary is Old Wentworth Road / Renmark-Wentworth Road).

Figure 10-8 shows the main surface water features in the vicinity of the transmission line corridor.

River Murray

The River Murray is the dominant surface water feature in the region. It flows in a generally westerly direction from the South Australia – New South Wales border to Morgan, where it turns southwards. Between Morgan and Overland Corner (located approximately 80 km upstream from Morgan), the river flows in a relatively narrow, steep sided gorge incised into the Murray Group limestones. Upstream of Overland Corner it forms a broad alluvial river valley about 10 km wide (Barnett 2015).

The River Murray is located to the south of the transmission line corridor. Between Morgan and Renmark the distance to the main channel varies from 5 km (near Morgan, Cadell and Overland Corner) to 10 – 15 km in other areas. North of Renmark, the transmission line corridor follows the edge of the floodplain, at distances of approximately 6 – 9 km from the main river channel. This eastern end of the transmission line corridor intersects the River Murray Floodplain Area defined under the River Murray Act (refer Chapter 5 Legislative and Planning Framework). This floodplain area is also listed under the Ramsar convention as the Riverland site as discussed further below.

The River Murray is subject to seasonal cycles of flooding, which have been significantly modified by water extraction and regulation of flows in the river by a system of storages, weirs and locks. In the southern part of the Basin, the majority of the floods occur in winter and spring, although there have been some large floods in summer and autumn (MDBA 2020). When river levels are high during periods of flood, the floodplain and associated creeks, channels, lagoons, billabongs, swamps and lakes become inundated.

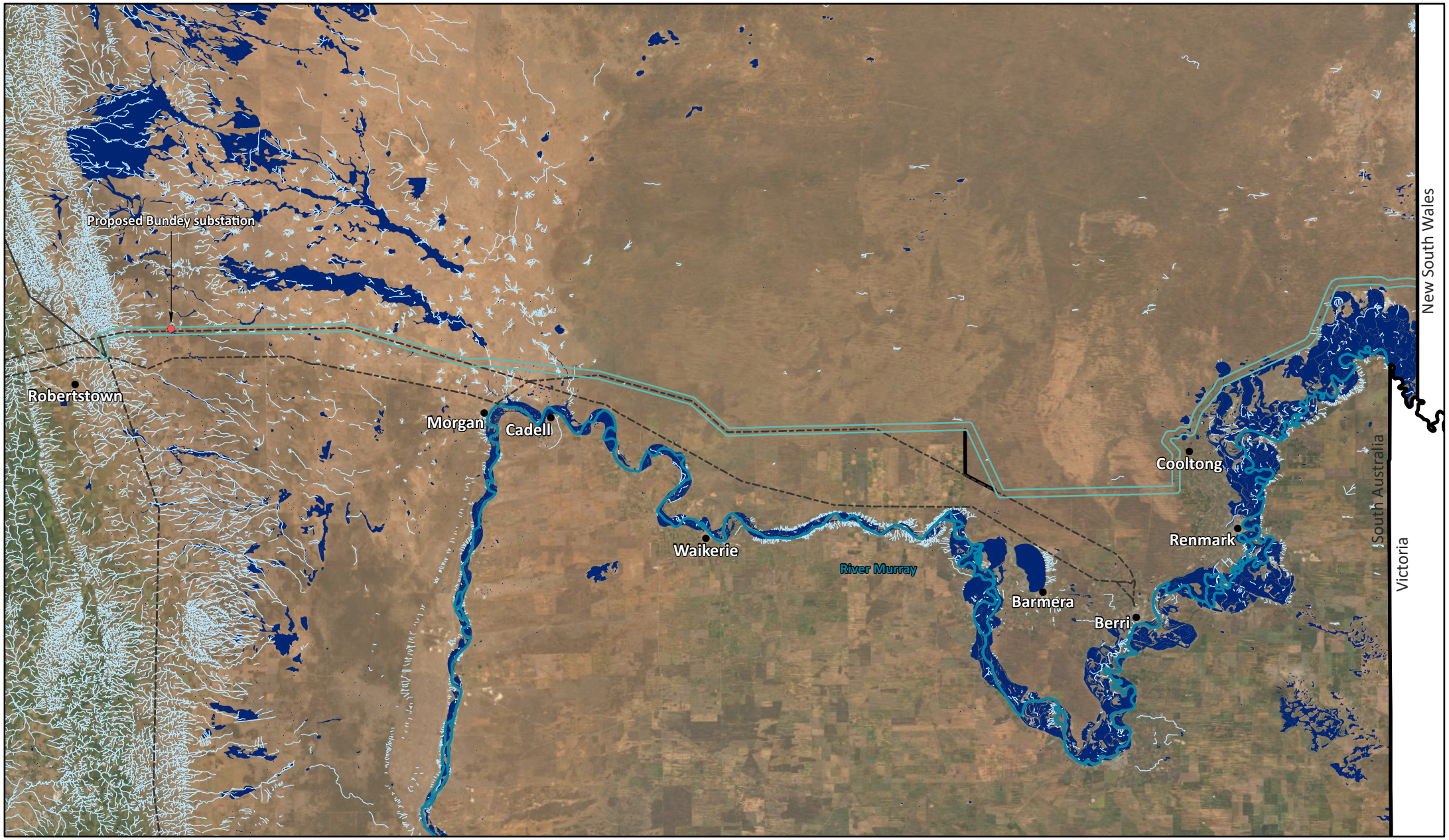
A South Australian River Murray flood is considered 'exceptional' when the water level is five or more metres above pool level (i.e. the regulated level weir pools in the river), which has occurred just four times (1931, 1956, 1973 and 1974) (WaterConnect 2019). The 1956 flood, which peaked at 341,000 ML/day, is the largest River Murray flood on record. Average daily flow to South Australia for the period 1968 – 2020 was 18,000 ML/day (MDBA 2021).

The floodplain of the River Murray along the 80 km section from the border to Renmark is listed under the Ramsar Convention as a wetland of international importance as the 'Riverland' Ramsar site (see

Chapter 9 Land Use and Tenure and Chapter 11 Flora and Fauna). This 30,600 ha site contains a series of creeks, channels, lagoons, billabongs, swamps and lakes which are subject to variable regimes of inundation. Wallace *et. al.* (2015) state that floodplain-river systems such as the Riverland Complex rely on frequent (sub-decadal scale) flooding to maintain their ecological function. However, changes in the hydrology of many wetlands since the 1920s and 1930s, as a result of weir installation along the river, has resulted in a transformation from seasonally variable water levels, to permanent inundation in a number of areas (DEW 2019b) and reduced flooding frequency in other areas.

Figure 10-9 shows areas of floodplain that are regularly subject to inundation in the eastern section of the transmission line corridor, as well as the 1956 flood level (which corresponds with the boundary of the Ramsar wetland site). The areas of inundation shown indicatively represent a 1 in 10 year scenario (based on comparison to Figure 3.17d of Newall *et al.* (2009)). Most of the wetlands in the vicinity of the transmission line corridor are subject to seasonal or intermittent freshwater inundation at varying frequencies, depending on river flows and managed inundation regimes. For example, Lake Merreti is permanently inundated with freshwater and Lake Woolpolool is a seasonal saline / brackish lake (Newall *et al.* (2009)).

The transmission line corridor passes predominantly north of the floodplain and the Ramsar site boundary, on higher ground on the northern side of the Old Wentworth Road / Renmark-Wentworth Road, for approximately 36 km. It does not cross any areas that are regularly inundated, and crosses three areas of upper floodplain (approximately 170 m, 480 m and 1.3 km in length) that were flooded in the 1956 flood and could be flooded in extreme flood events. A total of approximately 12.2 km of the proposed alignment is located within 1 km of lakes and swamps subject to reasonably frequent inundation (i.e. 1 in 10 (or less) years).



Water body*
Transmission line corridor
Cultural heritage avoidance alignment
Watercourse
Existing ElectraNet transmission line
River Murray
Proposed Bundey substation

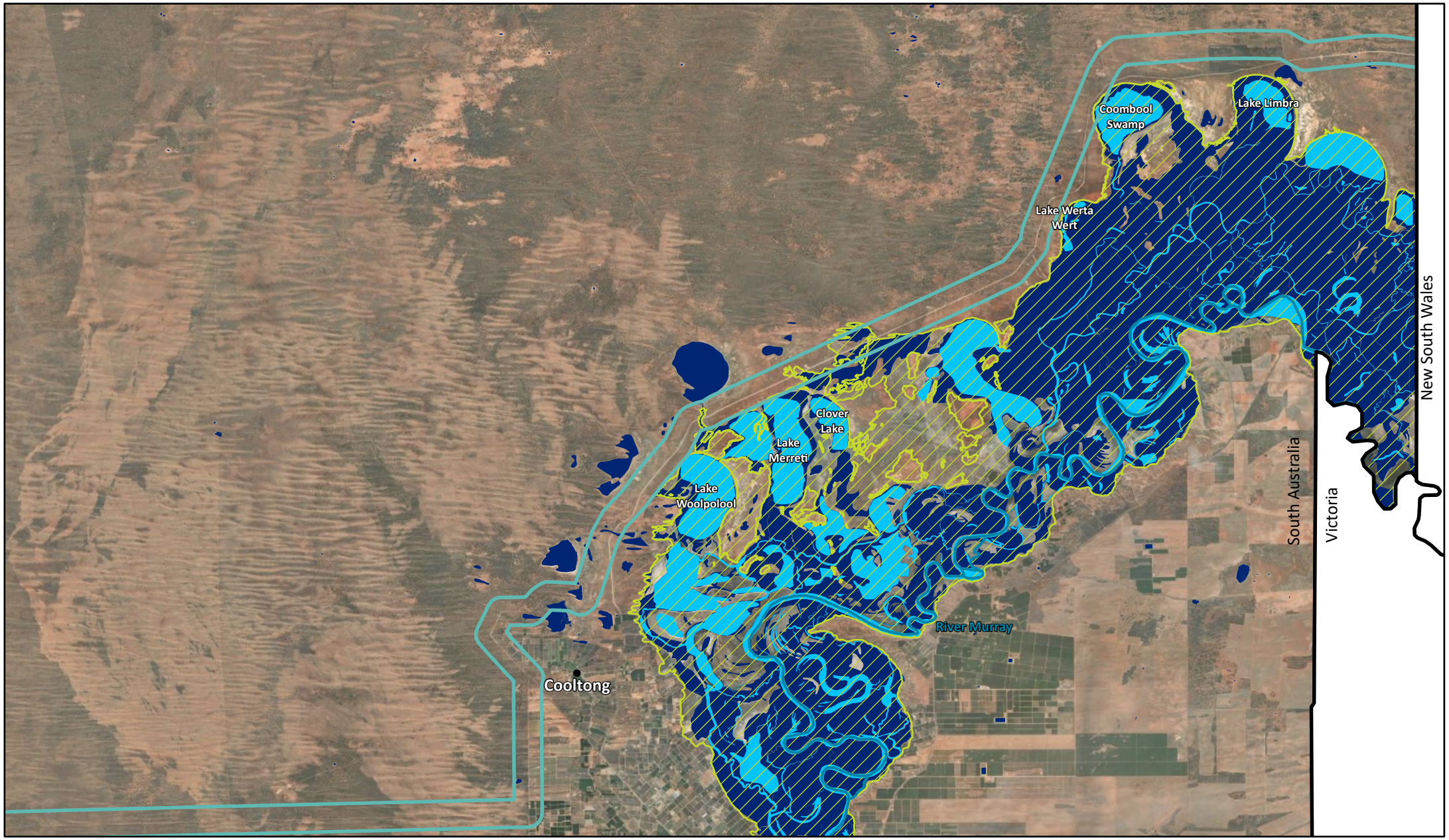
*Includes Reservoirs, Dams, Lakes (permanent, intermittent and mainly dry), Land Subject to Inundation and Flooding

Figure 10-8
Surface water features in the vicinity of the transmission line corridor

0 20
Kilometres

N

ElectraNet
energy connect
JBS&G



1956 flood extent
Regularily inundated area
Water body*
Transmission line corridor
Watercourse
River Murray

Figure 10-9
Historic flood levels and areas of regular inundation

0 5
Kilometres

N

ElectraNet
energy connect
JBS&G

*Includes Reservoirs, Dams, Lakes (permanent, intermittent and mainly dry), Land Subject to Inundation and Flooding

Other watercourses

As noted above, surface water features in the region other than the River Murray are limited, due principally to the semi-arid climate, relatively flat topography and generally sandy soils.

The western end of the transmission line corridor traverses a number of small ephemeral creeks which arise in the slopes of the Mouth Lofty Ranges. These creeks flow out of the ranges usually only in very wet years and discharge onto the plains to the east for short distances before dissipating by evaporation or infiltration into permeable sediments (Barnett 2015).

Only the largest of these watercourses reach the River Murray in exceptionally wet years (if at all) (Barnett 2015). The transmission line corridor crosses two of these larger watercourses: Burra Creek (approximately 7 km north of Morgan) and a watercourse known in the vicinity of the river as Emu Gully (approximately 3 km north-east of Cadell). Burra Creek has an incised channel in the vicinity of the transmission line corridor (see Plate 10-6), while Emu Gully is very broad and shallow in profile with no incised channel.

The Burra Creek catchment is the only defined catchment boundary in the region (Penney 2016). Its headwaters commence just north of Mount Bryan (approximately 95 km north-west of Morgan) and flow in a southerly direction towards Worlds End (approximately 60 km west of Morgan), before changing direction to the east and flowing to its discharge point at the River Murray. Streamflow is generated from local rainfall events, generally between April and September, in the higher elevated parts of the Mount Lofty Ranges and Southern Flinders Ranges (Penney 2016). Flow from Burra Creek to the River Murray is rare, as the lower reaches are essentially flood-out plains and lack defined drainage (SAMDBNRMB 2009). The last time this occurred estimated to be around 1941 (Deane *et al.* 2006 cited in Penney 2016).

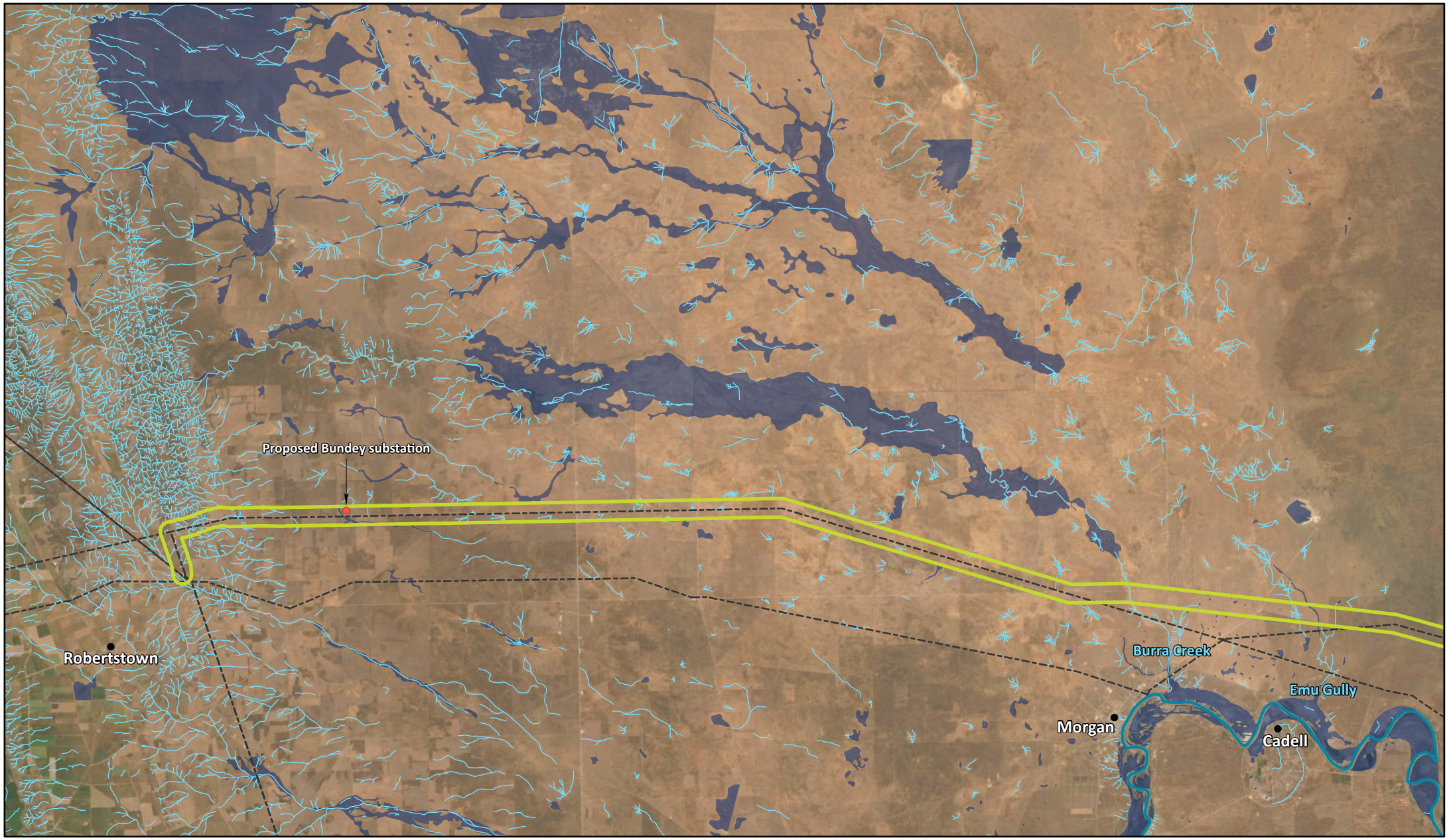
The catchment of Emu Gully extends approximately 80 km to the north-west and is characterised by discontinuous drainage lines with often broad and poorly defined channels, numerous depressions and swamps and an extensive network of farm dams along the major flow paths. Anecdotal evidence from the property manager indicates that the watercourse rarely flows across the entire catchment but can carry high volumes into the Murray River floodplain after extreme rainfall events (Lyon Solar 2017).

The other ephemeral watercourses that arise in the Mount Lofty Ranges south of Burra Creek (including those that are crossed by the far western end of the transmission line corridor) do not reach the River Murray because uplift along the Morgan Fault has created a barrier to eastward flow (Barnett 2015) and they terminate in permeable soils as they fan out onto the Murray Plains. The majority of the year these stream beds are dry (SAMDBNRMB 2009).

Watercourses at the western end of the transmission line corridor are shown in Figure 10-10.

Between Emu Gully and the River Murray floodplain near Renmark there are no defined watercourses or surface water features on or near the transmission line corridor, other than occasional dams which have been excavated to capture local runoff.

There are several very small drainage lines approximately 12 km long that cross the transmission line corridor and the Renmark-Wentworth Road near the eastern end of the corridor and carry localised runoff to the River Murray floodplain areas to the south.



Transmission line corridor
Water body*
Watercourse
Existing ElectraNet transmission line
Proposed Bundey substation

Figure 10-10
Watercourses at the western end of the transmission line corridor

0 10
Kilometres

N

ElectraNet
energy connect
JBS&G

*Includes Reservoirs, Dams, Lakes (permanent, intermittent and mainly dry), Land Subject to Inundation and Flooding

Plate 10-6: Burra Creek (approximately 1 km south of the proposed alignment)

The Bundey substation site is located on a flat calcareous loam plain. There are no defined drainage lines present. There are two shallow excavated dams on the western boundary and in the south western corner (see Plate 10-7) and mapping indicates a broad surface water flow path across the south-western part of the land parcel.

Plate 10-7: Panorama of proposed Bundey substation site from south-west corner

Water quality

The River Murray is a relatively turbid system, with elevated salinity and eutrophication reported as water quality issues (Newall *et al*. 2009, SAMDBNRMB 2015). Long term water quality monitoring data at Morgan (1978 – 2012 indicates a mean turbidity of 41 NTU (and a range of 0 to 410) and a mean salinity (electrical conductivity) of 522 µs/cm (range 166 – 32,100) (Henderson *et al.* 2013).

Turbidity and salinity in the wetlands of the Riverland Ramsar site are generally highly variable. Total dissolved solids in Clover Lake have been reported as ranging from 334 mg/L after flooding to 3,210 mg/L at the end of a long drying phase, with mean turbidity in Clover Lake of 110 NTU, during monitoring between 1990 and 1993 (Suter *et al*. 1993, cited in Newall *et al.* 2009). Turbidity is reported

as ranging an order of magnitude from minimum to maximum readings in the wetlands (Suter *et al*. 1993, cited in Newall *et al.* 2009).

Significant quantities of salt (via saline groundwater) intrude into the River Murray in the Riverland region annually. Consequently, a number of salt interception schemes to operate in the region. There are no salt interception schemes in close proximity to the transmission line corridor, although several operate along the southern side of the River Murray (e.g. Waikerie, Woolpunda and Murtho).

Water quality in the ephemeral watercourses in the western extent of the transmission line corridor is expected to be variable. As these are predominantly dry and require large rainfall events to commence flowing (Penney 2016), high turbidity is likely to be common. EPA SA water quality sampling for nearby watercourses in 2010 (including Burra Creek near Burra) indicated that 71% of sites were assigned a 'Fair' condition rating and 29% of sites were 'Poor'; no sites were assessed to be 'Very Poor' condition, or in the 'Good' to 'Excellent' range (Penney 2016). Most streams showed evidence of considerable human disturbance including nutrient enrichment, sediment deposition and degraded riparian zone (Penney 2016).

Surface water use

The River Murray provides the water resources to support the domestic, industrial, livestock and irrigation demands of the region and other areas of the state. River Murray water also provides approximately 40 per cent of Adelaide's annual mains water needs increasing to 90 per cent if required during drought (SAMDBNRMB 2015).

In the western half of the transmission line corridor away from the River Murray, surface water stored in localised dams is the main source of water (EDSCB 2002). Numerous small dams are present across the landscape in drainage lines and depressions.

10.3.4. Groundwater

The majority of the transmission line corridor is situated within the Murray Basin, a low-lying sedimentary basin, containing a multi-layered regional groundwater system. Groundwater in the basin typically flows from the basin margins to the River Murray which acts as a drain for all aquifer systems in the Murray Basin and is the focus for groundwater discharge (Barnett 2015). These discharge rates are normally low due to the low hydraulic gradients from the distant recharge areas.

There are three main regional aquifers separated by confining layers in the Murray Basin in the vicinity of the transmission line corridor. In order of deepest to shallowest these are: the Renmark Group confined aquifer; the Murray Group limestone aquifer, which contains the watertable west of Overland Corner; and the Pliocene Sands aquifer, which contains the watertable aquifer to the east of Overland Corner but is elevated above the water table or absent to the west (Barnett 2015).

Within the River Murray valley, the more recently deposited (Quaternary) alluvial sediments of the Monoman Sands and the Coonambidgal Formation overly the regional aquifer units. The River Murray valley is incised into the Murray Group Limestone downstream of Overland Corner, whereas upstream the limestones are downwarped and the river valley and the Quaternary alluvial sediments overly the Pliocene Sands.

The characteristics of these hydrostratigraphic units are described in Table 10-6 in order of increasing age, which roughly corresponds to increasing depth below ground surface. Descriptions have been adapted from Barnett (2015) and RPS (2012).

Table 10-6: Hydrostratigraphic units in the Murray Basin and Quaternary alluvium

Hydrostratigraphic Unit	Extent	Comment
Coonambidgal Formation	River Murray valley	Alluvial sediment restricted to the River Murray valley. A discontinuous clay and coarse-grained layer up to 2 m thick which determines the semi-confined / unconfined nature and recharge to the underlying Monoman Formation.
Monoman Formation	River Murray valley	Alluvial sediment restricted to the River Murray valley. An unconfined to semi-confined aquifer consisting of relatively clean fine to coarse alluvial sands overlain by thin silts and clay. The Riverland Ramsar site generally occurs within the Monoman Formation or the overlying Coonambidgal Formation. The Monoman Formation is in direct hydraulic connection with the underlying semi-confined Lower Pliocene Sands, the laterally adjacent unconfined Upper Pliocene Sands and the River Murray. Salinity can reach over 35,000 mg/L in areas of the floodplain where evaporative discharge results in concentration.
Pliocene Sands aquifer	Regional (east of Overland Corner)	The Loxton-Parilla Sands unit comprises fine to coarse sands with silt and clay layers. It is saturated only in the eastern part of the Project region (east of Overland Corner) where it contains the water table aquifer. The groundwater flow is typically towards the Murray River under low gradients, except where irrigation operations adjacent to the river have generated water table mounds. The aquifer thickens to the east to a maximum of about 50 m. Salinity in the aquifer is generally over 20,000 mg/L.
Bookpurnong Formation (confining layer)	Regional	Located between the Pliocene Sands and underlying Murray Group Limestone in the east of the Project region, this formation acts as an aquitard. Comprised of plastic silts and shelly clays that confine the underlying limestone aquifer. Occurs only to the east of Overland Corner and attains maximum thickness of approximately 35 m at the border.
Murray Group Limestone aquifer	Regional	This regionally extensive comprises a consolidated, highly fossiliferous, fine to coarse limestone. It is unconfined west of Overland Corner. This aquifer has been developed for stock, domestic, irrigation and town water supplies in the broader Murray Basin because it contains low salinity groundwater over large areas. Recharge occurs from high rainfall areas around the basin margins such as the Mount Lofty Ranges to the west and in southwest Victoria to the southeast. Groundwater flows under low hydraulic gradients to the River Murray where it discharges and contributes to the increasing salinity of the river. Average thickness is about 100 m west of Overland Corner, but it thickens to the east to about 150 m at the State border where it is downwarped below ground level and confined by the Bookpurnong Formation. Salinities increase downgradient, from below 1,000 mg/L at the recharge areas to over 20,000 mg/L adjacent to the river.
Ettrick Formation (confining layer)	Regional	Consisting of glauconitic and fossiliferous marl, the low permeability layer sits between the Murray Group Limestone and the underlying Renmark Group aquifer. Thickness in the Project region varies from 12 to 75 m and it deepens to the east.
Renmark Group aquifer	Regional	A confined aquifer comprising unconsolidated carbonaceous sands, silt and clay. It is continuous over the Project region and deepens to the east to a maximum thickness of 300 m over the Renmark Trough. It has been developed for stock and domestic supplies only around the basin margins, where it is relatively shallow and contains groundwater that is usually of lower salinity than that within the overlying limestone aquifer which is sometimes saline. Groundwater flow is generally from the basin margins toward the river where discharge occurs to the overlying Murray Group Limestone aquifer by upward leakage. Salinities are in the range of 10,000 – 20,000 mg/L.

The western-most section of the transmission line corridor is located on the pre-Cambrian fractured rock aquifers of the Burra and Umberatana groups in the Adelaide Fold Belt. The aquifers outcrop and receive recharge in the Mount Lofty Ranges. They are predominantly comprised of sandstones and quartzites. Barnett (2015) reports that wells are mostly located in drainage lines yielding stock supplies only with salinities generally varying between 4,000 – 8,000 mg/L. To the east of the Mount Lofty Ranges these pre-Cambrian fractured rock aquifers underlie the Cainozoic sediments of the western margin of the Murray Basin.

The Quaternary sediments at the surface on the transmission line corridor are not considered to house any significant groundwater resources (SKM 2002). The Woorinen Formation is highly permeable and rainfall is rapidly absorbed and taken up by vegetation. It may form locally perched aquifers where underlain by Blanchetown Clay. The Quaternary sediments are underlain by the Tertiary aquifers of the Murray Basin described in Table 10-6 which form the water table in the region (i.e. the Murray Group Limestone aquifer to the west of Overland Corner and the Pliocene Sands aquifer to the east).

The transmission line corridor does not intersect any groundwater management prescribed areas under the *Landscape South Australia Act 2019*. The closest prescribed areas are the Barossa Prescribed Water Resources Area and the Mallee Prescribed Wells Area, which are both located over 50 km to the south.

Shallow groundwater depth and quality

Depth to shallow groundwater along the transmission line corridor is mapped as greater than 20 m for the western two-thirds of the corridor (DEW 2016a). It is mapped at shallower depths (5 – 10 m) in several areas near the eastern end of the transmission line (north of Barmera and adjacent to the Riverland Ramsar site) as shown in Figure 10-11.

Shallow groundwater salinity is mapped as between 14,000 and 35,000 mg/L along the majority of the transmission line corridor (DEW 2016b) as shown in Figure 10-12. Shallow groundwater salinity is lower west of Morgan (in the range 1,500 – 7,000 mg/L) and higher in several areas near the eastern end of the transmission line (north of Barmera, north of Renmark and near the state border) where it is greater than 35,000 mg/L. Shallow groundwater salinities of over 40,000 mg/L up to 85,000 mg/L have been recorded in wells in the Riverland Ramsar site (WaterConnect 2020).

Groundwater wells

There are 59 drillholes (wells) recorded in WaterConnect within the transmission line corridor, and 1,079 within 5 km of the proposed alignment, as shown in Figure 10-13 (WaterConnect 2020). Of these, only four wells within the transmission line corridor are listed as operational wells, with a further 34 not listed or unknown. Within 5 km of the proposed alignment, 86 wells are listed as operational with a further 679 not listed or unknown.

A large proportion of the wells within 5 km of the proposed alignment are used for observation and monitoring (WaterConnect 2020). As discussed above, groundwater in the region is used for stock watering where salinity is suitable. Most reported salinities for wells within 5 km of the proposed alignment are unsuitable for stock watering (of the 402 bores where salinity is reported, 106 have salinities less than 13,000 mg/L and only 11 of these have salinities less than 1,200 mg/L[2]).

Salinity values reported for these wells on the WaterConnect portal are highly variable. The minimum total dissolved salinity (TDS) value reported within 5 km of the proposed alignment is 200 mg/L (well number 7030-93 located in the Riverland Ramsar site at 15 m depth). The maximum recorded salinity is 85,850 mg/L (well number 7029-1628 located west of Lake Woolpolool in the Riverland Wetland, 1.5 m depth).

[2] These salinities correspond to the upper limits for environmental values in the *Environment Protection (Water Quality) Policy 2015* for 'Primary industries – livestock drinking water' (13,000 mg/L) and 'Drinking water for human consumption' (1,200 mg/L).

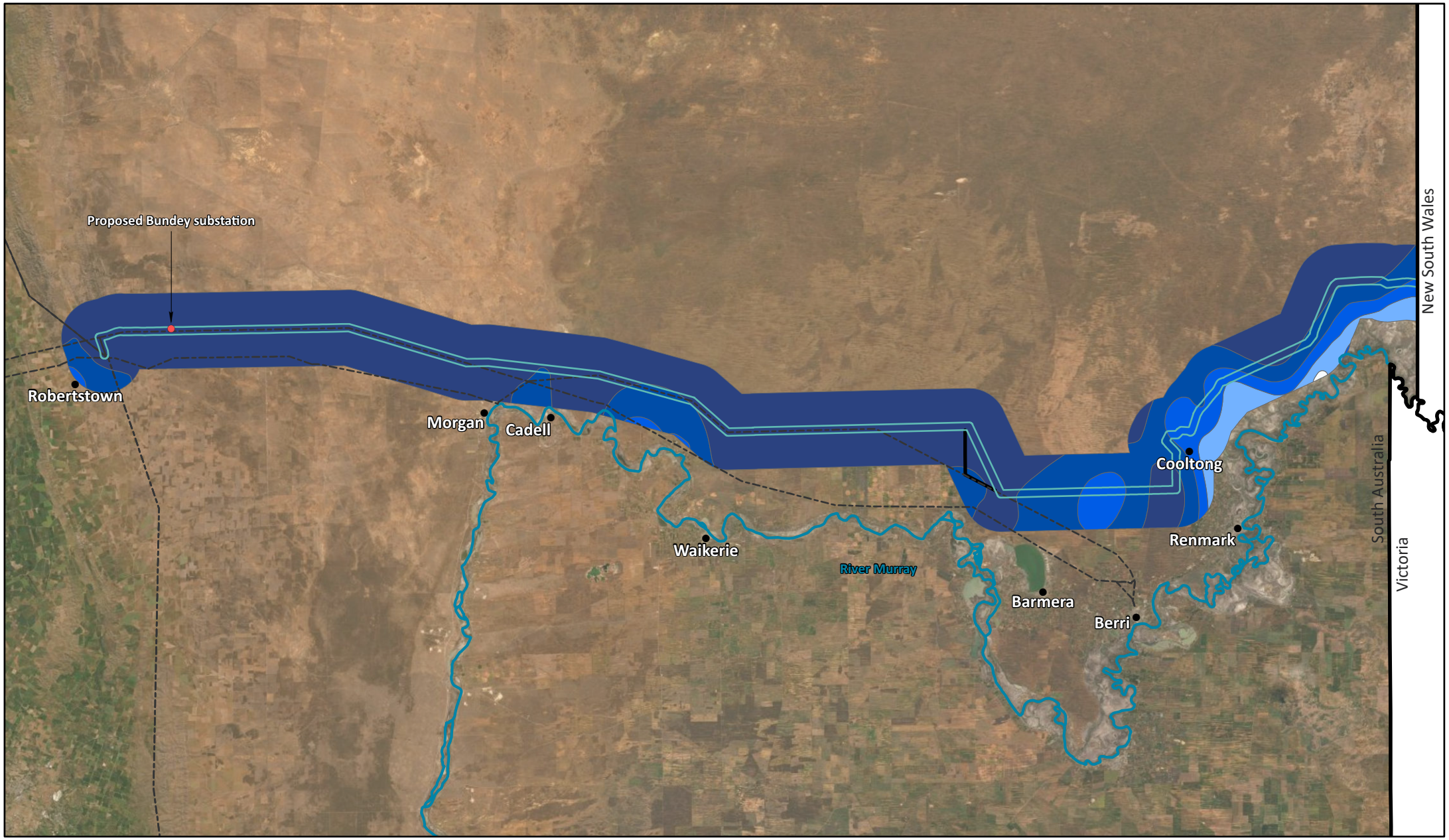
A summary of groundwater well data from the WaterConnect portal is provided in Table 10-7.

Table 10-7: Groundwater well data within 5 km of the proposed alignment

Location	Number of wells	Aquifers (number of wells)*	Average SWL** (m)	Average TDS (mg/L)	Average pH
Section 1: Robertstown to Goyder	53	Appila Tillite (2) Saddleworth Formation (1) Winnambool Formation (1)	36	8,258 (range 1,999 – 26,355)	7.9
Section 2: Goyder to Taylorville	52	Murray Group (11) Ettrick Formation Unit 1 (4) Coonambidgal Formation (2) Winnambool Formation (1)	32	10,660 (range 3,315 – 45,080)	7.9
Section 3: Taylorville to Wentworth-Renmark Rd	182	Loxton Sand (10) Murray Group (6) Monoman Formation (1) Bookpurnong Formation (1) Renmark Group (1) Warina Sand (1) Murray group (confined) (1)	26	23,160 (range 1,995 – 47,941)	6.1
Section 4: Wentworth-Renmark Rd to SA-NSW	792	Monoman Formation (334) Coonambidgal Formation (76) Loxton Sand (19) Murray group (confined) (7) Perched Woorinen Formation (1) Bookpurnong Formation (1) Warina Sand (1) Murray Group (1)	3.8	29,505 (range 200 – 85,850)	6.84

*Where reported (approximately 45% of wells had the aquifer reported)

**Standing water level (below ground surface)



Shallow standing water level (m)
- 0 - 2
- 2 - 5
- 5 - 10
- 10 - 20
- >20

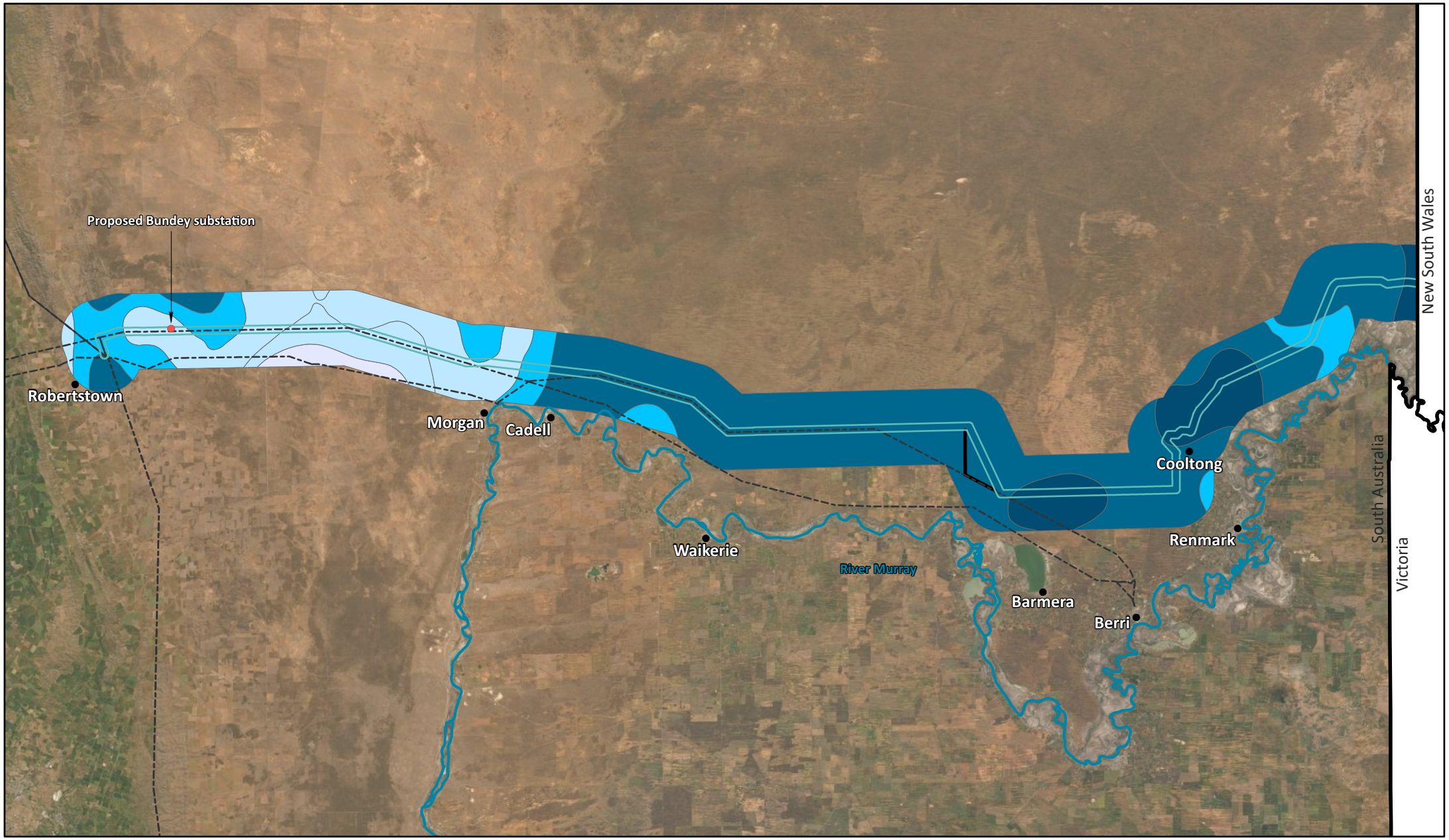
- Transmission line corridor
- Cultural heritage avoidance alignment
- Existing ElectraNet transmission line
- River Murray
- Proposed Bundey substation

Figure 10-11
Shallow groundwater depth on the transmission line corridor

0 20
Kilometres

N

ElectraNet energy connect JBS&G



Total Dissolved Salinity (mg/L)
- 0 - 1,500
- 1,500 - 7,000
- 7,000 - 14,000
- 14,000 - 35,000
- >35,000

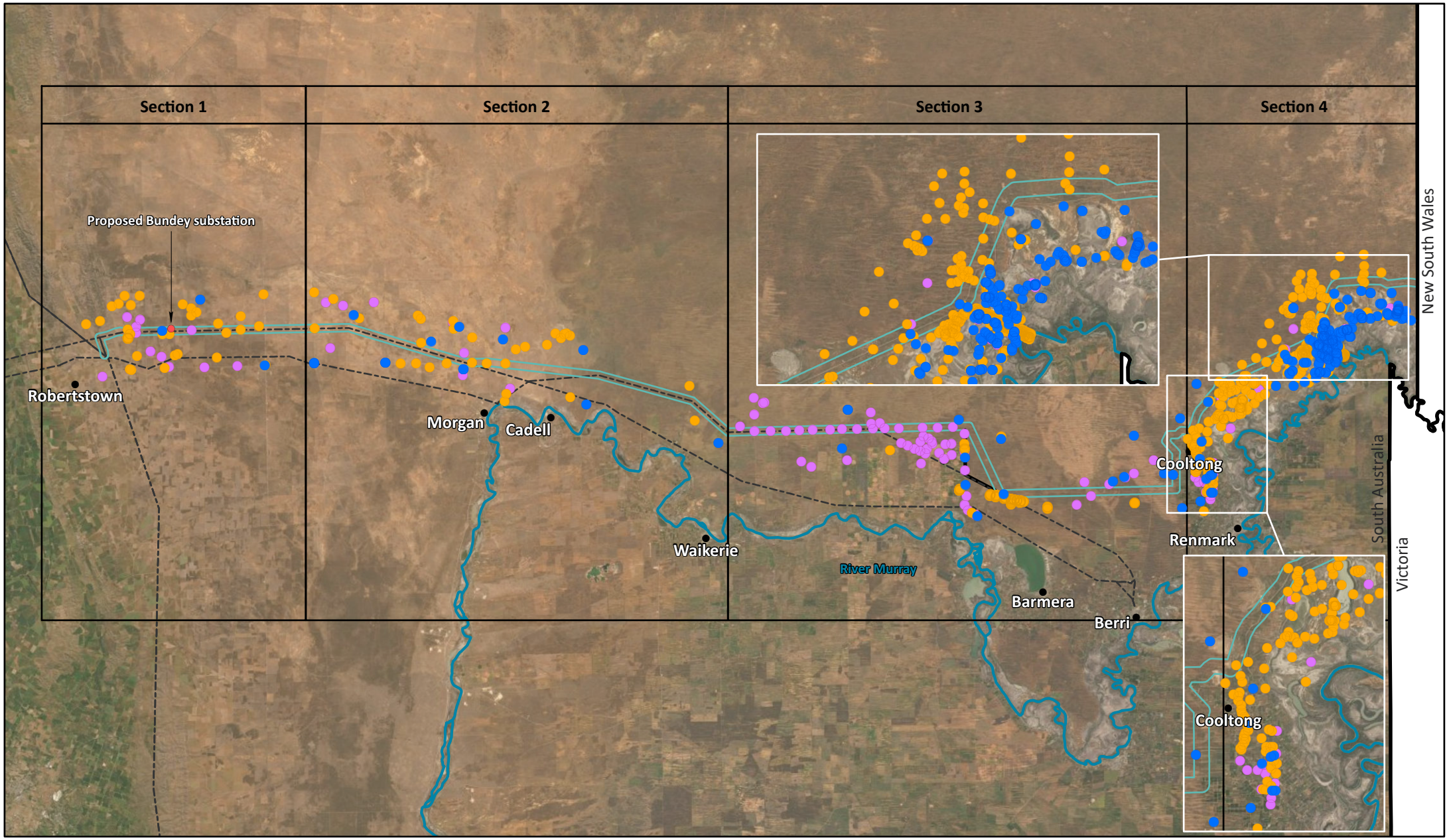
- Transmission line corridor
- Cultural heritage avoidance alignment
- Existing ElectraNet transmission line
- River Murray
- Proposed Bundey substation

Figure 10-12
Shallow groundwater salinity on the transmission line corridor

0 20
Kilometres

N

ElectraNet
energy connect
JBS&G



Transmission line corridor
Cultural heritage avoidance alignment
Existing ElectraNet transmission line
River Murray
Proposed Bundey substation

Groundwater well status
Operational
Unknown status
Blocked, abandoned or backfilled

Figure 10-13
Groundwater wells within 5 km of the proposed alignment

0 20
Kilometres

N

ElectraNet
energy connect
JBS&G

10.4. Impact Assessment

The following Project aspects have been identified as sources of impacts to soils, landform, surface water and groundwater:

- land disturbance and vegetation clearance
- presence of permanent infrastructure (including substation, towers and access tracks)
- dewatering of excavations (if required)
- water sourcing for use in construction
- wastewater disposal
- use of chemicals and fuels.

The potential impact events resulting from these aspects of the Project are discussed below. Predicted impact categories and an evaluation of uncertainty are also discussed for each impact event.

10.4.1. Erosion and sedimentation

There is a low potential for soil erosion or sedimentation of surface waters which can be readily managed by infrastructure location and erosion and sedimentation controls

Vegetation clearance, excavation and earthworks will be required for the construction of towers, the Bundey substation, new access tracks and temporary facilities (e.g. temporary laydown areas / staging sites and worker construction camps). These activities have the potential to lead to soil erosion if stockpiles or disturbed areas are exposed to wind or water flows, and could result in subsequent transport of sediment to watercourses or surface water bodies. With the implementation of measures such as appropriate location of infrastructure and sediment and erosion controls, significant impacts are not expected. Rehabilitation of temporary disturbance areas and operational monitoring and remediation (if required) will prevent any ongoing impacts.

The areas of disturbance for towers along the proposed alignment have a relatively small and discrete footprint and are sparsely distributed. The area of disturbance for towers and other infrastructure will be minimised and groundcover will be retained where possible (e.g. for the stringing access corridor). The most continuous soil disturbance will be the access track along the transmission line which will traverse a limited number of areas more susceptible to erosion. Existing tracks will be utilised where possible and grading or other earthworks will be limited to what is required to provide safe access for construction.

As described in Section 10.3.2, the majority of the transmission line corridor traverses land with low water erosion potential, with limited areas where erosion potential is higher at the western end of the alignment and near Burra Creek. The Bundey substation site is in an area of low water erosion potential.

Infrastructure such as towers, tracks and temporary facilities will be located and constructed to minimise the possibility of erosion. Sites with steeper slopes or in close proximity to watercourse banks (e.g. Burra Creek) will be avoided. Geotechnical investigations, micro-siting and detailed design will be used to inform this process. Soil stockpiles will be appropriately located to minimise the potential for off-site impacts. Sediment and erosion control measures will also be installed where appropriate (e.g. where earthworks are being undertaken in areas of higher erosion risk or in close proximity to watercourses or the River Murray wetlands). Drainage features or structures will be installed on the access track where appropriate to prevent erosion during operations and remedial action will be implemented where required.

There is a limited number of receptors such as watercourses or waterbodies along the transmission line corridor and it is not in close proximity to the River Murray. The proposed alignment is separated from the wetlands of the Riverland Ramsar site by the Old Wentworth Road / Renmark-Wentworth

Road and distances of 250 m to 500 m or more. As described in Section 10.1.1, naturally high turbidity is expected to be common in the watercourses and surface water bodies in the region following flow events. Any effect of the Project on turbidity and sedimentation in watercourses, farm dams or River Murray wetlands, where inflows following rainfall are naturally turbid and where the transmission line corridor forms a small proportion of their catchment, would be small, localised and short term, particularly with appropriate infrastructure location and implementation of sediment and erosion controls. The Project will not result in a substantial and measurable change in the water quality of the Riverland Ramsar site.

Temporary facilities will typically be located in areas where the potential for erosion and sedimentation of surface waters is low, and they will be rehabilitated following construction which will further reduce the potential for erosion and sedimentation.

In areas of higher wind erosion potential such as the central portion of the transmission line corridor, micro-siting of towers and access tracks (e.g. to avoid traversing along dunes) and use of existing tracks will minimise the potential for wind erosion. Dust control measures during construction and rehabilitation of areas of temporary disturbance will also reduce this potential, as discussed in Chapter 14 Air Quality.

ElectraNet will develop and implement a soil erosion and drainage management plan as part of the Construction Environmental Management Plan (CEMP), which will detail the requirements for soil management and sediment and erosion control. Monitoring will be undertaken during and following construction to ensure that sediment and erosion control measures are effective and remediation will be undertaken if required.

The predicted impacts are in the **Negligible** to **Minor** category. Uncertainty in the predicted impact (based on uncertainty in the implementation of controls or rehabilitation measures and the potential for extreme weather events) has been evaluated in Appendix O and the level of risk is **Low**.

10.4.2. Soil compaction

Soil compaction will be limited in extent and will be rehabilitated in areas of temporary disturbance following construction

Soil compaction can occur in areas where there are vehicle movements and material storage, and soil may be deliberately be compacted at some sites (e.g. temporary worker camps and laydown areas) to stabilise the site. Soil compaction can result in a reduced water infiltration capacity, increased potential for runoff and erosion and reduced vegetation growth. Soil compaction will be limited to defined areas and will be rehabilitated where required to prevent ongoing impacts.

The level of soil compaction will vary along the alignment, depending on the frequency each area is traversed. Soil compaction is expected to be highest within laydown areas and the entrance / exit of access tracks where vehicle traffic is more frequent, whereas soil within the vicinity of the tower base will likely be utilised for a short period of time during construction, which will limit soil compaction. Most areas will only be used briefly and will have limited vehicle movement. Existing tracks will be used as far as possible and movement of vehicles and equipment will be limited to defined areas.

In areas of temporary disturbance (e.g. non-permanent access tracks or laydown areas), compacted soil will be rehabilitated if required by scarifying or ripping and replacing any previously stripped stockpiled topsoil and vegetation (or as agreed with relevant landholders).

The predicted impacts are in the **Negligible** category. Uncertainty in the predicted impact (based on uncertainty in the implementation of controls or rehabilitation measures and the potential for extreme weather events) has been evaluated in Appendix O and the level risk of is **Low**.

10.4.3. Soil stockpiling

Soil stockpiles will be appropriately managed to maintain soil viability and minimise loss of soil from wind and water erosion during construction

Topsoil will be removed and stockpiled during construction, predominantly at tower sites, prior to respreading during rehabilitation. Loss of topsoil as well as a decline of soil quality may result due to wind or water erosion or mixing with subsoil. Soil stockpiles during construction will be appropriately managed to maintain soil viability.

Disturbed topsoil will be stockpiled within designated storage areas at each site. Stockpiles would be kept below approximately 2 m height to reduce the potential for windblown erosion to occur, and to preserve soil structure. Stripped topsoil will be segregated from excavated subsoil. Sediment and erosion controls (e.g. sediment fences) would be installed where required (e.g. if there is a watercourse nearby). Following the completion of construction, topsoil and cleared vegetation will be respread in areas of the site that are to be rehabilitated. Any surplus soil material not required for rehabilitation purposes will be disposed of off site or placed in agreed locations with landowners.

Impacts on soil viability and quantity as a result of stockpiling will be very limited in extent.

The predicted impacts are in the **Negligible** category. Uncertainty in the predicted impact (based on uncertainty in the implementation of management measures) has been evaluated in Appendix O and the level of risk is **Low**.

10.4.4. Disturbance of acid sulfate soil

Acid sulfate soil is not expected to occur. If it is encountered, it will be appropriately managed and treated to prevent impacts to soil or water quality

Acid sulfate soil can generate acidic conditions when exposed to oxygen and if incorrectly handled, may potentially impact on human health and the environment, and may also result in damage to infrastructure constructed on acid sulfate soil material. Acid sulfate soil potential in the transmission line corridor is predominantly negligible, and the proposed alignment avoids the ephemeral lakes in the Riverland Ramsar site where there is a high probability of occurrence of acid sulfate soils. It is expected that towers will not be located where acid sulfate soils are present. In the unlikely scenario that tower locations cannot avoid acid sulfate soils, geotechnical investigations and detailed design would ensure that tower foundations are appropriately designed for soil conditions and that measures are in place to manage any excavated material and prevent any impacts (e.g. storage in a lined area, lime dosing and minimisation of exposure to oxygen). The CEMP will also contain standard management measures to address unexpected disturbance of acid sulfate soils.

The predicted impacts are in the **Negligible** category. Uncertainty in the predicted impact (based on uncertainty in data in the eastern end of the transmission line corridor) has been evaluated in Appendix O and the level of risk is **Low**.

10.4.5. Alteration of drainage patterns

Design and placement of infrastructure (including towers, access tracks and the Bundey substation) will avoid alteration of surface water flows

Activities involving earthworks and installation of infrastructure have the potential to alter surface water flows, which can impact vegetation, downstream water features and agricultural or pastoral operations that are reliant on surface water.

The Project will have a negligible effect on surface water flows. The natural topography of the transmission line corrdior will be maintained, and the presence of towers will not provide any significant impediment to surface water flows or alter catchment areas. Towers will not be located in in areas where they could alter surface water flows or be damaged by flooding (e.g. in close proximity

to the Burra Creek channel). New or existing access tracks will be at the natural surface level and channel flows will be maintained at watercourse crossings (e.g. by construction at natural surface level or using pipes or culverts if required). Water affecting activity permits under the *Landscape South Australia Act 2019* will be obtained for watercourse crossings on the access track if required[3].

Construction of the Bundey substation may result in diversion of overland flows around the substation site. There is limited potential for scour to occur as slopes are low and flow paths in the vicinity of the site are broad and shallow. Siting and detailed design of the substation will ensure that there is no change to flow downstream of the substation and that scour or sedimentation do not occur.

There will not be a significant change in runoff in the transmission line corridor as impervious surfaces are not proposed to be introduced and the contribution from any less permeable areas (e.g. capped or compacted areas) will be negligible. Any effects on surface water flows during the construction period would be very minor, localised and short term. During construction, stockpiles will be managed to minimise impediment to flow, particularly near drainage lines.

The Project will not alter the hydrology of the Riverland Ramsar site.

The predicted impacts are in the **Negligible** category. Uncertainty in the predicted impact (based on uncertainty in placement of infrastructure or application of construction methodologies) has been evaluated in Appendix O and the level of risk is **Low**.

10.4.6. Groundwater use

Groundwater abstraction (if required) will be assessed and managed so that it does not result in drawdown of aquifers and reduction in groundwater availability for flora, fauna and groundwater users

Use of groundwater has the potential to result in drawdown of aquifers and reduction in groundwater availability for flora, fauna and groundwater users. However, as discussed below, the limited (if any) groundwater use for the project is not anticipated to have any significant impact.

Construction activities will require water for potable water supply (at temporary construction camps), concrete batching, dust suppression, and miscellaneous use such as wash bays. The water may be obtained from a range of sources, including existing licensed users (e.g. local landholders proximal to the route and local councils), the South Australian potable water network and potentially existing and new groundwater wells.

If groundwater is used (e.g. for dust suppression), the volumes used will be relatively low and extraction will be short term. If existing groundwater wells are used for water supply, the use of the wells and volume extracted will be in agreement with the landowner. Any new wells would be drilled in accordance with permit requirements and assessed to ensure that they will not impact any existing groundwater users. Groundwater use in the vicinity of the transmission line corridor is relatively limited.

The predicted impacts are in the **Negligible** category. Uncertainty in the predicted impact (based on uncertainty in the extent and location of possible groundwater use by the Project) has been evaluated in Appendix O and the level of risk is **Low**.

10.4.7. Soil or water contamination

Activities that could result in contamination or reduction in soil or water quality are assessed below. These include wastewater management, dewatering, use of saline water for dust suppression, disturbance of existing contamination and spills.

[3] Section 106 of the *Landscape South Australia Act 2019* outlines circumstances where a permit is not required, which may be relevant for the Project

Wastewater management

Wastewater disposal (e.g. temporary worker camp wastewater, washdown water) will be appropriately managed to avoid contamination of soil, surface water or groundwater

If an on-site wastewater treatment system is installed at camps, it would be designed and operated in accordance with the On-site Wastewater Systems Code and the *South Australian Public Health (Wastewater) Regulations 2013* to ensure that potential impacts are appropriately managed. Temporary washdowns would be operated in accordance with relevant EPA SA guidelines (e.g. EPA 517/16 *Stormwater management for wash bays*). Lined washout bays would be used to capture any hardened concrete, residual slurry or wastewater from washing of concrete trucks, prior to transport of waste off site once the wastewater has evaporated.

Wastewater management would also be undertaken in accordance with requirements of the Environment Protection (Water Quality) Policy and any wastewater disposal to land would not be in a location where it might enter any waters. Wastewater irrigation sites would be appropriately fenced and would also be located to avoid adverse impacts to native vegetation. Licensed contractors would be used where wastewater is removed for off-site treatment or disposal.

The predicted impacts are in the **Negligible** category. Uncertainty in the predicted impact (based on uncertainty in the locations for disposal or implementation of management measures) has been evaluated in Appendix O and the level of risk is **Low**.

Dewatering of excavations

Groundwater will largely not be intersected by excavation and dewatering (if required) will be managed appropriately to ensure there are no impacts to soil and surface water quality

Dewatering of excavations that encounter shallow groundwater or that collect rainwater or runoff can potentially result in soil erosion and soil and surface water quality impacts, if inappropriately managed.

The Project is not anticipated to intersect groundwater for the majority of the transmission line corridor as depth to groundwater is generally greater than 20 m. Shallower groundwater may occur within some areas (e.g. north of Cooltong, where it is mapped at 5 – 10 m depth). Footing excavations (which are typically 13 – 16 m in depth) may require dewatering (to adjacent land) during construction in these areas, or in other locations if excavations are open during significant rainfall events and collect runoff.

Dewatering would be undertaken in accordance with requirements of the Environment Protection (Water Quality) Policy and relevant guidelines e.g. EPA 1093/18 *Environmental management of dewatering during construction activities.*

If excavations require dewatering, water quality would be assessed to ensure that it is suitable for the disposal site with reference to relevant guidelines (e.g. EPA SA guidelines, ANZECC / ARMCANZ 2000 and ANZG 2018). Dewatering would be to land, in a location where it would not enter waters. It would be undertaken with landholder consent and sediment and erosion controls outlined in the CEMP would be in place. Alternatively, water may be treated or removed off-site for re-use or disposal.

Impacts of dewatering excavations on groundwater (e.g. drawdown) would be very localised and short term.

The predicted impacts are in the **Negligible** category. Uncertainty in the predicted impact (based on uncertainty in groundwater depths in the eastern end of the transmission line corridor and implementation of management measures) has been evaluated in Appendix O and the level of risk is **Low**.

Use of saline water for dust suppression

Use of saline water for dust suppression is expected to have a negligible impact

Saline water may be used for dust suppression on access tracks and stockpiles. Saline water may be extracted from groundwater wells or obtained from water treatment plant discharge and applied via water cart sprinklers and or hoses. There may be a minor and temporary increase in the salts in the soil or depositing on the leaf surface of plants in the immediate vicinity of areas where dust suppression undertaken as a result of the use of saline water in this application.

The impact of saline water use is expected to be confined to the disturbance footprint and even within the footprint, effects are likely to be very minor given the short-term nature of construction activities at any given location.

The predicted impacts are in the **Negligible** category. Uncertainty in the predicted impact (based on uncertainty in water salinity and extent of use) has been evaluated in Appendix O and the level of risk is **Low**.

Disturbance of existing contaminated soil

Existing contamination is not expected to be encountered or disturbed and procedures will be in place to prevent any additional contamination of soil, surface water or groundwater if it is encountered

While there is always potential for small-scale localised contamination in the transmission line corridor (e.g. if fuel or chemicals have been spilled or inappropriately disposed in the past), this is not considered likely. The detailed design process and geotechnical assessments will identify whether there are any potential site contamination issues at potential tower locations or specific management measures required. The CEMP will contain measures that would be implemented in the case of a discovery of potentially contaminated soil or groundwater, including measures to contain material and treat it on site or remove off-site for treatment or disposal at an appropriately licensed facility.

The predicted impacts are in the **Negligible** category. Uncertainty in the predicted impact (based on uncertainty in the potential for unexpected discovery or implementation of management measures) has been evaluated in Appendix O and the level of risk is **Low**.

Spills of chemicals or hydrocarbons

Appropriate storage and handling of chemical and fuels will be undertaken and contamination of soil, surface water or groundwater is not expected occur as result of construction and operation

There is no impact expected from the transport, storage and handling of hydrocarbons and chemicals, however accidental spills can lead to local contamination of soil, and potentially secondary impacts on surface water or groundwater.

In order to minimise the risk of soil or water contamination, fuel, oil and chemicals on site will be stored and handled in accordance with relevant standards and guidelines (e.g. AS 1940, EPA guideline 080/16 *Bunding and Spill Management* and the Australian Dangerous Goods Code). Fuel, oil and chemicals will be stored in their product containers with appropriate secondary containment (e.g. lined, bunded areas or on self-bunded pallets). Storage of fuel and chemicals will be restricted to designated areas at temporary facilities (e.g. construction camps and laydown areas). Waste chemicals, oils and other waste substances will be stored in designated waste storage areas for collection by an authorised contractor and disposed of off-site in accordance with EPA SA requirements.

Infield refuelling of vehicles would be undertaken within designated areas (e.g. cleared laydown areas) and is expected to be required infrequently. Permanent or transportable bunds and spill kits would be used for refuelling. All equipment will be subject to scheduled maintenance, to minimise the potential for oil leaks or broken hoses.

Runoff from hardstand areas at the Bundey substation will be directed to an oil water separator / containment tank which will reduce the risk of any spills resulting in contamination off-site.

If a spill occurs, it will be contained, reported and clean up actions initiated. Any contaminated soil resulting from a spill will either be treated in-situ or removed for treatment / disposal at an EPA SA approved facility. Assessment and remediation of spills would be consistent with the National Environment Protection (Assessment of Site Contamination) Measure and relevant EPA SA guidelines. A spill and emergency response plan will be developed to ensure mechanisms are in place to respond to any spill, leak, or unplanned emergency.

The measures that will be implemented for storage and handling of fuels and chemicals are well-established and widely used. They have been implemented successfully by ElectraNet on other transmission line construction projects and are known to be effective.

There are limited surface water receptors along the majority of the transmission line corridor and groundwater is predominantly at depths greater than 20 m, which limits the potential for secondary impacts of a spill to surface water or groundwater (if a spill occurs). As noted above, the transmission line corridor is not in close proximity to the River Murray and is the proposed alignment is separated from the wetlands of the Riverland Ramsar site by the Old Wentworth Road / Renmark-Wentworth Road and distances of 250 m to 500 m or more. Temporary facilities where fuel and chemicals are stored (e.g. camps) would not be established in areas where there is a risk of a spill entering the Riverland Ramsar site wetlands. Shallow groundwater use is also very low, further limiting the potential for secondary impacts of any spills on groundwater users.

There is no impact expected as a result of spills of chemicals or hydrocarbons. The level of risk associated with an unplanned event occurring has been assessed in Appendix O. The credible worst-case consequence would arise if a spill occurred near surface water, and is in the **Moderate** category, and this is considered **Unlikely**. The level of risk is **Low**.

10.4.8. Summary of key mitigation measures

Table 10-8: Key mitigation measures – physical environment

Mitigation measure	Construction	Operation
Restrict the area and duration of soil disturbance to the minimum necessary.	✓	✓
Retain groundcover where possible (e.g. for the stringing access corridor)	✓	
Incorporate existing tracks into the design as far as possible.	✓	
Locate and construct infrastructure such as towers, tracks and temporary facilities to minimise the potential for erosion and avoid alteration of surface water flows.	✓	✓
Install sediment and erosion controls (e.g. berms, drainage controls, sediment fencing) where necessary.	✓	✓
Implement measures to minimise wind erosion (e.g. watering or stabilisation) where required.	✓	
Ensure towers are not placed in watercourses, or on dune crests in areas of high erosion potential.	✓	✓
Undertake geotechnical investigations for detailed design.	✓	
Stockpile topsoil and cleared vegetation (separate from subsoil stockpiles) for re-spreading over areas of temporary disturbance.	✓	
Limit vehicle movements to defined tracks and work areas	✓	✓
Locate soil stockpiles to minimise the potential for off-site impacts (e.g. away from watercourses or potential flow paths.	✓	
Obtain water affecting activity permits for watercourse crossings where required.	✓	
Locate camps and temporary facilities away from watercourses and lakes.	✓	
Locate towers to avoid areas of potential acid sulfate soils as far as possible (e.g. near lakes at eastern end of transmission line corridor)	✓	✓
Develop a protocol for dealing with acid sulfate soils and potentially contaminated material if encountered during construction.	✓	

Mitigation measure	Construction	Operation
Manage any disturbed acid sulfate soil in accordance with industry standards (e.g. appropriate soil handling methods and lime dosing rates).	✓	
Implement appropriate measures for dewatering, such as disposal on site away from surface water features if it suitable for the disposal site (with reference to relevant guidelines).; water treatment; or removal off site for treatment or disposal. Any disposal on site must have landholder consent and be in a manner that minimises sedimentation and erosion.	✓	
Ensure that groundwater abstraction rates and volumes are within limits agreed with well owner.	✓	
Assess any new water supply wells to ensure they will not impact existing groundwater users.	✓	
Obtain appropriate permits for the construction of water supply wells where required.	✓	
Undertake hydrocarbon and chemical storage in accordance with Australian Standards and EPA SA bunding guidelines.	✓	
Undertake infield refuelling (where required) in designated areas with appropriate bunding and spill kits in place.	✓	✓
Avoid refuelling activities in close proximity to surface water features.	✓	✓
Manage camp wastewater in accordance with health regulations and *Environment Protection (Water Quality) Policy 2015.*	✓	
Maintain equipment to prevent spills or leaks.	✓	✓
Implement spill and emergency response procedures including containment, reporting and clean up.	✓	✓
Use licensed chemical and waste transporters.	✓	
Undertake progressive rehabilitation of temporary construction areas	✓	
Rehabilitate areas of temporary disturbance by scarifying or ripping to alleviate compaction and replacing any previously stripped stockpiled topsoil and vegetation (or as agreed with relevant landholders).	✓	
Undertake monitoring during and after construction to ensure that sediment and erosion control measures are effective and undertake remediation if required.	✓	✓
Monitor the easement and access tracks for evidence of erosion or sedimentation and undertake remediation where required.		✓

10.5. Conclusion

ElectraNet's key finding is that Project construction or operational activities will not have a significant impact on the physical environment. Potential impacts (e.g. erosion and sedimentation, alteration of surface water flows or spills) can be readily managed with appropriate location of infrastructure and application of standard management measures.