APPLICATION ON NOTIFICATION – CATEGORY 2

<table>
<thead>
<tr>
<th>Applicant:</th>
<th>RES Australia Pty Ltd</th>
</tr>
</thead>
<tbody>
<tr>
<td>Development Number:</td>
<td>422/E003/17</td>
</tr>
<tr>
<td>Nature of Development:</td>
<td>Twin Creek Wind Farm and Energy Storage Facility</td>
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<tr>
<td>Type of development:</td>
<td>Merit</td>
</tr>
<tr>
<td>Zone / Policy Area:</td>
<td>Primary Production / Rural Zones</td>
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<tr>
<td>Subject Land:</td>
<td>Numerous land parcels located north-east of Kapunda. Site entrance located on Mosey Road, St Kitts</td>
</tr>
<tr>
<td>Contact Officer:</td>
<td>Lee Webb</td>
</tr>
<tr>
<td>Phone Number:</td>
<td>(08) 7109 7066</td>
</tr>
<tr>
<td>Start Date:</td>
<td>10 May 2018</td>
</tr>
<tr>
<td>Close Date:</td>
<td>23 May 2018</td>
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</table>

During the notification period, hard copies of the application documentation can be viewed at the Department of Planning, Transport and Infrastructure, Level 5, 50 Flinders St, Adelaide, during normal business hours. Application documentation may also be viewed during normal business hours at the local Council office (if identified on the public notice).

Written representations must be received by the close date (indicated above) and can either be posted, hand-delivered or emailed to the State Commission Assessment Panel.

Any representations received after the close date will not be considered.

Postal Address:
The Secretary
State Commission Assessment Panel
GPO Box 1815
ADELAIDE SA 5001

Street Address:
Development Division
Department of Planning, Transport and Infrastructure
Level 5, 50 Flinders St
ADELAIDE SA 5000

Email Address: scapadmin@sa.gov.au
Applicant: RES Australia Pty Ltd

Development Number: 422/E003/17

Nature of Development: Twin Creek Wind Farm and Energy Storage Facility

Type of development: Merit

Zone / Policy Area: Primary Production / Rural Zones

Subject Land: Numerous land parcels located north-east of Kapunda. Site entrance located on Mosey Road, St Kitts

Contact Officer: Lee Webb

Phone Number: (08) 7109 7066

Close Date: 23 May 2018

My name:__________________________________________________________________________

My phone number: __________________________________________________________________

PRIMARY METHOD(s) OF CONTACT: Email address: _______________________________________

Postal address: ____________________________________________________________ Postcode __________

You may be contacted via your nominated PRIMARY METHOD(s) OF CONTACT if you indicate below that you wish to be heard in support of your submission.

My interests are:  

☐ owner of local property

☐ occupier of local property

☐ a representative of a company/other organisation affected by the proposal

☐ a private citizen

The address of the property affected is __________________________________________ Postcode __________

The specific aspects of the application to which I make comment on are:

_________________________________________________________________________________

_________________________________________________________________________________

_________________________________________________________________________________

_________________________________________________________________________________

_________________________________________________________________________________

Should the State Commission Assessment Panel conduct a public hearing for this Development Application:

I  

☐ wish to be heard in support of my submission

☐ do not wish to be heard in support of my submission

(Please tick one)

By  

☐ appearing personally

☐ being represented by the following person:

(Please tick one)

Date _________________________________   Signature  _________________________________________________

Return Address: The Secretary, State Commission Assessment Panel, GPO Box 1815, Adelaide SA 5001 or scapadmin@sa.gov.au.
**DEVELOPMENT APPLICATION FORM**

**COUNCIL:** LIGHT REGIONAL COUNCIL, REGIONAL COUNCIL OF GOYDER AND MID MURRAY COUNCIL

**APPLICANT:** RES AUSTRALIA PTY LTD
Postal Address: SUITE 4, LEVEL 1, 760 PACIFIC HIGHWAY CHATSWOOD NSW 2067

**OWNER:** VARIOUS – SEE ATTACHED
Postal Address:

**BUILDER:** TBA
Postal Address:
Licence No:

**CONTACT PERSON FOR FURTHER INFORMATION:**
Name: JULIE JANSEN - MASTERPLAN SA PTY LTD
Telephone: 8193 5600
Email: JULIE@MASTERPLAN.COM.AU
Mobile: 0413 832 616

**EXISTING USE:**
AGRICULTURE AND ASSOCIATED DWELLINGS AND OUTBUILDINGS

**DESCRIPTION OF PROPOSED DEVELOPMENT:**
TWIN CREEK WIND FARM AND ENERGY STORAGE FACILITY – INFRASTRUCTURE INCLUDING WIND TURBINE GENERATORS, ON-SITE SUBSTATION, OPERATIONS AND MAINTENANCE COMPOUND, TEMPORARY CONSTRUCTION COMPOUNDS (INCLUDING CONCRETE BATCHING PLANT), TRANSMISSION LINE AND TERMINAL SUBSTATION. A PERIOD OF FIVE YEARS IN WHICH TO SUBSTANTIALLY COMMENCE THE DEVELOPMENT FROM THE OPERATIVE DATE AND SUBSTANTIAL COMPLETION TO BE EXTENDED TO SEVEN YEARS FROM THE OPERATIVE DATE OF THE CONSENT.

**LOCATION OF PROPOSED DEVELOPMENT:**
House No: VARIOUS Lot No: VARIOUS Street: 
Section No (full/part): INCLUDING: S278 Hundred: BELVIDERE Volume: 5618 Folio: 693

Section No (full/part): 
Hundred: 
Volume: 
Folio: 

**DOES EITHER SCHEDULE 21 OR 22 OF THE DEVELOPMENT REGULATIONS 2008 APPLY?**  YES: ☑ NO: 

**HAS THE CONSTRUCTION INDUSTRY TRAINING FUND ACT 1993 LEVY BEEN PAID?**  YES: ☑ NO: ☑

**DEVELOPMENT COST** (Do not include any fit-out costs): $330 MILLION

I acknowledge that copies of this application and supporting documentation may be provided to interested persons in accordance with the Development Regulations 2008.

**SIGNATURE:**

**Dated:** 14 AUGUST 2017

MR DANIEL LEAHY FOR AND ON BEHALF OF RES AUSTRALIA PTY LTD
TWIN CREEK WIND FARM
Development Application for Development Plan Consent

August 2017

VOLUME 1
PROJECT SUMMARY
TWIN CREEK WIND FARM
AND ENERGY STORAGE PROJECT

VOLUME 1

PROJECT SUMMARY

RES AUSTRALIA PTY LTD

August 2017

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<th>Author</th>
<th>Reviewer</th>
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<td>Julie Jansen 24 March 2017</td>
<td>Daniel Leahy</td>
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<td>Julie Jansen, 16 April 2017</td>
<td>Daniel Leahy</td>
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<td>Final – Corrections</td>
<td>Julie Jansen, 01 August 2017</td>
<td>Annette Devenson, RES</td>
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Prepared by
MasterPlan SA Pty Ltd
ABN 30 007 755 277, ISO 9001:2015 Certified
33 Carrington Street, Adelaide SA 5000
Telephone: 8193 5600, masterplan.com.au
DEVELOPMENT APPLICATION DOCUMENT STRUCTURE

This is volume one of four volumes comprising the development application for the Twin Creek wind farm development. The application comprises:

Volume 1 – Project Summary
Volume 2 – Technical Reports
Volume 3 – Drawings, Maps and Figures
Volume 4 – Draft Construction Environmental Management Plan
# Contents

Executive Summary ........................................................................................................................................ vi

CHAPTER 1 - INTRODUCTION .................................................................................................................. 2

1.0 Introduction .............................................................................................................................................. 2

1.1 Applicant Details ...................................................................................................................................... 2

1.2 Application Structure ............................................................................................................................. 2

1.3 Proposed Location of the Twin Creek Wind Farm and Energy Storage Project ........................................ 3

1.4 Legal Description of the Site of the Development .................................................................................. 6

1.5 Project Overview .................................................................................................................................... 22

1.5.1 Summary of Development Components .......................................................................................... 22

1.5.2 Construction Compound, Substation and Battery Energy Storage Facility ........................................ 23

1.5.3 Concrete Batching Plant ................................................................................................................... 24

1.5.4 Temporary Construction Compounds .............................................................................................. 25

1.5.6 Battery Storage ................................................................................................................................. 26

1.6 Project Timing ....................................................................................................................................... 26

CHAPTER 2 – PROJECT CONTEXT ............................................................................................................... 28

2.1 Introduction ............................................................................................................................................ 28

2.2 RES Australia and projects .................................................................................................................... 28

2.3 Context for Wind Energy Development ................................................................................................. 28

2.3.1 Global Context ................................................................................................................................... 28

2.3.2 National Context ............................................................................................................................... 29

2.3.3 State Context ..................................................................................................................................... 30

2.3.4 Local Energy-System Security ......................................................................................................... 31

2.3.5 Local Energy-System Security ......................................................................................................... 31
2.3.6 Integration of Wind Farm and Battery Energy Storage into the National Electricity Network …… 32

2.5 Community Enhancement Programmes .................................................................................. 34

CHAPTER 3 – STRATEGIC AND LEGISLATIVE CONTEXT ........................................................................ 38

3.1 South Australian Strategic Context ......................................................................................... 38
   3.1.1 South Australia’s Strategic Plan .................................................................................. 38
   3.1.2 Strategic Infrastructure Plans .................................................................................. 38
   3.1.3 Energy Plan ........................................................................................................... 39
   3.1.4 Wind Farm Planning Policy .................................................................................. 39

3.2 Development Act 1993 ......................................................................................................... 40

3.3 Other Approvals ................................................................................................................ 42
   3.3.1 Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) .......... 42
   3.3.2 Aboriginal Heritage Act 1998 .............................................................................. 42
   3.3.3 Native Vegetation Act 1991 ............................................................................... 43

CHAPTER 4 – PROJECT DESCRIPTION .......................................................................................... 45

4.1 Site Selection ........................................................................................................................ 45

4.2 Project Evolution ................................................................................................................ 46

4.3 layout design ..................................................................................................................... 47

4.4 Wind Turbine Generators .................................................................................................. 50
   4.4.1 Construction of Electrical Infrastructure ................................................................. 55

4.5 Transportation .................................................................................................................... 55
   4.5.1 Regional Road Access for Construction Purposes ..................................................... 57
   4.5.2 Local Road Upgrades .............................................................................................. 59
   4.5.3 On-site Access Tracks ............................................................................................. 60
   4.5.4 Construction of On-Site Access Tracks .................................................................. 60

4.5 Water Provision .................................................................................................................. 61
6.4.1 Traditional Owners and Association with Landform .................................................. 91
6.4.2 Identified Heritage Places ......................................................................................... 92
6.4.3 Findings ................................................................................................................... 93
6.5 Bushfire Risk.................................................................................................................. 93
6.5.1 Context .................................................................................................................... 94
6.5.2 Bushfire Risk from the Proposal .............................................................................. 94
6.5.3 Operational Constraints and Opportunities .............................................................. 97
6.5.6 Conclusion and Recommendations ....................................................................... 98
6.6 Shadow Flicker and Blade Glint Assessment ............................................................... 98
6.7 EMI Assessment ......................................................................................................... 100
6.7.1 Investigations and Methodology ............................................................................ 100
6.7.2 Findings and Potential Mitigation .......................................................................... 103
6.8 Aviation Impact Assessment ....................................................................................... 104
6.9 Traffic Impact Assessment ......................................................................................... 106
6.9.1 Existing Conditions ............................................................................................... 107
6.9.2 Preferred Access Route ........................................................................................ 107
6.9.3 Traffic Impact Assessment ..................................................................................... 109
6.9.4 Conclusions ............................................................................................................ 111
6.10 Civil, Geology and Hydrology Assessment ................................................................. 112
6.11.1 Natural Features ................................................................................................. 112
6.11.2 Geotechnical Constraints and Opportunities ..................................................... 113
6.11 Socio-Economic Impact Assessment ........................................................................ 114
6.12 Development Plan Assessment ................................................................................ 118

CHAPTER 7 – CONCLUSIONS ....................................................................................... 122
CHAPTER 8 - STATEMENT OF COMMITMENTS ......................................................... 125
EXECUTIVE SUMMARY

INTRODUCTION

RES Australia Pty Ltd (RES Australia) proposes to develop the Twin Creek Wind Farm and Energy Storage project within the Mid North area of South Australia. The site of the proposed wind farm and battery energy storage is approximately 90km north east of Adelaide and north east of Kapunda. The site comprises approximately 5,600 hectares of farm land which is used predominately for sheep grazing and cereal cropping.

RES is the world's largest independent renewable energy company, with the expertise to develop, engineer, construct, finance, and operate projects around the globe. RES Australia has been developing renewable energy projects in Australia since 2004 and its recent wind projects include Ararat Wind Farm (75 turbines, 235 MW) and Murra Warra Wind Farm (116 turbines, 418 MW) in Victoria and Taralga Wind Farm (51 turbines, 107 MW) in New South Wales. The combination of the excellent exposure to South Australia’s abundant wind resource and a 2.0 kilometre distance buffer from wind turbines to non-involved dwellings makes Twin Creek, an ideal location for a renewable energy project.

The Twin Creek site has excellent exposure to South Australia’s abundant wind resources, making it an ideal location for a renewable energy project.

PROJECT OVERVIEW

The proposed wind farm will consist of the following components:

- up to 51 Wind Turbines Generators (WTG);
- a total installed wind capacity in the order of 185 MW;
- overall height of turbines would be up to 180 metres at the blade tip;
- associated hard standing areas and access roads;
- operations and maintenance building and compound with associated car parking;
- two electrical substations;
- battery energy storage facility with an indicative capacity of 215 MW;
- overhead and underground electrical cable reticulation;
- overhead transmission line for approximately 15 kilometres from the on-site substation to the existing overhead Robertstown - Tungkillo transmission line east of Truro;
- meteorological masts for measuring wind speed and other climatic conditions; and
• temporary construction facilities including a borrow pit and concrete batching plant facilities.

It is estimated that the Twin Creek Wind Farm was the capacity to generate 613,000 MWh per year. This generation is equivalent to the electricity needs of approximately 118,000 South Australia homes each year, (assuming the average annual household electricity use is 5,200 kWh per annum).

Development of the Twin Creek Wind Farm is forecast to generate $209 million of value added in the State of South Australia over the period of construction over a three-year period. 1,447 person years of employment in South Australia would be supported, or an average of over 480 jobs sustained per year over three years. Once operational the project is estimated to support annually $15.5 million of value added in South Australia, and support directly and indirectly in the order of 105 jobs per year.

Renewable wind energy generation has significant environmental benefits through carbon emissions reduction where it replaces coal or gas generated electricity. The value of carbon emission savings associated with the Twin Creek Wind Farm is estimated to be $9.8 million per annum or a net present value of $104 million over a 20 year period.

This project will contribute to the State Government and Federal Government renewable energy targets. Currently the State Government objective is to produce at least 50 percent of the State’s electricity from renewable sources by 2025. The Federal Government objective to achieve an additional 33,000 GWh of electricity from renewable sources by 2020 under the Renewable Energy Target (RET).

DEVELOPMENT APPLICATION PROCESS

The site of the proposed development transverses three Local Government areas. Infrastructure for the project will be developed within the Light Regional Council, Regional Council of Goyder and Mid Murray Council areas.

In accordance with Schedule 10(14) of the Development Regulations 2008, the Development Assessment Commission will be the relevant planning authority to assess the development application, as the proposed development is “for the purposes of the provision of electricity generating plant with a generating capacity of more than 5 MW that is to be connected to the State’s power system”. Assessment of the application will be undertaken against the relevant provisions of the Light Regional Council Development Plan, the Goyder Council Development Plan and the Mid Murray Development Plan.

PROJECT SITING AND LANDSCAPE

The proposed development is located between the townships of Kapunda, Eudunda and Truro as shown on Figure 1 – Location Plan below in Volume 3.
The site is located on the tablelands that form the wide ridgeline associated with Bald Hill and Long Hill situated within the Northern Mount Lofty Ranges.

Landform of the area is defined by numerous ridgelines that run north-south through the site creating a series of parallel ridges, wide open valleys, tablelands and isolated topographic features. The progressive geological faulting and folding processes that have formed the Southern Flinders Ranges and Northern Mount Lofty Ranges dominate the area creating a series of undulating ridges and escarpments.

Surrounding the site of the proposed development, the landscape is dominated by grazing with open paddocks defined by fenced boundaries and occasional trees to fence lines and creek lines. The land use that occurs in the open valley floor between the local ridgelines and across the tablelands associated with Bald Hill is more diverse with areas of arable cropping and grazing. This creates a patchwork character to the landscape with changes in colour and texture because of the different agricultural practices.

PROJECT EVOLUTION

RES Australia purchased a wind monitoring mast on the subject land from DP Energy and full development control of the site in January 2015. In 2015/2016 RES engaged and commenced detailed technical feasibility of the project.

Wind Farm development is an evolutionary process. Over the past 18 months – 2 years, RES has prepared numerous design layout iterations for the wind turbine generators, transmission line and ancillary infrastructure.

The project layout proposed is the result of comprehensive wind modelling, extensive environmental surveys and expert technical advice. Variations in the layout have resulted from technical advice regarding constraints, including ecological, civil, acoustic, geological, hydrological, electromagnetic, transportation, cultural heritage or other locational characteristics. In addition to advice from its technical experts, advice and input has been sought from the community, universities, Government Agencies and Light Regional Council, Regional Council of Goyder and Mid Murray Council.

Consultation with the community was undertaken in Kapunda, Eudunda and Truro during October 2016. The feedback received from this consultation was provided to technical experts of the project team and was considered in the final project design, as applicable. A further project open day was held on Friday 7th April 2017 illustrating the revised design ahead submitting this development application.

In preparing the development application, RES Australia has utilised the Clean Energy Council’s Best Practice Guidelines for the Australian Wind Industry, 2013. These guidelines provide wind farm proponents, such as RES Australia, with details on best practice for a “typical” project, addressing a wide range of environmental, amenity and stakeholder consultation aspects of a wind farm during its investigation phase, approvals process and construction.
The Guidelines do not replace existing energy or environmental planning legislation, policy or regulations at local or state level. The Twin Creek Wind Farm and Energy Storage project is assessed in accord with the South Australian legislation, namely the Development Act, 1993 and Development Regulations 2008.

Taking account of all the technical advice from independent experts, RES has prepared the development application as now submitted for determination.

**TECHNICAL INVESTIGATIONS**

The design of the wind farm has evolved and developed following detailed technical, engineering and environmental investigations.

A variety of investigations have been undertaken and assessment reports prepared to examine the existing situation, the likely impacts of the proposal, and mitigation and management mitigation measures proposed. These technical assessments have included noise impact, visual impact (including shadow flicker and blade glint), flora and fauna (including avifauna), Aboriginal and European heritage, traffic and transport, land use, hazards (including bushfire, aviation and physical safety), water resources and site drainage, soils and geology, and the social and economic impact of the project.

The studies and assessments which have been undertaken include:

- Twin Creek Wind Farm Consultation Outcomes Report by GHD dated June 2017;
- Twin Creek Wind Farm Flora and Fauna Assessment report by EBS Ecology (EBS) dated 28 June 2017;
- Landscape Character and Probable Visual Effect Assessment by Wax Design and Dr Brett Grimm dated 28 June 2017;
- Twin Creek Wind Farm Environmental Noise Assessment by Sonus dated June 2017;
- Desktop Cultural Heritage Assessment Twin Creek Windfarm Report by EBS Heritage dated 14 March 2017;
- Twin Creek Wind Farm Bushfire Management Plan by SA Bushfire Solutions dated June 2017;
- Twin Creek Wind Farm Shadow Flicker and Blade Glint Assessment by DNV-GL dated 26 June 2017;
- Twin Creek Wind Farm EMI Assessment by DNV-GL dated 26 June 2017;
- Aviation Impact Statement, Qualitative Risk Assessment (QRA) and Obstacle Lighting Review by Ambidji Group Pty Ltd (Ambidji a division of Landrum and Brown Worldwide) dated 17 March 2017;
- Traffic Impact Assessment by AECOM Australia Pty Ltd (AECOM) dated 26 June 2017;
• Twin Creek Wind Farm Civil, Geology and Hydrology by AECOM Australia Pty Ltd (AECOM) dated 28 June 2017;

• Socio-Economic Impact Assessment for the Twin Creek Wind Farm by Hudson Howells Strategic Management Consultants dated March 2017; and

• Twin Creek Wind Farm and Energy Storage Facility Development Plan Assessment Report by MasterPlan dated August 2017;

Copies of these technical reports are contained in Volume 2 of the development application.

The methodology employed and the findings of each of these technical assessments is summarised in this volume of the application documents.

Any issues identified via the technical reports have been incorporated in the final layout of the wind farm, as submitted, or are expected to be appropriately mitigated. No issues have been identified which are likely to preclude the proposed development from proceeding. The findings of the expert reports conclude:

• the development will assist in adding stability to local energy sector in South Australia via the inclusion of battery storage in combination with the wind farm, providing further renewable energy for the State;

• wind farms and ancillary infrastructure is an envisaged land use within the Primary Production Zone of the Light Regional Council Development Plan and Goyder Council Development Plan and the Rural Zone of the Mid Murray Council Development Plan;

• the project is compatible with the primary agricultural land uses of the region;

• the development will comprise approximately 2.0 percent of the project area and accordingly the predominant grazing and cropping land uses can continue;

• wind turbine generators are suitably separated from non-stakeholder dwellings by more than 2,000 metres;

• non-stakeholder dwellings are not adversely impacted by shadow flicker or blade glint;

• overall the Twin Creek Wind Farm would be viewed as a single cluster of infrastructure and the visual impact ranges from slight to substantial depending on the viewpoint of the site from the surrounding region;

• visual impact of the wind turbine generators is greatest to the east and west of the development site and deemed to be a substantial change to the rural landscape. Differing landscape character to the north and south of the development site provide greater landscape absorption;

• views of the wind farm from the towns of Kapunda, Eudunda and Nuriootpa are restricted by local topography and stands of vegetation resulting in limited or no visual effect;
noise from the wind turbine generators has been assessed to comply with the Wind Farms Environmental Noise Guidelines 2009 at all residences;

suitable access is available to the development site and the impacts from traffic and traffic related activities are considered acceptable (allowing for the implementation of mitigation measures and compliance with permit conditions);

during construction of the proposed development, the townships of Kapunda, Truro, Eudunda and also the Koonunga area are likely to be most affected by additional traffic movements;

the project will provide an improvement to the local road network within the immediate vicinity of the site of the development;

the project will improve emergency access tracks within the development site and the immediate locality;

the project should not adversely affect the operation of aerial response to bushfires interference to fixed point-to-point links passing over the project boundaries is unlikely;

base to mobile station style communications such as television and radio broadcasting and commercial and private mobile telephony services are unlikely to be affected;

interference to mobile station style communications may be experienced in areas of poor or marginal reception and if interference to television and radio reception is increased as a result of the project, a range of options are available to rectify difficulties;

investigations, findings and recommendations of the flora and fauna assessment have informed the design, siting and layout of infrastructure of the development to minimise impact threatened species and ecological communities;

the value of carbon emission savings associated with the Twin Creek Wind Farm is estimated to be $9.8 million per annum or a net present value of $104 million over a 20 year period; and

the project will generate $209 million of value added (which is a net contribution to Gross State Products) in the State of South Australia over the period of construction 1,447 person years of employment in South Australia would be supported – or an average of over 4,803 jobs sustained per year over three years of construction.

In summary, the Twin Creek Wind Farm and Energy Storage project will be a significant development and represents an important contribution to future renewable energy generation capability in South Australia. Overall, it is considered that the wind farm is an appropriate land use that warrants approval.
CHAPTER 1 – INTRODUCTION
CHAPTER 1 - INTRODUCTION

1.0 INTRODUCTION

This development application has been prepared by MasterPlan SA Pty Ltd on behalf of the proponent, RES Australia Pty Ltd, for the proposed development of a wind farm and energy storage project and ancillary infrastructure at Twin Creek, north-east of Kapunda.

The site of the proposed development transverses three Local Government areas. Infrastructure for the project will be developed within the Light Regional Council, Regional Council of Goyder and Mid Murray Council.

In accordance with Schedule 10(14) of the Development Regulations 2008, the Development Assessment Commission will be the relevant planning authority to assess the development application, as the proposed development is "for the purposes of the provision of electricity generating plant with a generating capacity of more than 5 MW that is to be connected to the State's power system". Assessment of the application will be undertaken against the relevant provisions of the Light Regional Council Development Plan, the Goyder Council Development Plan and the Mid Murray Development Plan.

1.1 APPLICANT DETAILS

RES Australia Pty Ltd (RES Australia) (ABN 55 106 637 754)
Suite 4, Level 1, 760 Pacific Highway
Chatswood NSW 2067
Website: www.res-group.com

Project Contact Details
Mr Daniel Leahy
Development Project Manager
RES Australia Pty Ltd
Phone: +61 2 8440 7422
Email: daniel.leahy@res-group.com

1.2 APPLICATION STRUCTURE

The development application for the Twin Creek wind farm is contained within four volumes and comprises:

Volume 1 – Project Summary
Volume 2 – Technical Reports
Volume 3 – Drawings, Maps and Figures
Volume 4 – Draft Construction Environmental Management Plan
1.3 PROPOSED LOCATION OF THE TWIN CREEK WIND FARM AND ENERGY STORAGE PROJECT

RES Australia proposes to develop the Twin Creek Wind Farm and Energy Storage Project within the Mid North area of South Australia. The site of the proposed wind farm is approximately 90 kilometres north-east of Adelaide and north-east of Kapunda. The proposed development is located between the townships of Kapunda, Eudunda and Truro as identified in Figures 1 – Location Plan.

The site of the development includes the area comprising the project infrastructure, as well as the 275kV transmission line. The transmission line extends approximately 15 kilometres south-east of the site and connects to the Robertstown - Tungkillo 275Kv transmission line adjacent the Sturt Highway near Truro.

Infrastructure including wind turbine generators, battery energy storage and site substation is located within the Light Regional Council and Regional Council of Goyder area. The transmission line transverses from within the Light Regional Council area to the Mid Murray Council area. The terminal substation at the junction with the Robertstown to Tungkillo 275Kv transmission line is also located within the Mid Murray Council area. Location of these development site relative to the Local Government boundaries and relevant zones is shown on Figure 4 – Planning Overlays.

The site of the development spans approximately 6.0 to 7.0 kilometres in a north-south direction and approximately 5.0 kilometres in an east-west direction (excluding the transmission line). Land within the development site which comprises the wind turbine generators and associated infrastructure is in the ownership of different families (within various entities). The transmission line comprises land owned by 18 land owners in 26 different Certificates of Title. The combined area of these properties is approximately 5,600 hectares.

Land within the site of the development is predominately used for sheep grazing and cereal cropping. A total of 8 dwellings are located within the site of the development and are referred to as “stakeholder” dwellings within the development application, as shown on Figure 7 – House and Turbine Location below.
1.4 LEGAL DESCRIPTION OF THE SITE OF THE DEVELOPMENT

The site of the development is described below, with reference to land included in the development.

The technical reports may utilise varying terminology to describe the development and the site of the development. References in the various technical reports include “the project”, “the proposed development”, “the wind farm”, the “wind farm infrastructure area”, “Twin Creek Wind Farm” and the “Twin Creek Wind Farm and Energy Storage Project”. Whilst the terminology may vary, the following should be noted:

• the “site of the development” incorporates all land within the project, including land in private ownership along the transmission route as detailed in Table 1 and 2 below. The “site of development” is shown on the plans prepared by RES as a purple line (site boundary 20170404)

• references to the “development area”, which is shown as green on the plans prepared by RES contains all infrastructure of the project, but may not include entire allotments as contained within the “site of the development”

• References to the “wind farm infrastructure area”, which is shown as grey on the plans prepared by RES are the corridors for the location of the infrastructure and micro-siting of that infrastructure.

The following tables (Table 1 and 2) comprises the legal description of the site of the development, along with development components located on each site. These properties are depicted in Figure 5 – Wind Farm and Grid Landowners.

Table 1 - WIND FARM – LAND PARCEL AND INFRASTRUCTURE INFORMATION

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<th>ALLOTMENT/SECTION AND FILED/HUNDRED PLAN</th>
<th>INFRASTRUCTURE</th>
<th>LOCAL GOVERNMENT AREA</th>
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<td>TURBINE 50, HARDSTAND, ACCESS TRACK, INFRASTRUCTURE ZONE, CABLES</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
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<tr>
<td>VOL 5293 FOL 934</td>
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<td>TURBINE 29, HARDSTAND, ACCESS TRACK, INFRASTRUCTURE ZONE, CABLES</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
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<td>VOL 5293 FOL 934</td>
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<td>ALLOTMENT/SECTION AND FILED/HUNDRED PLAN</td>
<td>INFRASTRUCTURE</td>
<td>LOCAL GOVERNMENT AREA</td>
</tr>
<tr>
<td>-----------------</td>
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</tr>
<tr>
<td>VOL 5293 FOL 934</td>
<td>ALLOTMENT 8 FILED PLAN 158975 IN THE AREA NAMED HANSBOROUGH HUNDRED OF JULIA CREEK</td>
<td>TURBINE 31, TURBINE 32, HARDSTAND, ACCESS TRACK, INFRASTRUCTURE ZONE, CABLES.</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
</tr>
<tr>
<td>VOL 5293 FOL 934</td>
<td>ALLOTMENT 9 FILED PLAN 158975 IN THE AREA NAMED HANSBOROUGH HUNDRED OF JULIA CREEK</td>
<td>TURBINE 30, HARDSTAND, ACCESS TRACK, INFRASTRUCTURE ZONE, CABLES.</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
</tr>
<tr>
<td>VOL 5293 FOL 926</td>
<td>ALLOTMENT 12 FILED PLAN 158976 IN THE AREA NAMED HANSBOROUGH HUNDRED OF JULIA CREEK</td>
<td>TURBINE 47, HARDSTAND, PERMANENT MET MAST, ACCESS TRACK, INFRASTRUCTURE ZONE, CABLES.</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
</tr>
<tr>
<td>VOL 5293 FOL 926</td>
<td>ALLOTMENT 13 FILED PLAN 158976 IN THE AREA NAMED HANSBOROUGH HUNDRED OF JULIA CREEK</td>
<td>TURBINE 48, TURBINE 49, HARDSTANDS, ACCESS TRACK, INFRASTRUCTURE ZONE, CABLES.</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
</tr>
<tr>
<td>VOL 5293 FOL 926</td>
<td>ALLOTMENT 14 FILED PLAN 158976 IN THE AREA NAMED HANSBOROUGH HUNDRED OF JULIA CREEK</td>
<td>TURBINE 43, HARDSTAND, ACCESS TRACK, INFRASTRUCTURE ZONE, CABLES.</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
</tr>
<tr>
<td>VOL 5293 FOL 926</td>
<td>ALLOTMENT 15 FILED PLAN 158976 IN THE AREA NAMED HANSBOROUGH HUNDRED OF JULIA CREEK</td>
<td>TURBINE 36, TURBINE 37, HARDSTAND, ACCESS TRACK, INFRASTRUCTURE ZONE, CABLES.</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
</tr>
<tr>
<td>VOL 5293 FOL 930</td>
<td>SECTION 122 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH</td>
<td>TURBINE 16, HARDSTAND, ACCESS TRACK, INFRASTRUCTURE ZONE, CABLES.</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
</tr>
<tr>
<td>VOL 5293 FOL 930</td>
<td>SECTION 123 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH</td>
<td>TURBINE 23, TURBINE 52, HARDSTAND, ACCESS TRACK, INFRASTRUCTURE ZONE, CABLES.</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
</tr>
<tr>
<td>VOL 5293 FOL 930</td>
<td>SECTION 124 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH</td>
<td>TURBINE 21, TURBINE 22, TURBINE 17, HARDSTAND, ACCESS TRACK, INFRASTRUCTURE ZONE, CABLES.</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
</tr>
<tr>
<td>VOL 5293 FOL 930</td>
<td>SECTION 125 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH</td>
<td>TURBINE 11, TURBINE 13, HARDSTAND, ACCESS TRACK, INFRASTRUCTURE ZONE, CABLES.</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
</tr>
<tr>
<td>VOLUME AND FOLIO</td>
<td>ALLOTMENT/SECTION AND FILED/HUNDRED PLAN</td>
<td>INFRASTRUCTURE</td>
<td>LOCAL GOVERNMENT AREA</td>
</tr>
<tr>
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</tr>
<tr>
<td>VOL 5293 FOL 930</td>
<td>SECTION 126 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH</td>
<td>ACCESS TRACK, CONSTRUCTION COMPOUND, MATERIAL LAYDOWN AREA, INFRASTRUCTURE ZONE, CABLES.</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
</tr>
<tr>
<td>VOL 5293 FOL 930</td>
<td>SECTION 127 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH</td>
<td>TURBINE 14, HARDSTAND, ACCESS TRACK, INFRASTRUCTURE ZONE, CABLES.</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
</tr>
<tr>
<td>VOL 5293 FOL 930</td>
<td>SECTION 128 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH</td>
<td>TURBINE 15, HARDSTAND, ACCESS TRACK INFRASTRUCTURE ZONE, CABLES.</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
</tr>
<tr>
<td>VOL 5293 FOL 930</td>
<td>SECTION 129 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH</td>
<td>INFRASTRUCTURE ZONE, ACCESS TRACKS, CABLES.</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
</tr>
<tr>
<td>VOL 5293 FOL 927</td>
<td>SECTION 218 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH</td>
<td>ACCESS TRACK, INFRASTRUCTURE ZONE, CABLES.</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
</tr>
<tr>
<td>VOL 5293 FOL 927</td>
<td>SECTION 219 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH</td>
<td>TURBINE 42, HARDSTAND, ACCESS TRACK, CONSTRUCTION COMPOUND, MATERIAL LAYDOWN AREA, INFRASTRUCTURE ZONE, CABLES.</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
</tr>
<tr>
<td>VOL 5293 FOL 927</td>
<td>SECTION 220 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH</td>
<td>TURBINE 45, TURBINE 46, HARDSTAND, ACCESS TRACK, INFRASTRUCTURE ZONE, CABLES.</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
</tr>
<tr>
<td>VOL 5293 FOL 931</td>
<td>SECTION 232 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH</td>
<td>TURBINE 28, TURBINE 35, HARDSTAND, ACCESS TRACK, INFRASTRUCTURE ZONE, CABLES.</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
</tr>
<tr>
<td>VOL 5293 FOL 931</td>
<td>SECTION 233 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH</td>
<td>TURBINE 12, TURBINE 20, HARDSTAND, ACCESS TRACK, CONSTRUCTION COMPOUND, MATERIAL LAYDOWN AREA, INFRASTRUCTURE ZONE, CABLES.</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
</tr>
<tr>
<td>VOL 5293 FOL 931</td>
<td>SECTION 234 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH</td>
<td>TURBINE 19, TURBINE 53, HARDSTAND, ACCESS TRACK, INFRASTRUCTURE ZONE, CABLES.</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
</tr>
<tr>
<td>VOLUME AND FOLIO</td>
<td>ALLOTMENT/SECTION AND FILED/HUNDRED PLAN</td>
<td>INFRASTRUCTURE</td>
<td>LOCAL GOVERNMENT AREA</td>
</tr>
<tr>
<td>-----------------</td>
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<td>-----------------------</td>
</tr>
<tr>
<td>VOL 5293 FOL 931</td>
<td>SECTION 235 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH</td>
<td>INFRASTRUCTURE ZONE, ACCESS TRACK, CABLES.</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
</tr>
<tr>
<td>VOL 5293 FOL 928</td>
<td>SECTION 236 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH</td>
<td>TURBINE 34, TURBINE 40, TURBINE 44, HARDSTAND, ACCESS TRACK, INFRASTRUCTURE ZONE, CABLES.</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
</tr>
<tr>
<td>VOL 5293 FOL 928</td>
<td>SECTION 237 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH</td>
<td>TURBINE 38, HARDSTAND, ACCESS TRACK, INFRASTRUCTURE ZONE, CABLES.</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
</tr>
<tr>
<td>VOL 5293 FOL 928</td>
<td>SECTION 238 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
</tr>
<tr>
<td>VOL 5293 FOL 928</td>
<td>SECTION 239 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH</td>
<td>TURBINE 27, TURBINE 33, HARDSTAND, ACCESS TRACK, INFRASTRUCTURE ZONE, CABLES.</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
</tr>
<tr>
<td>VOL 5293 FOL 928</td>
<td>SECTION 240 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH</td>
<td>TURBINE 18, TURBINE 26, HARDSTAND, ACCESS TRACK, INFRASTRUCTURE ZONE, CABLES.</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
</tr>
<tr>
<td>VOL 5964 FOL 335</td>
<td>SECTION 241 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
</tr>
<tr>
<td>VOL 5964 FOL 335</td>
<td>SECTION 242 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH</td>
<td>TURBINE 25, HARDSTAND, ACCESS TRACK, INFRASTRUCTURE ZONE, CABLES.</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
</tr>
<tr>
<td>VOL 5964 FOL 335</td>
<td>SECTION 243 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
</tr>
<tr>
<td>VOL 5618 FOL 689</td>
<td>SECTION 272 HUNDRED OF BELVIDERE IN THE AREA NAMED BAGOT WELL</td>
<td>TURBINE 9, TURBINE 10, HARDSTAND, ACCESS TRACK, INFRASTRUCTURE ZONE, CABLES.</td>
<td>LIGHT REGIONAL COUNCIL</td>
</tr>
<tr>
<td>VOL 5618 FOL 706</td>
<td>ALLOTMENT 91 FILED PLAN 199399 IN THE AREAS NAMED BAGOT WELL AND ST KITTS HUNDRED OF BELVIDERE</td>
<td>ACCESS TRACK, INFRASTRUCTURE ZONE, CABLES.</td>
<td>LIGHT REGIONAL COUNCIL</td>
</tr>
<tr>
<td>VOLUME AND FOLIO</td>
<td>ALLOTMENT/SECTION AND FILED/HUNDRED PLAN</td>
<td>INFRASTRUCTURE</td>
<td>LOCAL GOVERNMENT AREA</td>
</tr>
<tr>
<td>-----------------</td>
<td>------------------------------------------</td>
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</tr>
<tr>
<td>VOL 5618 FOL 693</td>
<td>SECTION 278 HUNDRED OF BELVIDERE IN THE AREA NAMED ST KITTS</td>
<td>ACCESS TRACK, BATTERY ENERGY STORAGE FACILITY, CONCRETE BATCHING PLANT AREA, CONSTRUCTION COMPOUND MATERIAL LAYDOWN AREA, OPERATIONS AND MAINTENANCE FACILITY, SUBSTATION, INFRASTRUCTURE ZONE, OVERHEAD LINE, CABLES.</td>
<td>LIGHT REGIONAL COUNCIL</td>
</tr>
<tr>
<td>VOL 5618 FOL 688</td>
<td>SECTION 283 HUNDRED OF BELVIDERE IN THE AREA NAMED ST KITTS</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>LIGHT REGIONAL COUNCIL</td>
</tr>
<tr>
<td>VOL 5618 FOL 688</td>
<td>SECTION 284 HUNDRED OF BELVIDERE IN THE AREA NAMED ST KITTS</td>
<td>ACCESS TRACK, INFRASTRUCTURE ZONE, OVERHEAD LINE, CABLES.</td>
<td>LIGHT REGIONAL COUNCIL</td>
</tr>
<tr>
<td>VOL 5390 FOL 991</td>
<td>ALLOTMENT 91 FILED PLAN 199397 IN THE AREA NAMED BAGOT WELL HUNDREDS OF BELVIDERE AND KAPUNDA</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>LIGHT REGIONAL COUNCIL</td>
</tr>
<tr>
<td>VOL 5390 FOL 991</td>
<td>ALLOTMENT 92 FILED PLAN 199397 IN THE AREA NAMED BAGOT WELL HUNDREDS OF BELVIDERE AND KAPUNDA</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>LIGHT REGIONAL COUNCIL</td>
</tr>
<tr>
<td>VOL 5390 FOL 991</td>
<td>ALLOTMENT 93 FILED PLAN 199397 IN THE AREA NAMED BAGOT WELL HUNDREDS OF BELVIDERE AND KAPUNDA</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>LIGHT REGIONAL COUNCIL</td>
</tr>
<tr>
<td>VOL 5390 FOL 991</td>
<td>ALLOTMENT 94 FILED PLAN 199397 IN THE AREA NAMED BAGOT WELL HUNDREDS OF BELVIDERE AND KAPUNDA</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>LIGHT REGIONAL COUNCIL</td>
</tr>
<tr>
<td>VOL 5390 FOL 991</td>
<td>ALLOTMENT 95 FILED PLAN 199397 IN THE AREA NAMED BAGOT WELL HUNDREDS OF BELVIDERE AND KAPUNDA</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>LIGHT REGIONAL COUNCIL</td>
</tr>
<tr>
<td>VOL 5390 FOL 991</td>
<td>ALLOTMENT 96 FILED PLAN 199397 IN THE AREA NAMED BAGOT WELL HUNDREDS OF BELVIDERE AND KAPUNDA</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>LIGHT REGIONAL COUNCIL</td>
</tr>
<tr>
<td>VOLUME AND FOLIO</td>
<td>ALLOTMENT/SECTION AND FILED/HUNDRED PLAN</td>
<td>INFRASTRUCTURE</td>
<td>LOCAL GOVERNMENT AREA</td>
</tr>
<tr>
<td>-----------------</td>
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</tr>
<tr>
<td>VOL 5390 FOL 991</td>
<td>ALLOTMENT 97 FILED PLAN 199397 IN THE AREA NAMED BAGOT WELL HUNDREDS OF BELVIDERE AND KAPUNDA</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>LIGHT REGIONAL COUNCIL</td>
</tr>
<tr>
<td>VOL 5390 FOL 991</td>
<td>ALLOTMENT 98 FILED PLAN 199397 IN THE AREA NAMED BAGOT WELL HUNDREDS OF BELVIDERE AND KAPUNDA</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>LIGHT REGIONAL COUNCIL</td>
</tr>
<tr>
<td>VOL 5390 FOL 991</td>
<td>ALLOTMENT 104 FILED PLAN 199397 IN THE AREA NAMED BAGOT WELL HUNDREDS OF BELVIDERE AND KAPUNDA</td>
<td>ACCESS TRACK, INFRASTRUCTURE ZONE, CABLES.</td>
<td>LIGHT REGIONAL COUNCIL</td>
</tr>
<tr>
<td>VOL 5390 FOL 991</td>
<td>ALLOTMENT 105 FILED PLAN 199397 IN THE AREA NAMED BAGOT WELL HUNDREDS OF BELVIDERE AND KAPUNDA</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>LIGHT REGIONAL COUNCIL</td>
</tr>
<tr>
<td>VOL 5618 FOL 699</td>
<td>SECTION 258 HUNDRED OF BELVIDERE IN THE AREA NAMED BAGOT WELL</td>
<td>INFRASTRUCTURE ZONE, ACCESS TRACK, CABLES.</td>
<td>LIGHT REGIONAL COUNCIL</td>
</tr>
<tr>
<td>VOL 5618 FOL 695</td>
<td>SECTION 263 HUNDRED OF BELVIDERE IN THE AREA NAMED BAGOT WELL</td>
<td>INFRASTRUCTURE ZONE, ACCESS TRACK, CABLES.</td>
<td>LIGHT REGIONAL COUNCIL</td>
</tr>
<tr>
<td>VOL 5618 FOL 696</td>
<td>SECTION 265 HUNDRED OF BELVIDERE IN THE AREA NAMED BAGOT WELL</td>
<td>TURBINE 5, TURBINE 8, HARDSTANDS, ACCESS TRACK, INFRASTRUCTURE ZONE, CABLES.</td>
<td>LIGHT REGIONAL COUNCIL</td>
</tr>
<tr>
<td>VOL 5618 FOL 701</td>
<td>SECTION 267 HUNDRED OF BELVIDERE IN THE AREA NAMED BAGOT WELL</td>
<td>TURBINE 6, TURBINE 52, HARDSTANDS, ACCESS TRACK, INFRASTRUCTURE ZONE, CABLES.</td>
<td>LIGHT REGIONAL COUNCIL</td>
</tr>
<tr>
<td>VOL 5618 FOL 703</td>
<td>SECTION 268 HUNDRED OF BELVIDERE IN THE AREA NAMED BAGOT WELL</td>
<td>TURBINE 1 HARDSTAND, PERMANENT MAST, ACCESS TRACK, INFRASTRUCTURE ZONE, CABLES.</td>
<td>LIGHT REGIONAL COUNCIL</td>
</tr>
<tr>
<td>VOL 5618 FOL 697</td>
<td>SECTION 269 HUNDRED OF BELVIDERE IN THE AREA NAMED BAGOT WELL</td>
<td>TURBINE 2, TURBINE 5 HARDSTAND, ACCESS TRACK, INFRASTRUCTURE ZONE, CABLES.</td>
<td>LIGHT REGIONAL COUNCIL</td>
</tr>
<tr>
<td>VOLUME AND FOLIO</td>
<td>ALLOTMENT/SECTION AND FILED/HUNDRED PLAN</td>
<td>INFRASTRUCTURE</td>
<td>LOCAL GOVERNMENT AREA</td>
</tr>
<tr>
<td>------------------</td>
<td>------------------------------------------</td>
<td>----------------</td>
<td>----------------------</td>
</tr>
<tr>
<td>VOL 5618 FOL 700</td>
<td>SECTION 270 HUNDRED OF BELVIDERE IN THE AREA NAMED BAGOT WELL</td>
<td>INFRASTRUCTURE ZONE, ACCESS TRACK, CABLES.</td>
<td>LIGHT REGIONAL COUNCIL</td>
</tr>
<tr>
<td>VOL 5618 FOL 687</td>
<td>SECTION 271 HUNDRED OF BELVIDERE IN THE AREA NAMED BAGOT WELL</td>
<td>TURBINE 4 HARDSTAND, ACCESS TRACK, INFRASTRUCTURE ZONE, CABLES.</td>
<td>LIGHT REGIONAL COUNCIL</td>
</tr>
<tr>
<td>VOL 5618 FOL 692</td>
<td>SECTION 273 HUNDRED OF BELVIDERE IN THE AREA NAMED BAGOT WELL</td>
<td>TURBINE 3 HARDSTAND, ACCESS TRACK, INFRASTRUCTURE ZONE, CABLES.</td>
<td>LIGHT REGIONAL COUNCIL</td>
</tr>
<tr>
<td>VOL 5618 FOL 691</td>
<td>SECTION 285 HUNDRED OF BELVIDERE IN THE AREA NAMED ST KITTS</td>
<td>ACCESS TRACK, PRINCIPAL SITE ENTRANCE, INFRASTRUCTURE ZONE, OVERHEAD LINE, CABLES.</td>
<td>LIGHT REGIONAL COUNCIL</td>
</tr>
<tr>
<td>VOL 5865 FOL 275</td>
<td>ALLOTMENT 25 FILED PLAN 158977 IN THE AREA NAMED HANSBOROUGH HUNDRED OF JULIA CREEK</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
</tr>
<tr>
<td>VOL 5488 FOL 108</td>
<td>SECTION 159 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
</tr>
<tr>
<td>VOL 5625 FOL 166</td>
<td>ALLOTMENT 24 FILED PLAN 217358 IN THE AREA NAMED BAGOT WELL HUNDRED OF BELVIDERE</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>LIGHT REGIONAL COUNCIL</td>
</tr>
<tr>
<td>VOL 5293 FOL 930</td>
<td>SECTION 121 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
</tr>
<tr>
<td>VOL 5293 FOL 926</td>
<td>ALLOTMENT 18 FILED PLAN 158976 IN THE AREA NAMED HANSBOROUGH HUNDRED OF JULIA CREEK</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
</tr>
<tr>
<td>VOL 5865 FOL 275</td>
<td>ALLOTMENT 19 FILED PLAN 158977 IN THE AREA NAMED HANSBOROUGH HUNDRED OF JULIA CREEK</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
</tr>
<tr>
<td>VOL 5293 FOL 926</td>
<td>ALLOTMENT 27 FILED PLAN 158976 IN THE AREA NAMED HANSBOROUGH HUNDRED OF JULIA CREEK</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
</tr>
<tr>
<td>VOL 5618 FOL 694</td>
<td>SECTION 251 HUNDRED OF BELVIDERE IN THE AREA NAMED BAGOT WELL</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>LIGHT REGIONAL COUNCIL</td>
</tr>
<tr>
<td>VOL 5618 FOL 704</td>
<td>ALLOTMENT 91 FILED PLAN 217083 IN THE AREAS NAMED KOONUNGA AND ST KITTS HUNDRED OF BELVIDERE</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>LIGHT REGIONAL COUNCIL</td>
</tr>
<tr>
<td>VOLUME AND FOLIO</td>
<td>ALLOTMENT/SECTION AND FILED/HUNDRED PLAN</td>
<td>INFRASTRUCTURE</td>
<td>LOCAL GOVERNMENT AREA</td>
</tr>
<tr>
<td>------------------</td>
<td>-------------------------------------------</td>
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</tr>
<tr>
<td>VOL 5488 FOL 108</td>
<td>SECTION 288 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
</tr>
<tr>
<td>VOL 5488 FOL 108</td>
<td>SECTION 357 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
</tr>
<tr>
<td>VOL 5764 FOL 914</td>
<td>SECTION 327 HUNDRED OF BELVIDERE IN THE AREA NAMED BAGOT WELL</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>LIGHT REGIONAL COUNCIL</td>
</tr>
<tr>
<td>VOL 5293 FOL 934</td>
<td>ALLOTMENT 4 FILED PLAN 158975 IN THE AREA NAMED HANSBOROUGH HUNDRED OF JULIA CREEK</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
</tr>
<tr>
<td>VOL 5390 FOL 991</td>
<td>ALLOTMENT 103 FILED PLAN 199397 IN THE AREA NAMED BAGOT WELL HUNDREDS OF BELVIDERE AND KAPUNDA</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>LIGHT REGIONAL COUNCIL</td>
</tr>
<tr>
<td>VOL 5290 FOL 269</td>
<td>SECTION 160 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
</tr>
<tr>
<td>VOL 5618 FOL 694</td>
<td>SECTION 255 HUNDRED OF BELVIDERE IN THE AREA NAMED BAGOT WELL</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>LIGHT REGIONAL COUNCIL</td>
</tr>
<tr>
<td>VOL 5865 FOL 276</td>
<td>SECTION 266 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
</tr>
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<td>VOL 5290 FOL 267</td>
<td>SECTION 208 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
</tr>
<tr>
<td>VOL 5865 FOL 275</td>
<td>ALLOTMENT 23 FILED PLAN 158975 IN THE AREA NAMED HANSBOROUGH HUNDRED OF JULIA CREEK</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
</tr>
<tr>
<td>VOL 5290 FOL 269</td>
<td>SECTION 164 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
</tr>
<tr>
<td>VOL 5618 FOL 690</td>
<td>SECTION 249 HUNDRED OF BELVIDERE IN THE AREA NAMED BAGOT WELL</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>LIGHT REGIONAL COUNCIL</td>
</tr>
<tr>
<td>VOL 5290 FOL 269</td>
<td>SECTION 162 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
</tr>
<tr>
<td>VOL 5618 FOL 702</td>
<td>SECTION 257 HUNDRED OF BELVIDERE IN THE AREA NAMED BAGOT WELL</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>LIGHT REGIONAL COUNCIL</td>
</tr>
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<td>VOL 5618 FOL 708</td>
<td>ALLOTMENT 571 FILED PLAN 176643 IN THE AREA NAMED BAGOT WELL HUNDRED OF BELVIDERE</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>LIGHT REGIONAL COUNCIL</td>
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<tr>
<td>VOLUME AND FOLIO</td>
<td>ALLOTMENT/SECTION AND FILED/HUNDRED PLAN</td>
<td>INFRASTRUCTURE</td>
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<tr>
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<tr>
<td>VOL 5625 FOL 166</td>
<td>ALLOTMENT 20 FILED PLAN 217158 IN THE AREA NAMED BAGOT WELL HUNDRED OF BELVIDERE</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>LIGHT REGIONAL COUNCIL</td>
</tr>
<tr>
<td>VOL 5290 FOL 269</td>
<td>SECTION 167 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
</tr>
<tr>
<td>VOL 5618 FOL 694</td>
<td>SECTION 254 HUNDRED OF BELVIDERE IN THE AREA NAMED BAGOT WELL</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>LIGHT REGIONAL COUNCIL</td>
</tr>
<tr>
<td>VOL 5865 FOL 275</td>
<td>ALLOTMENT 20 FILED PLAN 158977 IN THE AREA NAMED HANSBOROUGH HUNDRED OF JULIA CREEK</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
</tr>
<tr>
<td>VOL 5618 FOL 705</td>
<td>ALLOTMENT 569 FILED PLAN 176641 IN THE AREA NAMED ST KITTS HUNDRED OF BELVIDERE</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>LIGHT REGIONAL COUNCIL</td>
</tr>
<tr>
<td>VOL 5531 FOL 406</td>
<td>SECTION 103 HUNDRED OF BELVIDERE IN THE AREA NAMED KOONUNGA</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>LIGHT REGIONAL COUNCIL</td>
</tr>
<tr>
<td>VOL 5625 FOL 166</td>
<td>ALLOTMENT 23 FILED PLAN 217158 IN THE AREA NAMED BAGOT WELL HUNDRED OF BELVIDERE</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>LIGHT REGIONAL COUNCIL</td>
</tr>
<tr>
<td>VOL 5390 FOL 991</td>
<td>ALLOTMENT 99 FILED PLAN 199397 IN THE AREA NAMED BAGOT WELL HUNDREDS OF BELVIDERE AND KAPUNDA</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>LIGHT REGIONAL COUNCIL</td>
</tr>
<tr>
<td>VOL 5804 FOL 478</td>
<td>SECTION 252 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
</tr>
<tr>
<td>VOL 5488 FOL 108</td>
<td>ALLOTMENT 2 FILED PLAN 107172 IN THE AREA NAMED HANSBOROUGH HUNDRED OF JULIA CREEK</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
</tr>
<tr>
<td>VOL 5878 FOL 290</td>
<td>ALLOTMENT 2 FILED PLAN 160235 IN THE AREA NAMED HANSBOROUGH HUNDRED OF JULIA CREEK</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
</tr>
<tr>
<td>VOL 5625 FOL 166</td>
<td>ALLOTMENT 22 FILED PLAN 217158 IN THE AREAS NAMED BAGOT WELL AND ST KITTS HUNDRED OF BELVIDERE</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>LIGHT REGIONAL COUNCIL</td>
</tr>
<tr>
<td>VOL 5390 FOL 991</td>
<td>ALLOTMENT COMPRISING PIECES 102 FILED PLAN 199397 IN THE AREA NAMED BAGOT WELL HUNDREDS OF BELVIDERE AND KAPUNDA</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>LIGHT REGIONAL COUNCIL</td>
</tr>
<tr>
<td>VOLUME AND FOLIO</td>
<td>ALLOTMENT/SECTION AND FILED/HUNDRED PLAN</td>
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</tr>
<tr>
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<td>ALLOTMENT COMPRISING PIECES 101 FILED PLAN 193297 IN THE AREA NAMED BAGOT WELL HUNDREDS OF BELVIDERE AND KAPUNDA</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>LIGHT REGIONAL COUNCIL</td>
</tr>
<tr>
<td>VOL 5760 FOL 565</td>
<td>SECTION 206 HUNDRED OF BELVIDERE IN THE AREA NAMED BAGOT WELL</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>LIGHT REGIONAL COUNCIL</td>
</tr>
<tr>
<td>VOL 5293 FOL 934</td>
<td>ALLOTMENT 5 FILED PLAN 158975 IN THE AREA NAMED HANSBOROUGH HUNDRED OF JULIA CREEK</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>LIGHT REGIONAL COUNCIL</td>
</tr>
<tr>
<td>VOL 5826 FOL 797</td>
<td>ALLOTMENT 572 FILED PLAN 176644 IN THE AREA NAMED BAGOT WELL HUNDRED OF BELVIDERE</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>LIGHT REGIONAL COUNCIL</td>
</tr>
<tr>
<td>VOL 5865 FOL 275</td>
<td>ALLOTMENT 21 FILED PLAN 158977 IN THE AREA NAMED HANSBOROUGH HUNDRED OF JULIA CREEK</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
</tr>
<tr>
<td>VOL 5760 FOL 535</td>
<td>SECTION 509 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
</tr>
<tr>
<td>VOL 5488 FOL 108</td>
<td>SECTION 156 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
</tr>
<tr>
<td>VOL 5865 FOL 275</td>
<td>ALLOTMENT 26 FILED PLAN 158977 IN THE AREA NAMED HANSBOROUGH HUNDRED OF JULIA CREEK</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
</tr>
<tr>
<td>VOL 5625 FOL 166</td>
<td>ALLOTMENT 25 FILED PLAN 127258 IN THE AREA NAMED ST KITTS HUNDRED OF BELVIDERE</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>LIGHT REGIONAL COUNCIL</td>
</tr>
<tr>
<td>VOL 5488 FOL 108</td>
<td>SECTION 291 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
</tr>
<tr>
<td>VOL 5293 FOL 932</td>
<td>SECTION 209 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
</tr>
<tr>
<td>VOL 5293 FOL 926</td>
<td>ALLOTMENT 16 FILED PLAN 158976 IN THE AREA NAMED HANSBOROUGH HUNDRED OF JULIA CREEK</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
</tr>
<tr>
<td>VOL 5293 FOL 926</td>
<td>ALLOTMENT 17 FILED PLAN 158976 IN THE AREA NAMED HANSBOROUGH HUNDRED OF JULIA CREEK</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
</tr>
<tr>
<td>VOL 5865 FOL 275</td>
<td>ALLOTMENT 22 FILED PLAN 158977 IN THE AREA NAMED HANSBOROUGH HUNDRED OF JULIA CREEK</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
</tr>
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<td>ALLOTMENT/SECTION AND FILED/HUNDRED PLAN</td>
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</tr>
<tr>
<td>-----------------</td>
<td>------------------------------------------</td>
<td>----------------</td>
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</tr>
<tr>
<td>VOL 5625 FOL 166</td>
<td>ALLOTMENT 21 FILED PLAN 217158 IN THE AREA NAMED BAGOT WELL HUNDRED OF BELVIDERE</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>LIGHT REGIONAL COUNCIL</td>
</tr>
<tr>
<td>VOL 5618 FOL 707</td>
<td>ALLOTMENT 102 FILED PLAN 214685 IN THE AREA NAMED KOOUNUNGA HUNDRED OF BELVIDERE</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>LIGHT REGIONAL COUNCIL</td>
</tr>
<tr>
<td>VOL 5290 FOL 269</td>
<td>SECTION 163 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
</tr>
<tr>
<td>VOL 5390 FOL 991</td>
<td>ALLOTMENT 100 FILED PLAN 199397 IN THE AREA NAMED BAGOT WELL HUNDREDS OF BELVIDERE AND KAPUNDA</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>LIGHT REGIONAL COUNCIL</td>
</tr>
<tr>
<td>VOL 5488 FOL 108</td>
<td>SECTION 290 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
</tr>
<tr>
<td>VOL 5488 FOL 108</td>
<td>SECTION 289 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
</tr>
<tr>
<td>VOL 5290 FOL 269</td>
<td>SECTION 169 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
</tr>
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<td>VOL 5618 FOL 698</td>
<td>SECTION 279 HUNDRED OF BELVIDERE IN THE AREA NAMED ST KITTS</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>LIGHT REGIONAL COUNCIL</td>
</tr>
<tr>
<td>VOL 5672 FOL 368</td>
<td>SECTION 179 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
</tr>
<tr>
<td>VOL 5290 FOL 269</td>
<td>SECTION 166 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
</tr>
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<td>VOL 5531 FOL 407</td>
<td>SECTION 100 HUNDRED OF BELVIDERE IN THE AREA NAMED KOOUNUNGA</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>LIGHT REGIONAL COUNCIL</td>
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<tr>
<td>VOL 5293 FOL 934</td>
<td>ALLOTMENT 7 FILED PLAN 158975 IN THE AREA NAMED HANSBOROUGH HUNDRED OF JULIA CREEK</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
</tr>
<tr>
<td>VOL 5531 FOL 405</td>
<td>SECTION 105 HUNDRED OF BELVIDERE IN THE AREA NAMED KOOUNUNGA</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>LIGHT REGIONAL COUNCIL</td>
</tr>
<tr>
<td>VOL 5488 FOL 108</td>
<td>SECTION 155 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
</tr>
<tr>
<td>VOL 5865 FOL 275</td>
<td>ALLOTMENT 24 FILED PLAN 158977 IN THE AREA NAMED HANSBOROUGH HUNDRED OF JULIA CREEK</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
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<td>VOL 5290 FOL 267</td>
<td>SECTION 207 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH</td>
<td>NO INFRASTRUCTURE PLANNED</td>
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### Table 2 - GRID CONNECTION – LAND PARCEL AND INFRASTRUCTURE INFORMATION

<table>
<thead>
<tr>
<th>VOLUME AND FOLIO</th>
<th>ALLOTMENT/SECTION AND FILED/HUNDRED PLAN</th>
<th>INFRASTRUCTURE</th>
<th>LOCAL GOVERNMENT AREA</th>
</tr>
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<tr>
<td>VOL 5290 FOL 269</td>
<td>SECTION 165 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
</tr>
<tr>
<td>VOL 5618 FOL 694</td>
<td>SECTION 250 HUNDRED OF BELVIDERE IN THE AREA NAMED BAGOT WELL</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>LIGHT REGIONAL COUNCIL</td>
</tr>
<tr>
<td>VOL 5290 FOL 269</td>
<td>SECTION 161 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
</tr>
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<td>VOL 5618 FOL 694</td>
<td>SECTION 250 HUNDRED OF BELVIDERE IN THE AREA NAMED BAGOT WELL</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>LIGHT REGIONAL COUNCIL</td>
</tr>
<tr>
<td>VOL 5293 FOL 930</td>
<td>SECTION 129 HUNDRED OF JULIA CREEK IN THE AREA NAMED HANSBOROUGH</td>
<td>NO INFRASTRUCTURE PLANNED</td>
<td>REGIONAL COUNCIL OF GOYDER</td>
</tr>
<tr>
<td>VOL 5618 FOL 693</td>
<td>SECTION 278 HUNDRED OF BELVIDERE IN THE AREA NAMED ST KITTS</td>
<td>OVERHEAD LINE</td>
<td>LIGHT REGIONAL COUNCIL</td>
</tr>
<tr>
<td>VOL 5618 FOL 688</td>
<td>SECTION 284 HUNDRED OF BELVIDERE IN THE AREA NAMED ST KITTS</td>
<td>OVERHEAD LINE</td>
<td>LIGHT REGIONAL COUNCIL</td>
</tr>
<tr>
<td>VOL 5264 FOL 963</td>
<td>SECTION 290 HUNDRED OF BELVIDERE IN THE AREA NAMED ST KITTS</td>
<td>OVERHEAD LINE</td>
<td>LIGHT REGIONAL COUNCIL</td>
</tr>
<tr>
<td>VOL 5663 FOL 19</td>
<td>SECTION 287 HUNDRED OF BELVIDERE IN THE AREA NAMED ST KITTS</td>
<td>OVERHEAD LINE</td>
<td>LIGHT REGIONAL COUNCIL</td>
</tr>
<tr>
<td>VOL 5476 FOL 305</td>
<td>SECTION 190 HUNDRED OF BELVIDERE IN THE AREA NAMED ST KITTS</td>
<td>OVERHEAD LINE</td>
<td>LIGHT REGIONAL COUNCIL</td>
</tr>
<tr>
<td>VOL 5486 FOL 562</td>
<td>ALLOTMENT 200 DEPOSITED PLAN 48414 IN THE AREA NAMED ST KITTS HUNDRED OF BELVIDERE</td>
<td>OVERHEAD LINE</td>
<td>LIGHT REGIONAL COUNCIL</td>
</tr>
<tr>
<td>VOL 5486 FOL 561</td>
<td>ALLOTMENT 99 DEPOSITED PLAN 48414 IN THE AREA NAMED ST KITTS HUNDRED OF BELVIDERE</td>
<td>OVERHEAD LINE</td>
<td>LIGHT REGIONAL COUNCIL</td>
</tr>
<tr>
<td>VOL 5274 FOL 160</td>
<td>SECTION 314 HUNDRED OF BELVIDERE IN THE AREA NAMED ST KITTS</td>
<td>OVERHEAD LINE</td>
<td>LIGHT REGIONAL COUNCIL</td>
</tr>
<tr>
<td>VOLUME AND FOLIO</td>
<td>ALLOTMENT/SECTION AND FILED/HUNDRED PLAN</td>
<td>INFRASTRUCTURE</td>
<td>LOCAL GOVERNMENT AREA</td>
</tr>
<tr>
<td>-----------------</td>
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<td>-----------------------</td>
</tr>
<tr>
<td>VOL 5146 FOL 519</td>
<td>SECTION 581 HUNDRED OF BELVIDERE IN THE AREA NAMED ST KITTS</td>
<td>OVERHEAD LINE</td>
<td>LIGHT REGIONAL COUNCIL</td>
</tr>
<tr>
<td>VOL 6124 FOL 753</td>
<td>ALLOTMENT 1 DEPOSITED PLAN 36071 IN THE AREA NAMED ST KITTS HUNDRED OF BELVIDERE</td>
<td>OVERHEAD LINE</td>
<td>LIGHT REGIONAL COUNCIL</td>
</tr>
<tr>
<td>VOL 5616 FOL 778</td>
<td>SECTION 319 HUNDRED OF BELVIDERE IN THE AREA NAMED ST KITTS</td>
<td>OVERHEAD LINE</td>
<td>LIGHT REGIONAL COUNCIL</td>
</tr>
<tr>
<td>VOL 5616 FOL 778</td>
<td>SECTION 83 HUNDRED OF DUTTON IN THE AREA NAMED DUTTON</td>
<td>OVERHEAD LINE</td>
<td>MID MURRAY COUNCIL</td>
</tr>
<tr>
<td>VOL 5616 FOL 778</td>
<td>SECTION 85 HUNDRED OF DUTTON IN THE AREA NAMED DUTTON</td>
<td>OVERHEAD LINE</td>
<td>MID MURRAY COUNCIL</td>
</tr>
<tr>
<td>VOL 5640 FOL 955</td>
<td>SECTION 87 HUNDRED OF DUTTON IN THE AREA NAMED TRURO</td>
<td>OVERHEAD LINE</td>
<td>MID MURRAY COUNCIL</td>
</tr>
<tr>
<td>VOL 5517 FOL 458</td>
<td>SECTION 37 HUNDRED OF DUTTON IN THE AREA NAMED TRURO</td>
<td>OVERHEAD LINE</td>
<td>MID MURRAY COUNCIL</td>
</tr>
<tr>
<td>VOL 5485 FOL 579</td>
<td>SECTION 38 HUNDRED OF DUTTON IN THE AREA NAMED TRURO</td>
<td>OVERHEAD LINE</td>
<td>MID MURRAY COUNCIL</td>
</tr>
<tr>
<td>VOL 5485 FOL 733</td>
<td>SECTION 36 HUNDRED OF DUTTON IN THE AREA NAMED TRURO</td>
<td>OVERHEAD LINE</td>
<td>MID MURRAY COUNCIL</td>
</tr>
<tr>
<td>VOL 5503 FOL 860</td>
<td>SECTION 34 HUNDRED OF DUTTON IN THE AREA NAMED TRURO</td>
<td>OVERHEAD LINE</td>
<td>MID MURRAY COUNCIL</td>
</tr>
<tr>
<td>VOL 5322 FOL 638</td>
<td>ALLOTMENT 1 DEPOSITED PLAN 44123 IN THE AREA NAMED TRURO HUNDRED OF DUTTON</td>
<td>OVERHEAD LINE</td>
<td>MID MURRAY COUNCIL</td>
</tr>
<tr>
<td>VOL 5812 FOL 749</td>
<td>SECTION 51 HUNDRED OF DUTTON IN THE AREA NAMED TRURO</td>
<td>OVERHEAD LINE</td>
<td>MID MURRAY COUNCIL</td>
</tr>
<tr>
<td>VOL 5810 FOL 208</td>
<td>ALLOTMENT 682 FILED PLAN 209058 IN THE AREA NAMED TRURO HUNDRED OF JELLICOE</td>
<td>OVERHEAD LINE</td>
<td>MID MURRAY COUNCIL</td>
</tr>
<tr>
<td>VOL 5315 FOL 264</td>
<td>SECTION 221 HUNDRED OF JELLICOE IN THE AREA NAMED TRURO</td>
<td>OVERHEAD LINE</td>
<td>MID MURRAY COUNCIL</td>
</tr>
<tr>
<td>VOL 5652 FOL 492</td>
<td>ALLOTMENT 1 DEPOSITED PLAN 48425 IN THE AREA NAMED TRURO HUNDRED OF JELLICOE</td>
<td>OVERHEAD LINE</td>
<td>MID MURRAY COUNCIL</td>
</tr>
<tr>
<td>VOL 5950 FOL 567</td>
<td>SECTION 218 HUNDRED OF JELLICOE IN THE AREA NAMED TRURO</td>
<td>OVERHEAD LINE</td>
<td>MID MURRAY COUNCIL</td>
</tr>
<tr>
<td>VOLUME AND FOLIO</td>
<td>ALLOTMENT/SECTION AND FILED/HUNDRED PLAN</td>
<td>INFRASTRUCTURE</td>
<td>LOCAL GOVERNMENT AREA</td>
</tr>
<tr>
<td>------------------</td>
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<tr>
<td>VOL 5950 FOL 564</td>
<td>DEPOSITED PLAN 65817 IN THE AREA NAMED TRURO HUNDRED OF JELLCIOE</td>
<td>OVERHEAD LINE</td>
<td>MID MURRAY COUNCIL</td>
</tr>
<tr>
<td>VOL 5947 FOL 941</td>
<td>DEPOSITED PLAN 65818 IN THE AREA NAMED TRURO HUNDRED OF JELLCIOE</td>
<td>OVERHEAD LINE</td>
<td>MID MURRAY COUNCIL</td>
</tr>
<tr>
<td>VOL 5304 FOL 717</td>
<td>FILED PLAN 163638 IN THE AREA NAMED TRURO HUNDRED OF JELLCIOE</td>
<td>OVERHEAD LINE</td>
<td>MID MURRAY COUNCIL</td>
</tr>
<tr>
<td>VOL 5360 FOL 970</td>
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<td>OVERHEAD LINE</td>
<td>MID MURRAY COUNCIL</td>
</tr>
<tr>
<td>VOL 6157 FOL 823</td>
<td>DEPOSITED PLAN 174416 IN THE AREA NAMED TRURO HUNDRED OF JELLCIOE</td>
<td>OVERHEAD LINE</td>
<td>MID MURRAY COUNCIL</td>
</tr>
<tr>
<td>VOL 5506 FOL 92</td>
<td>FILED PLAN 163637 IN THE AREA NAMED TRURO HUNDRED OF JELLCIOE</td>
<td>OVERHEAD LINE, TERMINAL SUBSTATION, ACCESS TRACK, VEGETATIVE SCREENING, ELECTRICAL INFRASTRUCTURE.</td>
<td>MID MURRAY COUNCIL</td>
</tr>
</tbody>
</table>
1.5 PROJECT OVERVIEW

The proposed Twin Creek Wind Farm and Energy Storage project is to be located approximately 90 kilometres north-east of Adelaide and between the townships of Kapunda, Eudunda and Truro.

The project will involve the construction and operation of up to a maximum of 51 wind turbine generators. Each wind turbine generator has a generation capacity of around 3.6 MW and a total installed capacity of up to 183 MW. The project includes a 50 MW battery energy storage facility.

1.5.1 Summary of Development Components

The proposed development incorporates the following elements:

- up to 51 Wind Turbines Generators (WTG);

- the development application is based on Vestas V136 turbine as a candidate turbine, however the final turbine model will be subject to a competitive tender process post Development Plan Consent;

- each WTG has an indicative capacity of 3.6 MW, however the exact capacity may vary with selection of the final turbine model;

- overall height of turbines would be up to 180 metres at the blade tip. Development Plan Consent is sought for a wind turbine generator with a maximum overall height of 180 metres;

- based on the candidate turbine the indicative dimensions are approximately 112 metres to the hub and blades approximately 68 metres in length. The exact dimensions may alter with the selection of the final turbine model;

- turbines are three-bladed, semi-variable speed, pitch regulated machines with a rotor and nacelle mounted on a reducing cylindrical steel tower;

- wind turbine generator blades constructed in a white or off white colour with non-reflective coatings;

- the WTG’s extend approximately 6 to 7 kilometres in a north-south direction and approximately 5 kilometres in an east-west direction;

- micro-siting for the wind turbine generators is sought, for WTG so that, should environmental constraints or unacceptable ground conditions be identified during construction, these can be avoided;

- all infrastructure will be micro-sited within the “infrastructure zone” and within the following parameters:
  - WTG to be located within 100 metres of their proposed locations and in accordance with the micro-siting drawing provided in Volume 3;
  - tracks, hardstands and associated infrastructure to suit any micro-sited WTG locations;
- substations, battery energy storage facility or operation and maintenance compound within 100 metres of their proposed location; and
- overhead transmission line within infrastructure zone.

- two meteorological masts with a height equivalent to the hub height of the final selected turbine. Based on the candidate turbine, this height would be approximately 112 metres;
- a network of internal tracks (5.0 to 7.0 metres in running width) linking turbines and to provide access to and from public roads. The total length of track is approximately 40 kilometres. Where possible existing tracks are utilised and upgraded for access;
- approximately 49 kilometres of 33kV electrical cables (underground) linking turbines to the on-site substation;
- 275kV overhead transmission line for approximately 15 kilometres from the on-site substation to the terminal substation and tee in to the Robertstown to Tungkillo 275 kV transmission line. Poles will be constructed with steel or concrete monopoles up to 35 metres high and spaced approximately 200-400 metres apart (or wider should terrain enable) depending on ground conditions;
- two substations, the first is within the wind farm infrastructure zone, on the south-eastern side of the development site near the wind farm access point. The second substation is the terminal substation, which is located adjacent south of the Sturt Highway east of the township of Truro at the 275kV tee in point;
- at the terminal substation the 275kV transmission towers may comprise lattice towers up to 45 metres high to tee into the existing transmission line;
- operations and maintenance facilities including; office, control room, staff facilities, car park area for staff and visitors and workshop;
- up to four temporary laydown and construction facilities;
- a mobile concrete batching plant within one of the temporary laydown and construction facilities; and
- a battery energy storage facility with an indicative capacity of 215 MW. The facility includes up to 24 containerised energy storage enclosures (which house batteries, inverters, transformers, racking and associated electrical equipment), a control building and switchroom. The capacity of the energy storage may alter with the selection of the final infrastructure and is subject to the conditions of the Office of Technical Regulator (Schedule 5 of the Development Regulations 2008 in relation to the security and stability of the State’s power system).

1.5.2 Construction Compound, Substation and Battery Energy Storage Facility

The construction operations and maintenance, battery storage and substation compound, includes:

- operations and maintenance area identified on the plan as a "utility zone" of approximately 0.8 hectares. This area comprises:
- the office and staff facilities 20 metres (L) x 10 metres (W) x 4.5 metres (H);
- operations and maintenance building 25 metres (L) x 15 metres (W) x 8 metres (H);
- bunded hazardous chemical storage area; and
- car parking and communications tower (approximately 25 metres in height).

• battery storage compound of approximately 1.1 hectares. This area comprises:
  - 24 energy storage containers containing UL-listed batteries, inverters, transformers, racking and associated equipment, typically 12 to 15 metres in length, 2.5 metres in height and typically 0.5 metres FFL above natural ground;
  - associated transformers;
  - switchroom;
  - control building; and
  - car parking.

• construction laydown area of approximately 2.9 hectares;

• substation including switch room and control buildings of approximately 2.2 hectares. This area comprises:
  - 33kV switch room;
  - control building;
  - one permanent 275kV - 33kV substation with approximate dimensions of 75 metres x 85 metres; and
  - bunds for fuel, oil and chemical storage.

Overall the site of the construction operations and maintenance, battery storage and substation compound is approximately 7 hectares. The compound is accessed from Mosey Road via an internal access road. The compound is setback approximately 1.4 kilometres from the nearest public road (at its closest point). All areas of the compound may be fenced with 2m high security fencing. Screen vegetation planting would be undertaken around the perimeter of the compound in accordance with WAX Design recommendations contained within the Landscape Character and Probable Visual Effect Assessment report.

The permanent construction operations and maintenance, battery storage and substation compound is located on Section 278 in Certificate of Title Volume 5618 Folio 693. Plans of the indicative layout of the compound and its associated facilities are incorporated in the development application documents (Volume 3).

1.5.3 Concrete Batching Plant

A mobile temporary concrete batching plant is to be located within a compound of approximately 1.3 hectares (115 metres x 115 metres. This compound is to be located immediately to the south-west of the permanent construction operations and maintenance, battery storage and substation compound (if this material is not sourced off-site). This temporary concrete batching plant is located on the same property as the permanent construction operations and maintenance, battery storage and substation compound.
The need for on-site concrete batching plants will depend on the final selected civil contractor requirements.

1.5.4 Temporary Construction Compounds

A total of five temporary laydown and construction facilities are proposed throughout the development site, including the temporary concrete batching plant described above and the three satellite temporary construction compounds.

The temporary construction and laydown facilities are anticipated to be utilised during the 18 month to two year construction timeframe of the development and may include the following sites:

- Section 278 in Certificate of Title Volume 5618 Folio 693 south east of WTG 9;
- Section 2193 in Certificate of Title Volume 5293 Folio 927 between WTG 42 and 48;
- Section 126 in Certificate of Title Volume 5293 Folio 930 between WTG 51 and 17;
- Section 233 in Certificate of Title Volume 5293 Folio 931 between WTG 13 and 19; and
- Allotment 91 in Certificate of Title Volume 5506 Folio 92 adjacent the terminal substation.

The final number and location of these facilities would be determined as part of the final design of the wind farm, following selection of the construction contractor and establishing their requirements.

1.5.5 275kV Terminal Substation

In addition to the substation within the wind farm infrastructure zone, as described in Section 1.5.2, a second substation is the terminal substation at the 275kV tee in point. This substation is located adjacent the Sturt Highway east of the township of Truro on Allotment 91 in Certificate of Title Volume 5506 Folio 92.

The substation including switch room and control buildings is approximately 2.0 hectares and comprises:

- switch room;
- control building;
- two permanent substations;
- 2.0 metre high perimeter security fence;
- site entrance from the Sturt Highway; and
- screen vegetation planting would be undertaken adjacent the road reserve in accordance with WAX Design recommendations contained within the Landscape Character and Probable Visual Effect Assessment.
A temporary construction compound of approximately 1.5 hectares would also be located on the site.

1.5.6 Battery Storage

As described in Section 1.5.2 above, the battery energy storage comprises 24 containerised energy storage units with an indicative capacity of 215 MW. The components of the facility will include UL-listed batteries, inverters and transformers, switchroom, control building, car parking and associated equipment.

The batteries will have grid support capabilities and can be configured to respond to a variety of network requests to stabilise network services. The services provided will be subject to detailed negotiation as part of the grid connection agreement process. It is likely however that the batteries on Twin Creek will be principally utilised for energy production shifting and performance of regulatory standards.

1.6 PROJECT TIMING

RES Australia is seeking a period of 5 years in which to substantially commence the development from the operative date and substantial completion to be extended to 7 years from the operative date of the consent.

Table 1.1 outlines the likely timetable for construction and operation of the Twin Creek Wind Farm project.

Table 1.1 – Project Timing

<table>
<thead>
<tr>
<th>PHASE</th>
<th>DURATION</th>
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</thead>
<tbody>
<tr>
<td>Pre-construction, project planning and development approval</td>
<td>12 months</td>
</tr>
<tr>
<td>Construction and commissioning</td>
<td>18-24 months</td>
</tr>
<tr>
<td>Operation</td>
<td>25 -30 years</td>
</tr>
<tr>
<td>Maintenance</td>
<td>Periodic and as required</td>
</tr>
<tr>
<td>Decommissioning or replacement</td>
<td>At completion of project life - up to 24 months</td>
</tr>
</tbody>
</table>

Following determination of the development application for Development Plan Consent, RES Australia will undertake a tender process to confirm the equipment supplier and involved contractors, pre-construction arrangements and finalisation of the Construction Environmental Management Plan (CEMP) and Operational Management Plan, and the construction phase of the project.
CHAPTER 2 – PROJECT CONTEXT

2.1 INTRODUCTION

Twin Creek Wind Farm and Energy Storage Project is a development of economic and environmental significance and represents an important contribution to renewable energy generation in South Australia.

The project provides additional generating capacity of approximately 613,000 Megawatt hours (MWh) every year over the operating life of the wind farm. This generation is equivalent to the electricity needs of approximately 118,000 South Australia homes each year, (assuming the average annual household electricity use is 5,200 kWh per annum). In addition to the wind generation, the energy storage facility has a storage capacity of 50 MW.

The wind farm and energy storage will generate electricity for use by electricity customers within the National Electricity Market.

2.2 RES AUSTRALIA AND PROJECTS

RES is the world’s leading independent renewable energy companies, with the expertise to develop, engineer, construct, finance, and operate projects around the globe. It has deployed over 12GW of utility renewable energy projects involving wind, solar and energy storage technologies. RES Australia has been developing renewable energy projects in Australia since 2004. RES’s recent Australian projects include Ararat Wind Farm (75 turbines, 235 MW) and Murra Warra Wind Farm (116 turbines, 418 MW) in Victoria and Taralga Wind Farm (51 turbines, 107 MW) in New South Wales.

RES contracted energy storage portfolio exceeds 144 MW (92 MWh), with over 200 MW in development. It has partnered with over 9 utilities across these projects and is recognised by Navigant Research as one of the top two global integrators of energy storage.

2.3 CONTEXT FOR WIND ENERGY DEVELOPMENT

2.3.1 Global Context

There is overwhelming evidence that carbon emissions are having a detrimental effect on the environment and that if such emissions continue to increase there will be serious consequences for biological and social systems worldwide. It is recognised that the use of renewable energy sources will displace greenhouse gas emissions arising from fossil fuel electricity generation. Policies have been put in place at the international, national and state level to proactively support the establishment and use of renewable energy.
The Intergovernmental Panel on Climate Change (IPCC\textsuperscript{1}) assesses the scientific, technical and socio economic information relevant for the understanding of risk of human-induced climate change. The Fifth Assessment Report (AR5) produced by the IPCC in 2015 reports comprehensive evidence of climate change, impacts and associated directions for mitigation of the social, environmental and economic costs.

The AR5 concluded that annual global greenhouse gas emissions have risen by 12.5 percent since 1990, and that the concentration of atmospheric carbon dioxide has reached the order of 390 parts per million in 2010, which has increased from the pre-industrial level of about 180 parts per million (an increase of 39 percent). The increase in atmospheric carbon is primarily due to the combustion of fossil fuels, coal, oil and gas.

Research by the World Resources Institute (WRI) has estimated two of the largest global sources of carbon dioxide are electricity and heat (32 percent) and transportation (17 percent) (Climate Analysis Indicators Tool, 2006).

At the United Nations Climate Change Conference held in Paris in 2015, all 196 delegate countries including Australia agreed to reduce greenhouse gas emissions as soon as possible and to keep global warming to below two degrees as measured against preindustrial levels.

Wind power is recognised globally due to its proven technology and because it is less expensive compared to other forms of renewable energy, and accordingly has experienced strong growth globally. The Global Wind Energy Council (GWEC) have reviewed the growth in the wind power market, and despite a 38.3 GW increase in the world's wind power capacity during 2009 (a 31 percent increase from the previous year), during 2010, the overall growth decreased by 0.5 percent to a 38.3 GW growth. This decrease is generally attributed to the global financial crisis; however the outlook for 2011 is more optimistic. The largest contributors to the global wind capacity are China, the United States of America, Germany and Spain.

2.3.2 National Context

Domestically, Australia's current commitment is to reduce emissions of greenhouse gases to five percent below 2000 levels by 2020.

Electricity generation accounts for over 30 percent of Australia's greenhouse gas emissions. On the 23rd June 2015 the Federal Parliament passed the Renewable Energy (Electricity) Amendment Bill 2015 which mandates that 33,000GWh (23.5 percent) of the country's electricity will be generated from renewable sources by 2020.

Australia has a relatively small component of the global wind electricity, however is expected to play a major role in the transition to a low carbon economy. As identified by the GWEC, Australia has some of the best wind resources in the world.

At the end of 2010, the GWEC have identified that 1,880 MW of wind capacity was installed in Australia, consisting of 1,052 operating wind turbines in 52 wind farms. On average, the capacity has increased by 30 percent per year over the past decade.

As electricity generation contributes to a significant proportion of Australia’s greenhouse gas emissions, there is considerable pressure for the electricity industry to reduce its contribution. A range of measures, including increased efficiency of generation, fuel switching, and increased renewable energy generation will need to be adopted to achieve a significant mitigation in the growth of greenhouse gas emissions from the electricity industry.

2.3.3 State Context

The South Australian Government has an active programme to deliver reductions in greenhouse gas emissions.

A clean energy future is identified as a key strategy in the actions in reducing greenhouse emissions. The proposed development is directly aligned with the South Australian Strategic Plan target for renewable energy is: “support the development of renewable energy so that it comprises 33% of the state’s electricity production by 2020”.

In addition to establishing a target for renewable energy, the SASP has a goal to reduce greenhouse gas emissions. The SASP Target in relation to greenhouse gas emissions reduction is to “achieve the Kyoto target by limiting the state’s greenhouse gas emissions to 108% of 1990 levels during 2008-2012, as a first step towards reducing emissions by 60% (to 40% of 1990 levels) by 2050”. South Australia has achieved its Kyoto target of restricting emissions levels to less than 36.4 Mt CO2-e through to 2012 and is now working towards the 2050 target. Continuing to provide alternative sustainable energy sources is viewed as a technique to a reduction in greenhouse gas emissions.

In March 2017, the South Australia Government released an “Energy Plan” with a vision “to source, generate and control more of South Australia’s power supply in South Australia so we can increase self-reliance and provide reliable, competitive and clean power for all into the future.” The Energy Plan contains the following goals:

• provide South Australia with large-scale storage for renewable energy so power is available when it is needed, beginning the transformation to next-generation renewable technology;

• provide South Australia with a government-owned source of emergency electricity generation;

• give South Australia greater local powers over national market operators and privately owned generators;

• create new investment in cleaner energy to increase competition, put downward pressure on prices and provide more energy system stability;

• South Australia to source and use more South Australian gas to generate its own electricity, increasing the state’s self-reliance; and

• create more electricity generation to increase competition and put downward pressure on prices.
It is noted that the SA Energy Plan is seeking to ensure that energy can be dispatched as it is needed to provide energy security. The plan notes that large-scale storage transforms renewable energy into dispatchable energy.

### 2.3.4 Local Energy-System Security

RES Australia recognise the licensing and registration requirements of a generator on the National Electricity Market and as a generator within the State of South Australia. These require satisfaction of requirements from entities such as ElectraNet, Australian Electricity Market Operator (AEMO) and Essential Services Commission of South Australia (ESCOSA). There are further registration requirements as a renewable energy generator over and above registration as a generator.

RES Australia also recognises ESCOSA’s directive around integration of new generation sources into networks in seeking to provide network support. These requirements, as well as potential future requirements, are accommodated in the project design through the WTG technology and battery energy storage facility.

In terms of technology, the Twin Creek project considers the suite of new generation Type 4 full inverter based wind turbine generators as being capable of providing services such as enhanced reactive capability, high levels of active power injection post fault recovery, and enhanced flexibility between wind speed and turbine output, underpinning the Fast Frequency Response (FFR) relative to traditional Type 3 doubly fed induction generators dominating the current wind fleet.

Further, the proposed energy storage capability of the facility increases the capability of the proposal providing flexibility to numerous use scenarios including frequency regulation and contingency FFR decoupled from wind resource, the ability to provide current into faults, and flexible yet highly controllable reactive capability.

RES Australia will work with the statutory bodies in relation to an agreed set of performance standards applicable for the facility, to the satisfaction of all appropriate parties through the standard connection process.

### 2.3.5 Local Energy-System Security

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Further, the proposed energy storage capability of the facility increases the capability of the proposal by providing flexibility to numerous use scenarios including the ability to provide dynamic reactive power, voltage control, configurable performance through contingency events, active power control for frequency response and assistance with system restart.

RES Australia will work with the statutory bodies in relation to an agreed set of performance standards applicable for the facility, to the satisfaction of all appropriate parties through the standard connection, registration and commissioning process.

2.3.6 Integration of Wind Farm and Battery Energy Storage into the National Electricity Network

RES Australia is experienced in the process in connecting generation plant to the National Electricity Market (NEM), having developed the now operating 107 MW Taralga Wind Farm in NSW and the 242 MW Ararat Wind Farm in Victoria which has received AEMO registration and is generating to the NEM.

The Twin Creek energy facility will be registered as a Semi-Scheduled Generator under the National Electricity Rules (the Rules), due to its capacity exceeding the threshold of 30MW. A connection enquiry has been lodged with ElectraNet as the responsible Transmission Network Services Provider for the Twin Creek energy facility and RES has received the following feedback from their investigations:

...no constraints are expected under reasonably foreseeable operating conditions. The network connection is in a very strong part of the backbone 275 kV network and hence the reason for low exposure to constraints. Even if further generation is added in the same corridor, the exposure to constraints may be limited, though this has not been fully assessed. With more wind farms added in the Mid North and Eyre, the 132 kV parallel network may come under some scrutiny. These are issues which are likely to have low cost fixes, to further strengthen the network capacity however.

The process for proceeding with the facility is to progress to the connection application phase of the interconnection studies. This will include detailed static and dynamic modelling to confirm the technology capability with respect to the access standards, ultimately arriving at a set of negotiated generator performance standards. Simultaneously, ESCOSA requirements will also be assessed for the selected technology.
Although the technical performance standards of the battery energy facility will be negotiated as part of the suite of grid connection agreements, RES have extensive experience in implementing utility scale grid connected battery energy storage facilities in a range of functions which include:

1. **Generation** - Frequency Regulation, Renewable Integration, Spinning Reserve, Ramp Rate Management, Renewable Firming.


3. **Distribution** - Disaster Recovery / Relief, Microgrid & Island Grid Support, Distribution Upgrade Support, Peak Load Reduction, Power Quality, Reactive power and voltage Support.

The battery functions are dispatchable in automatic and manual modes using RES's proprietary RES control software ‘RESolve’.

The facility design will incorporate the communications requirements of both ElectraNet and the Australian Energy Market Operator (AEMO) to ensure network and Supervisory Control and Data Acquisition (SCADA) signals are received in the required timeframes ensuring integration of the facility with the broader network operation controls.

### 2.4 GREENHOUSE GAS EMISSIONS

The electricity produced by the proposed Twin Creek Wind Farm and Energy Storage project will be fed into the NEM. Increased generation of electricity using wind energy will inevitably result in greenhouse gas emissions savings from electricity generation.

There is significant literature available that shows that wind farms:

- are one of the most benign forms of generation technologies with one of the lowest possible greenhouse impacts;

- cause no greenhouse gas emissions as a result of operation which results in significant greenhouse gas emission reductions compared to existing electricity generating plants; and

- have little opportunity to make other than very marginal gains in the greenhouse efficiency through changes in construction methods or transportation.

An estimation of greenhouse gas emission savings as a result of the Twin Creek Wind Farm has been undertaken by Hudson Howells (Twin Creek Socio-Economic Impact Assessment in Volume 2 of the application). As discussed in the Hudson Howells assessment report, “renewable wind energy generation has significant environmental benefits through carbon emission reduction where it replaces coal or gas generated electricity”.
To estimate the value of this reduction it is assumed that the Twin Creek Wind Farm will have the following operating characteristics:

- total wind farm capacity of up to 183 MW;
- annual average utilisation rate of 40 percent;
- total generation of 613 Gigawatt hours (Gwh) per annum.

“It is conservatively assumed that when electricity is generated through coal fired stations, it produces 0.8 tonnes of carbon per megawatt hour of electricity generated. So the generation of 613 Gwh per annum through coal generation would produce in the order of 0.491 million tonnes of carbon emissions. At a carbon price of $20 per tonne (historically conservative relative to international trading schemes, and much lower than what is expected in the longer term – but matching current prices), the value of carbon emission savings therefore associated with the Twin Creek Wind Farm is estimated to be $9.8 million per annum or a net present value of $104 million over a 20 year period (real discount rate of 7%)” (page 65).

2.5 COMMUNITY ENHANCEMENT PROGRAMMES

RES Australia will commit to a voluntary community enhancement programme as a benefit to the community, to offset residual impacts in the local area in which the wind farm is proposed. The programme would be established to benefit the community across the three Council areas.

RES Australia has established various community enhancement programmes at their operating wind farms elsewhere in Australia and internationally.

Key stakeholders will be consulted in establishing the community enhancement program, including each of the three Councils and local community and sporting groups. RES Australia would seek nominations from the community to establish a ‘board or committee’ to operate and manage the program. RES would have a member on the board/committee established as one participant only, without any specific decision making role. Applications for grants would be sought from the community on an annual basis. Funding may be sought for sponsorship of sporting clubs, community events or physical enhancement projects in the community.

The final structure and amount of community engagement programmes will be finalised prior to construction and will seek to have input from a diverse range of community members.

RES Australia is committed to supporting the community and has already provided sponsorship to the Kapunda Football Club, the Rotary Kidman Art Show and the Kapunda High School Centenary Foundation Inc. It has also pledged a donation to Eudunda Hardcourt project (used by local tennis and netball sport clubs).
In addition to an agreed community enhancement programme, Twin Creek Wind Farm will provide local economic benefit, the employment of local contractors through the establishment of a contractors’ register list, and increased business opportunities as flow-on effects in nearby townships. Further information relating to the social and economic aspects of the project is provided in the Hudson Howells Twin Creek Socio-Economic Impact Assessment report in Volume 2 of the application.

2.6 SUMMARY OF PROJECT BENEFITS

The key benefits of the construction and operation of the Twin Creek Wind Farm are summarised below:

• contribute to the achievement of the National and State objectives for the sustainable production of energy and the abatement of greenhouse gas emissions;

• the provision of an additional energy source for retailers to meet the obligations of the Federal Government’s RET Scheme;

• additional electricity generation in the order of 613 GWh/year to assist the National Electricity Market to be able to satisfy forecast increased electricity demands, being enough clean energy to provide for approximately 118,000 South Australia homes each year;

• the development will assist in adding stability to local energy sector in South Australia via the inclusion of battery storage in combination with the wind farm, providing further renewable energy for the State;

• the provision of an additional, sustainable energy source to provide for an alternate energy source to fossil fuels;

• the displacement of energy from fossil fuels, with the value of carbon emission savings conservatively estimated to be $9.8 million per annum;

• the provision of management and mitigation measures to ensure the project does not compromise environmental values either during construction or operation, and does not place stress on the existing environmental values at the locality including ecological, heritage, soils or water quality;

• local economic benefit, particularly to the land owners within the project area and also to the wider community. The construction phases of the project in particular will involve the employment of local contractors and increased business opportunities as flow-on effects in nearby townships;

• during construction the wind farm would generate an estimated 1,447 person years of employment in South Australia, or an average of over 480 jobs sustained per year over three years;

• once operational the wind farm is estimated to support annually $15.5 million of value added in South Australia, and support directly and indirectly in the order of 105 jobs per year; and
• the proposal can co-exist with the grazing and cropping land use activities on the subject land which can continue during the operation of the project.

The benefits of the project as outlined above should be considered in the context of the potential impacts of the project. The potential impacts of the project are outlined within this volume of the application (Chapter 6) and in detail in the technical reports contained in Volume 2.

An assessment of the proposed development in relation to social, environmental and economic impacts, particularly as established in the relevant Development Plan provisions of the Light Development Plan, Goyder Development Plan and Mid Murray Development Plan is contained in Volume 2. The conclusion of this assessment is that on balance, the Twin Creek Wind Farm and energy storage facility is a suitable land use.
CHAPTER 3 – STRATEGIC AND LEGISLATIVE CONTEXT
CHAPTER 3 – STRATEGIC AND LEGISLATIVE CONTEXT

3.1 SOUTH AUSTRALIAN STRATEGIC CONTEXT

The State Government's policies supporting renewable energy have a strategic context.

3.1.1 South Australia’s Strategic Plan

South Australia’s Strategic Plan (SASP) establishes targets and priorities as a blueprint for the future of South Australia. First prepared in 2004, the SASP has been updated twice since that time and currently comprises seven strategic priorities, 10 economic priorities and 100 measurable targets.

In 2004, the Plan set a target for South Australia to lead Australia in wind and solar power generation within 10 years and to increase the use of renewable energy to comprise 15 percent of total consumption. By 2009, South Australia had 56 percent of the nation’s wind power, 30 percent of the solar photovoltaic capacity feeding into the national grid and consumption of renewable energy reached 16.4 percent. In 2007, the target was increased to aim for 20 percent of the state’s production from renewables by 2014. The 2010 Plan Progress Report stated that whilst the target had been considered ambitious, it was now likely to be reached well ahead of schedule.

The 2011 SASP has a primary goal that “South Australia has reliable and sustainable energy sources, where renewable energy powers our homes, transport and workplaces”. The SASP target for renewable energy is: “support the development of renewable energy so that it comprises 33% of the state’s electricity production by 2020”. The 2014-2015 progress update of the SASP states that: “the proportion of electricity produced from renewable energy sources in South Australia has grown considerably from 4.9% in 2004-05 (baseline year) to 42.2% in 2014-15. Wind energy is the major renewable energy technology that has contributed to the result. The result for 2013-14 is well in excess of both the 20% milestone to be achieved by 2014 and the target of 33% to be achieved by 2020”.

In addition to establishing a target for renewable energy, the SASP has a goal to reduce greenhouse gas emissions. The SASP Target in relation to greenhouse gas emissions reduction is to “achieve the Kyoto target by limiting the state’s greenhouse gas emissions to 108% of 1990 levels during 2008-2012, as a first step towards reducing emissions by 60% (to 40% of 1990 levels) by 2050”. South Australia has achieved its Kyoto target of restricting emissions levels to less than 36.4 Mt CO2-e through to 2012 and is now working towards the 2050 target. Continuing to provide alternative sustainable energy sources is viewed as a technique to a reduction in greenhouse gas emissions.

3.1.2 Strategic Infrastructure Plans

The Strategic Infrastructure Plan for SA has guided and coordinated the state’s approach to infrastructure provision since 2005. It provides an overarching state framework for the planning and delivery of infrastructure by all government and private sector infrastructure providers.
A strategic prior of the Infrastructure Plan is to “support research and development in renewable technologies, particularly wind, solar PV and geothermal energy, to enhance their technical and economic viability”. The plans identifies that “the most promising renewables of interest to South Australia, based on regional comparative advantages, are wind, solar and geothermal energy….Successful use of additional wind energy will depend on connection and performance standards for wind farms; the ability to export wind energy to and balance imports from the eastern states via interconnectors; the use of demand side measures or additional flexible generation, as well as the development of improved forecasting and data systems”.

3.1.3 Energy Plan

The newly released South Australian Government Energy Plan (March 2017) establishes clear goals to support a new generation of renewable energy that can be dispatched as it is needed to provide energy security. The plan notes that large-scale storage transforms renewable energy into dispatchable energy. The vision and goals of the SA Energy Plan are outlined in Section 2.3).

3.1.4 Wind Farm Planning Policy

In 2011 the State Government introduced (on an interim basis) planning policies via the Statewide Wind Farms Development Plan Amendment (DPA) as a commitment to certainty for communities and wind farm investors. The policies of the Statewide Wind Farm DPA were finalised in October 2012. The planning policies found within relevant Development Plans throughout South Australia explicitly envisage wind farms in all primary production (rural) zones in South Australia.

Wind farms and ancillary development such as substations, maintenance sheds, access roads and connecting power-lines (including to the National Electricity Grid) are envisaged within the zone, excluding the area within the Barossa Valley Region Policy Area 2 and Precinct 19 Marananga Seppeltsfield Fringe, and constitute a component of this part of the zone’s desired character. These facilities will need to be located in areas where they can take advantage of the natural resource upon which they rely and, as a consequence, components (particularly turbines) may need to be:

• located in visually prominent locations such as ridgelines;
• visible from scenic routes and valuable scenic and environmental areas; and
• located closer to roads than envisaged by generic setback policy.

This, coupled with the large scale of these facilities (in terms of both height and spread of components), renders it difficult to mitigate the visual impacts of wind farms to the degree expected of other types of development. Subject to implementation of management techniques set out by general / council wide policy regarding renewable energy facilities, these visual impacts are to be accepted in pursuit of benefits derived from increased generation of renewable energy.

The policies also establish criteria for Category 2 public notification, as noted below:
Wind farms and ancillary development such as substations, maintenance sheds, access roads and connecting power-lines (including to the National Electricity Grid) where the base of all wind turbines is located at least 2000 metres from:

(a) an existing dwelling or tourist accommodation that is not associated with the wind farm;
(b) a proposed dwelling or tourist accommodation for which an operable development plan consent exists; and
(c) the boundaries of any Airfield, Airport, Centre, Community, Fringe, Historic Conservation, Home Industry, Living, Mixed Use, Residential, Settlement, Tourist, Township or Urban Zone, Policy Area or Precinct or any Heritage Area (including within the area of an adjoining Development Plan).

The policies introduced by the Statewide Wind Farm DPA are contained within the current Development Plans of Light Regional Council, Regional Council of Goyder and Mid Murray Council and are relevant to the assessment of the Twin Creek wind farm development application.

### 3.2 DEVELOPMENT ACT 1993

In accordance with Part 4 of the Development Act 1993, no development may be undertaken unless it is an approved development. A development is approved, only if a relevant authority has assessed the development against, and granted consent in respect a range of consents that may be relevant. The development application by RES Australia for the Twin Creek Wind Farm and Energy Storage facility seeks Development Plan Consent.

In accordance with Schedule 10(14) of the Development Regulations 2008, the Development Assessment Commission will be the relevant planning authority to assess the development application, as the proposed development is “for the purposes of the provision of electricity generating plant with a generating capacity of more than 5 MW that is to be connected to the State's power system”. Assessment of the application will be undertaken against the relevant provisions of the Light Regional Council Development Plan, the Goyder Council Development Plan and the Mid Murray Development Plan.

Schedule 5 of the Development Regulations 2008, requires a certificate be issued by the Technical Regulator certifying that development described in Schedule 10(14) complies with the requirements of the Technical Regulator in relation to the security and stability of the State’s power system. A certificate from the Technical Regulator has been issued that certifies that the proposed development complies with the requirements of the Technical Regulator.

The development site of the proposed Twin Creek Wind Farm is located within the following zones:

- Primary Production Zone, General Farming Policy Area 3, Light Regional Council Development Plan (consolidated 8 December 2016);
- Primary Production Zone, Goyder Council Development Plan (consolidated 24 November 2016); and
Figure 4 – Planning Overlays, illustrates the development site and Council boundaries and land use zones.
A "wind farm and ancillary development such as substations, maintenance sheds, access roads and connecting power lines (including to the National Electricity Grid)" is a consent land use within the Primary Production Zone within the Light Regional Council Development Plan and the Rural Zone of the Mid Murray Development Plan, if it is located outside of the Barossa Valley Character Preservation District as defined by Character Preservation legislation. All infrastructure associated with the Twin Creek Wind Farm is outside of the Barossa Valley Character Preservation District.

A wind farm (and ancillary development) is not listed as a complying or non-complying form of development within the Primary Production Zone of the Goyder Council Development Plan and therefore a consent land use to be assessed on merit.

3.3 OTHER APPROVALS

The nature and scale of a wind farm project requires a range of approvals, licences and permits under various State and Commonwealth legislation.

It is common place for wind farm developments to concurrently seek approval in relation to the following three pieces of legislation during the development approval process.

3.3.1 Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)

The EPBC Act is Commonwealth Legislation that focuses on the protection of the environment, especially matters of national environmental significance. The submission and/or determination of an EPBC referral is independent of the development approval process.

RES Australia have identified the need to submit a referral to the Commonwealth Department of the Environment, Water, Heritage and the Arts for consideration under the EPBC Act. This referral is to occur concurrently with the processing of the development application.

3.3.2 Aboriginal Heritage Act 1998

The Aboriginal Heritage Act 1998 places a duty of care on RES Australia as proponents of the development to address the likelihood of any impact on heritage.

RES Australia along with its consultants, have already undertaken extensive survey work of the site of the development in association with the Ngadjuri local aboriginal community. This process is ongoing and RES Australia are aware of their responsibility pursuant to the Aboriginal Heritage Act 1998.

Approvals required pursuant to the Aboriginal Heritage Act 1998 are independent of the development approval process.
3.3.3 Native Vegetation Act 1991

Any clearance of native vegetation will require approval under the *Native Vegetation Act 1991*. Approval for clearance of native vegetation is independent of the development approval process.
CHAPTER 4 –
PROJECT DESCRIPTION
CHAPTER 4 – PROJECT DESCRIPTION

4.1 SITE SELECTION

RES Australia undertake a systematic process to identify suitable wind farm sites and to assess their relative merits. This process includes identification of potential sites with suitable wind energy resources and transmission infrastructure.

DP Energy established a meteorological monitoring mast on the subject land in around 2012. RES Australia purchased the existing meteorological mast from DP Energy and full development control of the site in January 2015.

RES Australia undertook an initial feasibility study which identified the following advantages of the Twin Creek site:

• high probability of a strong wind resource;
• availability of an appropriate voltage transmission line within a suitably proximity of the site with generation capacity;
• sparse distribution of dwellings within proximity of the site;
• sparse vegetation cover within the development site;
• supportive host landholders; and
• uncomplicated transport access route.

Sophisticated and detailed wind resource modelling was commissioned for the Twin Creek development site. This wind modelling utilised the recorded data from 2012 to present. Figure 2 in Volume 3 illustrates predicted wind speeds.

Concurrent with modelling of the wind resource around Twin Creek, RES Australia have undertaken economic feasibility. Economic and business considerations have a major impact on whether a wind farm project warrants investment. Wind farms need to be of a sufficient size (i.e. number of turbines) relative to the nature of the wind resource and the cost of establishing the project and connection to the national electricity grid.

Proximity to a suitable electricity transmission network is critical. It is also important to minimize the distance of transmission to maximise the efficiency of the project. As energy is transmitted, a small proportion is lost to the atmosphere as heat. Thus, the shorter the distance to grid, the lower the losses and thus the higher the wind farm efficiency.
4.2 PROJECT EVOLUTION

Once Twin Creek Wind Farm site was determined as being an appropriate and suitable wind farm site, detailed technical investigations commenced and the design of the wind farm commenced.

A variety of design options have been considered during the conceptual design of the wind farm. The overall objective of the conceptual design stage was, following identification of potential site constraints to identify the layout of the project to deliver significant savings in greenhouse gas emissions whilst being commercially viable and socially and environmentally acceptable. Constraint analysis included visual analysis, heritage assessment, flora and fauna assessment, community consultation, aviation, acoustic, civil and infrastructure, transportation, bushfire and telecommunications.

The selected design is described in Chapter 5 of this Volume 1 report. Further refinement and micro-siting of the project elements will be undertaken as part of the final design stage, however the proposed design in described in Chapter 5 is sufficiently detailed for the purposes of obtaining Development Plan Consent.

The following variables have been considered in the project design:

- **Turbines**: the spacing of turbines relates to the size of turbines, the orientation of the layout to the prevailing winds and environmental considerations. The following are the specific changes which have occurred to the layout design as a result of the investigations and project consultation:
  
  - The deletion of 12 turbines with associated tracks and a site entrance road proposed in the south-east of the project area to minimise/avoid the habitat of Pygmy Blue Tongue Lizard.
  
  - Relocation of T8, T2, T44, T41 and T40 to address concerns from an adjoining neighbour regarding turbine distance to property boundary.

A review of the wind characteristics of the project area and the commercial available wind turbine equipment indicate that the proposed turbine model and height is most suitable and commercially viable. Lower structures would reduce the electrical generation of the wind farm.

Consistent with the trend in recent years, larger megawatt class wind turbines are being used increasingly in Australian and overseas. The use of larger turbines has also resulted in reduced costs of wind energy compared to other renewable technologies, as well as reducing the number of turbines required to be constructed to achieve an equivalent generation capacity.

The candidate turbine model selected for the development application is the Vestas V136 turbines with maximum height to blade tip of 180 metres;

- **Site Access**: Existing tracks have been utilised through the project area wherever possible, and new tracks located to minimise the total length of new tracks, to ensure suitable grades, adequate curvature on bends and to avoid areas of vegetation, fauna or archaeological sensitivity;
• **Electrical Transmission**: A combination of underground and overhead transmission cables will be used in the development. Underground cables are utilised for the connection of the wind turbines to the on-site substation, whilst overhead cables are utilised for the transmission to the terminal substation and existing 275kV transmission line;

• **Energy Storage**: Energy storage was not part of the initial project design and has been incorporated post the original community consultation; and

• **Construction Alternatives**: The Traffic Impact Assessment in Volume 2 (and summarised in Chapter 6 of this report) provides an indication of the viable site access routes for restricted access vehicles. Issues of grade, road surface, curvature, local traffic conditions and minimal disturbance to neighbours have influenced the selection of the preferred route.

The concrete for construction purposes will be provided on site via installation of a temporary mobile on-site concrete batching plant. The temporary concrete batching plant is located within one of the temporary construction compounds and adjacent to the operations and maintenance compound.

Subject to material suitability, material may be sourced from a borrow pit within the development site for the construction of access tracks. The construction phase will involve the transport of gravel to locations where it can be spread along the access tracks.

As far as possible the construction period will be limited to minimise any impact on the local community and to enable completion of the wind farm and commencement of the electricity generation as soon as practicable.

### 4.3 LAYOUT DESIGN

The project site for the wind farm turbines spans an area of approximately 6 to 7 kilometres in a north-south direction and approximately 5 kilometres in an east-west direction (excluding the transmission line). The transmission line travels in a south easterly direction from the onsite substation to the terminal substation for a length of approximately 15 kilometres.

The wind farm is illustrated on the plans prepared by RES and contained in **Volume 3**, as detailed below.

- **Figure 1** Location Plan – 03498D2212-01
- **Figure 2** Wind Map – 03498D2213-01
- **Figure 3** Site and Context Analysis (2 Pages) - 03498D22103-01
  - Page 1 - Wind Farm
  - Page 2 - Grid Route
- **Figure 4** Planning Overlays – 03498D2214-01
Figure 5  Landownership (2 Pages) – 03498D2525-01
Page 1 - Wind Farm
Page 2 - Grid Route

Figure 6  Proposed Turbine Locations – 03498D0002-01

Figure 7  House and Turbine Locations (2 Pages) – 03498D0202-01
Page 1 - Wind Farm
Page 2 - Grid Route

Figure 8  Infrastructure Drawing (2 Pages) – 03498D1002-01
Page 1 - Wind Farm
Page 2 - Grid Route

Figure 9  Design Response – 03498D2104-01
Page 1 - Wind Farm
Page 2 - Grid Route

Figure 10  Micrositing Drawing – 03498D2215-01

Figure 11A  Proposed Construction Operations, Maintenance and Substations Areas – 03498D3501-02

Figure 11B  Proposed Terminal Station Site Plan – 03498D4001-01

Figure 12  Typical Operation and Maintenance Area – 03498D3502-01
Page 1 - General View
Page 2 - Operation and Maintenance Building
Page 3 - Office

Figure 13  Typical Temporary Construction Compound– 03498D3503-01

Figure 14  Typical Concrete Batching Plant– 03498D3504-01

Figure 15  Typical Onsite Intermediary Collector Station– 03498D4005-01

Figure 16  Proposed Energy Storage Facility – 03498D3401-01

Figure 17  Proposed Cable Reticulation Layout – 03498D4301-01
The properties on which it is proposed to construct the wind farm and energy storage project are privately owned and are used predominantly for sheep and cattle grazing and cropping. The development, although covering a wide area, will occupy only a small part of each property and the existing land use will be preserved. Further details on the land within the project area is provided below.

The turbine layout has been designed to provide for the optimum arrangement with the following objectives:

• maximisation of the wind farm electrical output;
• maintain spacing of turbines to minimise turbulence and airflow interactions between turbines;
• avoidance of locations which would affect the existing flora and fauna, and heritage values of the site;
• maintenance of acceptable noise levels and construction of large turbine components;
• enable accessibility in relation to delivery and construction of large turbine components; and
• achieving a wind farm scale required for project economic viability.

The wind farm layout has been informed through:

• extensive wind monitoring data and feasibility studies;
• environmental investigations;
• land suitability assessment;
• land owner requests; and
• community and stakeholder engagement processes.
As described in Section 4.2 above, there have been numerous iterations of the layout design because of these investigations and consultation.

Variations to this layout may result from:

- further public and agency consultations and submissions;
- refinements and minor variations following additional investigations during the detailed design phase, including geotechnical investigations;
- micro siting turbines up to 100 metres from the present location. or
- to address the conditions of any approval granted.

Any such variations will be addressed at the appropriate time, with the layout being finalised prior to development approval being issued.

4.4 WIND TURBINE GENERATORS

A maximum of 51 wind turbine generators (turbines) will be constructed as part of the proposal. The location of the wind turbine generators is shown on Figure 6 - Proposed Turbine Locations (Volume 3) and the locations of which detailed in Table 3.

**Table 3 Location of Wind Turbine Generators**

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* The missing turbine numbers 39 and 41 reflect a previously considered turbine location which has not been included in this layout.

The candidate turbine model selected for this development application is the Vestas V136 turbines with tip height of 180 metres.

A schematic illustration of the proposed wind turbine is shown below and in more detail in Figure 23 (Volume 3). The total height of each turbine to blade tip is a maximum of 180 metres. Each turbine will have a control system to each rotation to face the rotor into oncoming wind, and to adjust the pitch of the turbine blades. The turbines and supporting structures will be finished in a matte off-white colour.
FIGURE 23
TYPICAL FRONT AND SIDE ELEVATION OF A WIND TURBINE

SIDE VIEW  
FRONT VIEW  
PHOTOGRAPH OF TYPICAL TURBINE
Each of the 51 turbines will comprise several main component parts:

- Towers: each supporting structure will be a tapered steel structure with an approximate diameter of 5.0 metres at the base and 2.5 metres at the top;

- Footings: each tower will be located on a reinforced concrete footing with a diameter of up to 5.0 metres at the surface and 20 metres subsurface to a depth of up to 3.5 metres;

- Rotor and blades: each turbine will have three blades constructed of fibreglass, and attached to a steel rotor and shaft. The rotor will incorporate metallic conductors to conduct lightning strikes to earth; and

- Nacelle: each turbine will incorporate the ‘nacelle’, housing mounted at the top of each tower which encloses a gear box, generator, motors, brakes, electronic components, wiring and hydraulic and lubricating oil systems. The nacelle will be constructed of steel and fibreglass and will be approximately 13 metres long, 4.5 metres wide and 4.0 metres in height. The nacelle will also incorporate weather monitoring equipment.

4.5 Electrical Infrastructure

A series of underground and overground cables, switchgear and a substation are proposed to connect the Twin Creek Wind Farm and Energy Storage project with the national electricity grid. Connection to the existing 275kV Robertstown to Tungkillo transmission line will occur as a “t-connection” approximately 15 km south east of the onsite substation.

Considerable consultation with ElectraNet has been undertaken and the connection point is well suited to the network. Electranet have advised that do not see any constraints to connecting the wind farm to the network under reasonably foreseeable operating conditions. Alternatives were considered including connection to the Templars substation and surrounding 132kV network however these options were not suitable on account of existing grid capacity. A schematic drawing of the electrical substations for the project is shown in Figures 15 and 23 in Volume 3. Figure 18 (Volume 3) illustrates the proposed cable reticulation layout.

The following outlines the main components of the electrical infrastructure:

- the output from each turbine will be directed to 33kV underground cables, which link each turbine to a new proposed substation located in the south-eastern portion of the wind farm development area;

- the 33kV cables will generally follow upgraded and proposed access tracks within the site and have an approximate total length of 49km;

- a new onsite substation will provide a connection for the generated power to a 275kv transmission line;

- a new transmission line will be constructed to terminal substation which will tee-in to the existing 275kV transmission line approximately 15 kilometres to the south east of the onsite substation, adjacent the Sturt Highway east of Truro;
• a new terminal (tee-in) substation will provide connection of the 275kV transmission line into the Robertstown- Tungkillo 275kV transmission line and connected to the national electricity network; and

• 24 energy storage containers containing UL-listed batteries (or similar, depending on technology available at the time of final design).

The following is proposed:

• Local generator transformers, providing the connection between turbine and underground or 33 kV cables:

  - each turbine may incorporate a generator transformer within a 'padmount kiosk' adjacent to the hardstand area, painted in a low visibility green. Depending on the turbine selected, the generator transformer may be located internal to the nacelle and painted in a matte off-white;
  - depending on the supplier, each generator transformer is likely to be approximately 3.5 metres long, by 2.5 metres wide and 2.5 metres high; and
  - the transformers may be either oil-filled or dry, depending on the turbine equipment supplier. If oil-filled transformers are used, the volume of oil used for generator transformers is likely to be in the order of 2,000 litres, with appropriate metres for containment and spill protection utilised.

• Approximately 49 kilometres of underground 33kV cables, providing connections between each turbine and the substation:

  - the turbines are grouped according to location to generally provide the most direct and economical route between the turbines and the substation, and have been developed to minimise route length, according to slope and vegetation features;
  - generally cabling will be located alongside access tracks to minimise site disturbance; and
  - the underground trenches will also incorporate control cables for the monitoring and management of the turbines.

• Substation including switch room and control buildings of approximately 2.2 hectares. This area comprises:

  - 33kV switch room;
  - control building;
  - one permanent 275kV -33kV substation with approximate dimensions of 75 metres x 85 metres;
  - bunded area for storage of hazardous materials. Oil will be stored at the site for use in the transformers and associated components. Oil will be stored in concrete bunds, with an oil spill retention basin and an oil/water separator external to the concrete transformer bunds;
  - an earthen bund embankment will surround the substation area as a secondary containment measure;
  - 2.0 metre high chain mesh will be provided surrounding the perimeter of the substation site; and
low level security lighting will be installed, with additional flood lighting triggered by security sensors.

Buildings within the construction, operations and maintenance and energy storage compound have the following general features:

- buildings will either be slab on ground constructions with steel frames, metal or brick walls and a sheet steel roof, or demountable buildings;
- roof water will be captured in rainwater tanks for domestic purposes;
- a septic system will be installed to treat wastewater produced from the office building, subject to Council environmental health standards;
- the office building will house wind farm control instrumentation, electrical and communications equipment and staff amenities;
- the operations and maintenance building would accommodate equipment and stores, a small work area;
- a control building will contain 275kV switchyard control equipment and batteries; and
- a car park for all site staff, site vehicles and visitors.

4.4.1 Construction of Electrical Infrastructure

The trenching for the installation of approximately 49 kilometres of underground cables will involve the following:

- underground cables, comprising power and control cables will be buried in trenches of approximately 1.2- to 1.5 metres in depth and 0.28 to 0.55 metres in width
- excavation will be depending upon ground conditions, most likely undertaken by either a mobile trenching machine, a hydraulic rock breaker, and an excavator;
- wherever practical, trenches will be backfilled immediately upon cable installation in accordance with the Construction and Environmental Management Plan, with measures adopted to slow stormwater flows and to prevent the scouring of open trench or disturbed ground prior to revegetation;
- a temporary access track will be located alongside the trenches for access during construction for trenching and cable installation vehicles;
- marker tape and posts will be placed above buried cables in accordance with the relevant standards to indicate the presence of underground cables; and
- surplus excavated material will be distributed over the surrounding area and will be revegetated. Alternatively, it may be used in track construction.

4.5 TRANSPORTATION

The following provides an outline of the proposed works to enable access during construction and operational phases of the project. Access works comprise local road upgrades to enable transport of wind farm components, and new and upgraded on-site access tracks for both construction and operation.
A diagram of the proposed regional/local roads is provided in Figure 1 of AECOM Transport Impact Assessment report contained in Volume 2.

Figure 1  Recommended route for access to the proposed Twin Creek Wind Farm site
4.5.1 Regional Road Access for Construction Purposes

The following provides a brief description of the various components of the project and anticipated source:

• wind turbine generator components including the nacelle, blades and hubs are anticipated to be imported from overseas via the Port of Adelaide;

• depending on available suppliers, the wind turbine generator towers may be sources from various locations around Australia;

• depending on the selection of the suitable suppliers, electrical equipment may be sourced from various locations around Australia, however it is expected that the main transformers and energy battery containers will arrive via the Port of Adelaide; and

• local quarries will be utilised for stone and concrete aggregate.

Tables 6, 7 and 8 of the Transport Impact Assessment report provides an overview of the dimensions of the various components and to demonstrate the smallest vehicle (in PBS class) that may be used to transport the component and therefore the route along which that vehicle may travel. This analysis has informed the appropriate transport routes to the proposed site.

The Transport Impact Assessment indicates that all wind turbine and tower components fall into the over dimensional category and will therefore require individual permits and police escorts for transportation to the site. The limitations on over dimensional and over mass vehicles requires that 100% of all vehicles transporting the wind turbine components to the site use the Sturt Highway-Truro Road-Bagot Well Road route.

<table>
<thead>
<tr>
<th>Component</th>
<th>Height (m)</th>
<th>Length (m)</th>
<th>Width (m)</th>
<th>Weight (Tonnes)</th>
<th>Over Dimensional</th>
<th>Over Mass</th>
<th>Suitable PBS Level Access</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nacelle</td>
<td>3.4</td>
<td>12.8</td>
<td>4.2</td>
<td>70</td>
<td>Y (due to height and width)</td>
<td>Y</td>
<td>1A: single articulated vehicle of truck trailer combination</td>
</tr>
<tr>
<td>Hub</td>
<td>3.8</td>
<td>3.8</td>
<td>5.5</td>
<td>70</td>
<td>Y (due to height and width)</td>
<td>Y</td>
<td>1A: single articulated vehicle of truck trailer combination</td>
</tr>
<tr>
<td>Blades</td>
<td>4.1</td>
<td>66.7</td>
<td>-</td>
<td>5.5 – 6.5</td>
<td>Y</td>
<td>N</td>
<td>Exceeds PBS level 4 due to length</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Component</th>
<th>Min Diameter (m)</th>
<th>Max Diameter (m)</th>
<th>Length (m)</th>
<th>Weight (Tonnes)</th>
<th>Over Dimensional</th>
<th>Over Mass</th>
<th>Suitable PBS Level vehicle</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (Top)</td>
<td>2.0 – 2.5</td>
<td>3.0 – 3.5</td>
<td>20.0 – 25.0</td>
<td>25.0</td>
<td>Y</td>
<td>N</td>
<td>2A: B-double</td>
</tr>
<tr>
<td>2 (Middle)</td>
<td>3.0 – 3.5</td>
<td>3.5 – 4.0</td>
<td>20.0 – 25.0</td>
<td>40.0</td>
<td>Y</td>
<td>N</td>
<td>2A: B-double</td>
</tr>
<tr>
<td>3 (Middle)</td>
<td>3.0 – 3.5</td>
<td>3.5 – 4.0</td>
<td>20.0 – 25.0</td>
<td>40.0</td>
<td>Y</td>
<td>N</td>
<td>2A: B-double</td>
</tr>
<tr>
<td>4 (Middle)</td>
<td>3.0 – 3.5</td>
<td>3.5 – 4.0</td>
<td>20.0 – 25.0</td>
<td>40.0</td>
<td>Y</td>
<td>N</td>
<td>2A: B-double</td>
</tr>
<tr>
<td>5 (Bottom)</td>
<td>3.5 – 4.0</td>
<td>4.5 – 5.0</td>
<td>20.0 – 25.0</td>
<td>35.0</td>
<td>Y</td>
<td>N</td>
<td>2A: B-double</td>
</tr>
</tbody>
</table>
Table 3  Approximate weight and dimensions of substation transformer component

<table>
<thead>
<tr>
<th>Component</th>
<th>Height (m)</th>
<th>Length (m)</th>
<th>Width (m)</th>
<th>Weight (Tonnes)</th>
<th>Over Dimensional</th>
<th>Over Mass</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transformer 132/33kV</td>
<td>7.0</td>
<td>8.0</td>
<td>8.0</td>
<td>145.7</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Transformer 275/132 kV</td>
<td>7.5</td>
<td>9.0</td>
<td>5.5</td>
<td>TBC Slightly greater than 145.7t</td>
<td>Y</td>
<td>Y</td>
</tr>
</tbody>
</table>

AECOM estimate that there will be approximately 175,000 trips generated over the 18 month construction period, comprised of:
- 1,500 over dimensional and over mass trips;
- 34,000 truck trips; and
- 53,000 car trips.

Table 4  Estimated total trips generated by the proposed wind farm site

<table>
<thead>
<tr>
<th>Material</th>
<th>Estimated Quantity</th>
<th>Unit</th>
<th>Vehicle Type</th>
<th>Estimated One-Way Vehicle Trips</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete Materials</td>
<td>36000</td>
<td>cubic metres</td>
<td>Semi-trailers</td>
<td>Total trips: 3600 Average Trips/Month: 200 Average Trip/Day: 9</td>
</tr>
<tr>
<td>Reinforcing Steel</td>
<td>1800</td>
<td>Tonnes</td>
<td>Semi-trailers</td>
<td>Total trips: 180 Average Trips/Month: 10 Average Trip/Day: 0</td>
</tr>
<tr>
<td>Road base</td>
<td>252750</td>
<td>Tonnes</td>
<td>Semi-trailers</td>
<td>Total trips: 25275 Average Trips/Month: 1404 Average Trip/Day: 64</td>
</tr>
<tr>
<td>Miscellaneous Equipment and Materials</td>
<td>Nominal</td>
<td>-</td>
<td>Semi-trailers</td>
<td>Total trips: 200 Average Trips/Month: 11 Average Trip/Day: 1</td>
</tr>
<tr>
<td>Wind Turbine Components</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tower Sections</td>
<td>300</td>
<td>5 section/tower</td>
<td>Over size</td>
<td>Total trips: 600 Average Trips/Month: 33 Average Trip/Day: 2</td>
</tr>
<tr>
<td>Nacelles</td>
<td>120</td>
<td>2 section/nacelle</td>
<td>Over size</td>
<td>Total trips: 240 Average Trips/Month: 13 Average Trip/Day: 1</td>
</tr>
<tr>
<td>Hub</td>
<td>60</td>
<td>1 hub/turbine</td>
<td>Over size</td>
<td>Total trips: 120 Average Trips/Month: 7 Average Trip/Day: 0</td>
</tr>
<tr>
<td>Blades</td>
<td>180</td>
<td>3 blades/turbine</td>
<td>Over size</td>
<td>Total trips: 360 Average Trips/Month: 20 Average Trip/Day: 1</td>
</tr>
<tr>
<td>Substation Transformer</td>
<td>2</td>
<td>-</td>
<td>Over size</td>
<td>Total trips: 4 Average Trips/Month: 0 Average Trip/Day: 0</td>
</tr>
<tr>
<td>Switchgear and other substation equipment</td>
<td>Nominal</td>
<td>-</td>
<td>Semi-trailers</td>
<td>Total trips: 240 Average Trips/Month: 13 Average Trip/Day: 1</td>
</tr>
<tr>
<td>Site Work Activities</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cranes</td>
<td>0</td>
<td>-</td>
<td>Semi-trailers and mobile wheel based cranes</td>
<td>Total trips: 0 Average Trips/Month: 0 Average Trip/Day: 0</td>
</tr>
<tr>
<td>Employees</td>
<td>200</td>
<td>-</td>
<td>Cars/4WD</td>
<td>Total trips: 52800 Average Trips/Month: 2933 Average Trip/Day: 133</td>
</tr>
<tr>
<td>Construction Equipment, Plant and Components</td>
<td>1200</td>
<td>-</td>
<td>Various</td>
<td>Total trips: 2400 Average Trips/Month: 133 Average Trip/Day: 6</td>
</tr>
<tr>
<td>Total trips-Traffic Movements</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Over size/oversize vehicles</td>
<td>1,374</td>
<td>74</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Trucks</td>
<td>31,895</td>
<td>1,772</td>
<td>81</td>
<td></td>
</tr>
<tr>
<td>Cars</td>
<td>52,800</td>
<td>1,933</td>
<td>133</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>172,000</td>
<td>9,558</td>
<td>474</td>
<td></td>
</tr>
</tbody>
</table>
The preferred route for movement of components to the development site is from the Port of Adelaide, via the Port River Expressway, Port Wakefield Road, the Northern Expressway to Sturt Highway, Truro Road, Bagot Well Road, Camel Hill Road, Flagstaff Hill Road and Mosey Road to the site access.

4.5.2 Local Road Upgrades

Preliminary discussions have been held with the Light Regional Council, Regional Council of Goyder and Mid Murray Council regarding proposed access and utilisation and upgrading of local roads. RES Australia propose to enter into a Deed of Agreement with Light Regional Council and the Regional Council of Goyder in relation to local road upgrades (as required), concurrently with the assessment of the development application.

The Traffic Impact Assessment report by AECOM has identified intersections that present possible geometric and load constraints (Table 9 quoted below) for the largest of the wind farm components, that is, the turbine blade. The routes shown as Option 1 and 2 were investigated by AECOM. The findings were that the roads in Option 2 would require the greatest extent of modifications to private property at several locations the greatest of which is the intersection of Truro Road and Teagle Road. Subsequently option 1 is the preferred route, at this time. The final route would be subject to review following the selection of wind turbine components, as the dimensions of these components may allow some variation of the route.

<table>
<thead>
<tr>
<th>Option</th>
<th>Constraint location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Option 1 - Truro Road / Bagot Well Road / Camel Farm Road</td>
<td>Sturt Hwy / Truro Rd</td>
</tr>
<tr>
<td></td>
<td>Truro Rd / Bagot Well Rd</td>
</tr>
<tr>
<td></td>
<td>Bagot Well Rd / Camel Flat Rd</td>
</tr>
<tr>
<td></td>
<td>Camel Farm Road / Flagstaff Hill Rd</td>
</tr>
<tr>
<td>Option 2 - Truro Road / Teagle Road / Bagot Well Road / Weaver Road / Camel Farm Road</td>
<td>Sturt Hwy / Truro Rd</td>
</tr>
<tr>
<td></td>
<td>Truro Rd / Teagle Road</td>
</tr>
<tr>
<td></td>
<td>Teagle Road (various locations)</td>
</tr>
<tr>
<td></td>
<td>Teagle Road / Bagot Road</td>
</tr>
<tr>
<td></td>
<td>Weaver Road / Camel Farm Road</td>
</tr>
<tr>
<td></td>
<td>Camel Farm Road / Flagstaff Hill Rd</td>
</tr>
</tbody>
</table>

AECOM identify that in general, the road network is considered adequate for the transportation of over dimensional loads. Structural assessments will need to be carried out for over mass vehicles, particularly on local roads and over the bridge located on Truro Road. Preparation of a Traffic Management Plan would occur prior to construction.
4.5.3 On-site Access Tracks

Access tracks will be constructed to enable access to the wind turbine generators for the purposes of turbine construction and maintenance.

The width of access tracks will be approximately 9.0 metres to allow for the delivery of parts and materials to each of the turbine locations. Access tracks will be reduced to a width of 5.0 to 6.0 metres following construction. Those areas of land no longer required for access will be appropriately remediated to the state they existed prior to construction commencing.

The location of on-site access tracks are within the Infrastructure Zone shown on Figure 8 (Volume 3). The layout and design of the access tracks have considered the following:

- upgrades to existing tracks are proposed wherever possible;
- minimising total track length;
- landowner preferences;
- to enable the movement of oversize and heavy vehicles of up to 60 meters in length;
- low to moderate grades and curvatures suitable for the required vehicles (the maximum slope for roadways is typically 14 percent);
- general location along the ridge lines within the project area to enable access to groups of turbines; and
- reducing the need for vegetation clearance.

Construction will involve clearing and the construction of paths in accordance with the proposed traffic and site conditions. The final location of tracks will be subject to the Construction and Environmental Management Plan, and developed in conjunction with members of the project team, such as EBS Ecology and EBS Heritage, along with project contractors to ensure minimal impact on flora and fauna and sites of archaeological sensitivity.

4.5.4 Construction of On-Site Access Tracks

The forming of approximately 49 kilometres of upgrade and new access tracks with a width up to 9.0 metres during construction:

- this will include clearing, grading and removal of topsoil as required, and the compaction of gravel road base;
- the provision of drainage works in accordance with the Construction Environmental Management Plan;
- excavated topsoil will be stockpiled during construction, and later used in the rehabilitation of the site. Stockpiles to be managed in accordance with the Construction Environmental Management Plan;
• access tracks to be reduced to 5.5 to 7.0 metres in width and surrounding land restored, revegetated and/or returned to former grazing uses.

The sourcing of gravel and sand for access road construction:
• a borrow pit within the site of the development to source appropriate materials for internal tracks;
• concrete for the construction of roadways and turbine footings is likely to be sources from local quarries;
• the use of local materials via a borrow pit and local quarries will assist in minimising the transport distance;
• road base material may also be extracted from the removal of material from turbine footing locations;
• the contractor will review options for sourcing gravel for track construction and if any extraction of gravel is proposed then appropriate approvals will be sought, both from legislative approvals and approval from the landowner; and
• any material brought to the site will be assessed against the provisions of the Construction Environmental Management Plan to reduce the risk of weed introduction.

4.5 WATER PROVISION

Water will be required for construction, including for wetting exposed soils during stockpiling to reduce the risk of erosion and dust movement. Water will be sourced by the construction contractor, which may incorporate on site bores or carting and storing water on site. Any bores required would be licensed in accordance with legislative requirements.

Water associated with the staff facilities during construction and once operational would be via rainwater storage tanks and utilise roof drainage.

An approved septic system will be installed to treat small quantities of wastewater produced from staff amenities.

4.6 WIND MONITORING MASTS

Currently the site contains one 60m wind monitoring mast installed within the project for investigations purposes. This mast will be removed prior to construction of the wind turbine generators. Two new meteorological masts will be erected to provide ongoing meteorological investigations and power curve verification. The locations of the existing wind monitoring mast and proposed masts are identified on the, Figure 3, Site and Context Analysis Plan (Volume 3).

The construction of the wind monitoring masts will involve the construction of concrete footings, erection of the mast with supporting guy wires, and the installation of monitoring equipment. Figure 28 (Volume 3) illustrates a typical mast.
4.7 TEMPORARY CONSTRUCTION FACILITIES

Construction of the wind farm will take approximately 18 months to two years, with in the vicinity of 350 people being on site at the peak of the construction period.

Specific elements of the project which will be evident during the construction phase of the project include the following:

• temporary construction compounds, which comprise:
  - several demountable buildings used for office, workshop and storage purposes, an amenities block, and portable toilet facilities will be located at the project area during construction;
  - arrangements will be made for power and communications at the site office during the construction period;
  - on site car parking and
  - a cleared flat area to provide for the storage of various items during construction.

The location of the temporary construction compounds is indicated on the Figure 8 – Infrastructure (Volume 3). A schematic diagram of the temporary or satellite construction compounds is provided in Figure 13 (Volume 3).

One of the four temporary construction compounds is proposed to accommodate a temporary mobile concrete batching plant and will be utilised to produce the concrete required for the project. This would be accommodated within a site of approximately 1.3 hectares and comprise the mobile concrete batching plant would operate during the 18 months to 2 years’ construction period. All temporary construction facilities will be removed and the land restored and rehabilitated once construction has been completed. This will include the following:

• the removal of temporary facilities, wastes and surplus materials from the site;
• removal and restoration of any temporary construction tracks and ongoing maintenance of any land stabilisation required;
• revegetation of disturbed areas in consultation with the land owners to return the land to the condition prior to construction (in most cases this will include re-seeding and restoration for agricultural production) to prevent site erosion and sedimentation;
• the rehabilitation of areas where underground cables have been installed; and
• management of weeds in the disturbed areas.

4.8 CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLANS

A Construction Environmental Management Plan (CEMP) incorporate the necessary environmental controls during both construction and operation to address any potential identified risks in the assessment of the development. A draft CEMP has been prepared and is contained in Volume 4 of this application.
The CEMP covers the following aspects, in accordance with the findings of the investigative studies undertaken in the preparation of this application:

- construction traffic management;
- location and extent of site earthworks;
- soil and water management;
- emissions including dust and noise control;
- fuel storage and handling;
- waste storage, handling and disposal;
- bush fire prevention;
- coordination with property owners and effects on stock;
- weed control and site restoration;
- management of any quarrying activities (if relevant); and
- management of any mobile concrete batching plant.

A final version of the CEMP and additional management plans will be prepared during the detailed construction phase of the project and provided to the planning authority prior to Development Approval being issued.

4.9 OPERATIONAL WIND FARM

The wind turbines convert wind energy into electrical energy on an automatic basis. The rotation of the blades by wind, causes the rotation of the turbine rotor which is connected via a gearbox to a generator.

Wind turbine operation will commence at a wind speed of approximately 3.0 metres per second (~11km kilometres per hour) and de-rate or stop at ~23 metres per second (82 kilometres per hour). The turbines will have a maximum rotation speed to 14 to 18 revolutions per minute, causing a rotation of 360 degrees approximately every 4.2 seconds.

Once commissioned, the wind farm will operate with a moderate on-site work force at the operations and maintenance compound of approximately six to ten staff, employed for inspection and maintenance purposes. Additional visits by other technical staff will be made where assistance is required. Once commissioned, the wind farm will be able to operate whenever wind speeds allow for generation.
4.10 DECOMMISSIONING OR REPLACEMENT

At the end of its economic life, all equipment will either be replaced with comparable new equipment, or the wind farm will be decommissioned.

New approvals would be sought, if or as required, at the time of replacement of components.

Decommissioning would generally involve dismantling or removal of all above ground equipment and any cables or other infrastructure buried to a depth of up to 1m below ground surface, and land will be rehabilitated. Access tracks may be retained depending on the landowners' wishes. Any overhead wires no longer required will be removed.

A decommissioning plan would be prepared and submitted to the relevant planning authority for approval, if/as required, prior to decommissioning commencing. The proponent is responsible for the decommissioning of the wind farm and energy storage facility. Every associated land owner of the Twin Creek Wind Farm has this clause in their lease. This is a legally binding obligation that will be tied to the land regardless if the parties of the lease alter over time.
CHAPTER 5 – CONSULTATION
CHAPTER 5 – CONSULTATION

RES Australia is aware of the necessity for an effective and genuine consultation process, in which the community and stakeholders are actively engaged. It is important for sufficient information to be provided to ensure community members are aware of all factors of the development, and where opportunity is provided to make representations enabling community members to make fully informed comment.

RES engaged GHD Consultants to prepare a Stakeholder and Community Engagement Strategy (SCES) to provide structure and rigour to communications throughout the planning phase of the Twin Creek Wind Farm Project to the lodgement of the development application. A summary report of the consultation undertaken is contained in the GHD Twin Creek Wind Farm Consultation Outcomes Report, which is contained within Volume 2 of the application.

RES have undertaken an engagement approach that is personal and has focused on consultation and engagement with the landowners, the neighbours and the local communities potentially impacted. Such an approach over a period of time will enable a deeper level of stakeholder and community knowledge regarding the wind farm and greater awareness of the processes to which RES is committed in order to mitigate or manage potential impacts. Through this process greater trust between the community and the project team has been developed and RES are seeking to develop a level of tolerance and potentially acceptance for the project.

The focus of communications during the planning phase of the project has been to seek input from the community about the proposed development in particular what they value about their community, and adequately respond to and address the community’s concerns in a timely manner. The methods of community engagement have included:

• mail outs: to host landowners, adjacent and broader and participating land owners informed of investigations and the application process;

• Community Open Days: two separate community open days were held, one in October 2016 and the second in April 2017. On each occasion the sessions were held at Kapunda, Eudunda and Truro;

• meeting and briefings held with Light Regional Council, Regional Council of Goyder and Mid Murray Councils on various occasions by members of the project team;

• personal communication: meetings, emails and phone discussions with landowners, community members, broader residents and anyone who had a general interest in the project;

• meetings and briefings with various Government Agencies by members of the project team; and

• Website: RES have a website which specifically relates to the project. The website http://www.twincreek-windfarm.com/ contains information relating to the project and an enquiry system for members of the public to communicate with the project team.
As a result of the consultation and engagement with the community, there have been variations to the layout of the wind farm and relocation of turbines in direct response to concerns raised from adjoining neighbours (as outlined in Section 4.2).
6.0 INTRODUCTION

This chapter provides a summary of the investigations and assessment of the Twin Creek Wind Farm undertaken by members of the project team.

A variety of investigations have been undertaken and assessment reports prepared to examine the existing conditions, the likely impacts of the proposal, and mitigation and management mitigation measures proposed. These technical assessments have included noise impact, visual impact (including shadow flicker and blade glint), flora and fauna (including avifauna), Aboriginal and European heritage, traffic and transport, land use, hazards (including bushfire, aviation and physical safety), water resources and site drainage, soils and geology, and the social and economic impact of the project.

Copies of the full technical reports are contained in Volume 2 of this application.

6.1 FLORA AND FAUNA ASSESSMENT

EBS Ecology (EBS) was engaged by RES Australia to assess the potential flora and fauna constraints for the proposed Twin Creek Wind Farm and Energy Storage facility. The following is a summary and extracts of the investigations, findings and recommendations made by EBS. The complete “Twin Creek Wind Farm Flora and Fauna Assessment” report dated 28 June 2017” is contained within Volume 2 of the application documents.

6.1.1 Investigations Undertaken

Investigations, findings and recommendations of EBS have informed the design, siting and layout of infrastructure for both the principal wind farm infrastructure area (wind turbine generators and associated infrastructure) as well as the transmission line.
**EBS Ecology have undertaken the following surveys:**

<table>
<thead>
<tr>
<th>Survey type</th>
<th>Date</th>
<th>Season</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flora and fauna assessment</td>
<td>8-11 September 2015</td>
<td>Spring</td>
<td>General assessment and condition rating of vegetation, bird, bat and PBTL assessment</td>
</tr>
<tr>
<td>Targeted Lomandra assessment</td>
<td>8 October 2015</td>
<td>Spring</td>
<td>Assess whether Lomandra Grasslands qualified as a TEC</td>
</tr>
<tr>
<td>Avifauna survey</td>
<td>3-5 February 2016</td>
<td>Summer</td>
<td>Revisit bird count surveys established in spring 2015</td>
</tr>
<tr>
<td>Avifauna survey</td>
<td>18-20 April 2016</td>
<td>Autumn</td>
<td>Revisit bird count surveys established in spring 2015</td>
</tr>
<tr>
<td>Avifauna survey</td>
<td>26-28 August 2016</td>
<td>Winter</td>
<td>Revisit bird count surveys established in spring 2015 and undertake nest checks</td>
</tr>
<tr>
<td>Targeted PBTL survey and Bat survey</td>
<td>22 Feb – 4 March 2016</td>
<td>Summer/Autumn</td>
<td>Detailed assessment of PBTL habitat and occupation across the site. Anabat survey repeated from September 2015 survey due to poor weather conditions</td>
</tr>
<tr>
<td>Additional PBTL survey</td>
<td>5, 8 and 14 April 2016</td>
<td>Autumn</td>
<td>Investigate additional routes within areas of likely habitat</td>
</tr>
<tr>
<td>Additional PBTL survey</td>
<td>31 Oct – 11 Nov 2016</td>
<td>Spring</td>
<td>Targeted areas and additional infrastructure</td>
</tr>
<tr>
<td>Additional PBTL survey</td>
<td>22 Nov – 25 Nov 2016</td>
<td>Spring</td>
<td>Targeted areas and additional infrastructure</td>
</tr>
<tr>
<td>Vegetation Assessment</td>
<td>23, 24, 29, 30 Nov and 1 Dec 2016</td>
<td>Summer</td>
<td>Vegetation assessment of additional turbine, solar farm, substation and transmission line</td>
</tr>
<tr>
<td>Additional PBTL survey</td>
<td>6-9 December 2016</td>
<td>Summer</td>
<td>Targeted areas and additional infrastructure</td>
</tr>
<tr>
<td>Additional PBTL survey</td>
<td>9 Jan – 13 Jan 2017</td>
<td>Summer</td>
<td>Targeted areas and additional infrastructure</td>
</tr>
<tr>
<td>Vegetation Assessment</td>
<td>5 April 2017</td>
<td>Autumn</td>
<td>Vegetation assessment of 2nd substation and potential shift of transmission line easement</td>
</tr>
</tbody>
</table>

The surveys were in addition to extensive desktop assessment of a variety of sources.
All data from these assessments have informed the final design as now submitted for Development Plan Consent, to mitigate against potential impact on flora and fauna including threatened species, particularly the Pygmy Blue-Tongue Lizard (PBTL).

### 6.1.2 Vegetation Associations and Identified Flora and Fauna

EBS recorded eight vegetation associations with the site of the development (with a Significant Environmental Benefit (SEB) condition range of 0:1 to 6:1). These vegetation associations are described in Table 18 of the EBS report as follows:

#### Overall summary of vegetation associations

<table>
<thead>
<tr>
<th>Vegetation association</th>
<th>Area</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lomandra effusa + Austrostipa sp. grasslands</td>
<td>196.2ha</td>
<td>1:1-6:1</td>
</tr>
<tr>
<td>Austrostipa sp. grassland</td>
<td>1751.7ha</td>
<td>1:1-5:1</td>
</tr>
<tr>
<td>Planted species</td>
<td>21.8ha</td>
<td>0:1</td>
</tr>
<tr>
<td>Eucalyptus leucoxylon +/- Eucalyptus porosa +/- Callitris gracilis open woodland</td>
<td>64.7ha</td>
<td>2:1-6:1</td>
</tr>
<tr>
<td>Juncus spp. (Rush) and Juncus pallidus (Pale rush) Sedgeland +/- Phragmites australis(Common Reed)</td>
<td>52.1ha</td>
<td>3:1</td>
</tr>
<tr>
<td>Cropping</td>
<td>1388.8ha</td>
<td>0:1</td>
</tr>
<tr>
<td>Eucalyptus porosa +/ - Eucalyptus odorata +/- Eucalyptus gracilis open woodland</td>
<td>2.4ha</td>
<td>4:1</td>
</tr>
<tr>
<td>Pasture grassland / exotic grassland</td>
<td>868.2781ha</td>
<td>0:1-1:1</td>
</tr>
<tr>
<td>Eucalyptus odorata +/- Eucalyptus porosa closed woodland over grassy understorey</td>
<td>6.8ha</td>
<td>4:1</td>
</tr>
<tr>
<td>Eucalyptus camaldulensis ssp. camaldulensis +/- Eucalyptus leucoxylon Closed Tall Shrubland over Austrostipa sp. (Spear-grass) near creeklines</td>
<td>2.3ha</td>
<td>6:1</td>
</tr>
<tr>
<td>Eucalyptus leucoxylon Tall Open Woodland over shrubby understorey</td>
<td>3.6ha</td>
<td>5:1-6:1</td>
</tr>
</tbody>
</table>
During the 2015 field survey 59 native fauna species were recorded, including two amphibians, five reptile species, 3 mammals, 42 birds (6 exotic) and 7 bats (all native). One amphibian and two bird species of national or state conservation significance were identified:

- Pygmy Blue-tongue Lizard (*Tiliqua adelaidensis*) nationally endangered;
- Rainbow Bee-eater (*Merops ornatus*) nationally migratory, and
- Blue-winged Parrot (*Neophema chrysostoma*) State vulnerable.

Three Wedge-tailed Eagle nests we rerecorded within a *Eucalyptus leucoxylon* ssp. woodland area situated just outside of the “development area” but within the site of the development. Other native fauna species recorded during the spring 2015 included seven bat species.

Remnant vegetation has been mapped for South Australia (SA) by the Department of Environment, Water and Natural Resources (DEWNR) based on interpretation of aerial photography or Landsat imagery and floristic data. The following native vegetation communities are mapped for SA within the proposed Twin Creek Wind Farm and Energy Storage development site:

- *Acacia paradoxa* shrubland;
- *Allocasuarina verticillata* woodland;
- *Austrostipa* sp. grassland;
- *Eucalyptus gracilis* mallee woodland;
- *Eucalyptus leucoxylon* ssp. woodland;
- *Eucalyptus odorata* woodland;
- *Lomandra effusa* (mixed) grassland;
- *Lomandra* sp. sedgeland and
- *Phragmites australis, Typha domingensis* grassland.
6.1.3 Threatened Ecological Communities

The EBS report describes that the conservation status of flora and fauna species at three geographic scales:

- national (Environment Protection and Biodiversity Conservation Act 1999 - EPBC Act),
- state (National Parks and Wildlife Act 1972 - NPW Act); and
- regional (Gillam 2009).

Threatened ecological communities are recognised under the Environment Protection and Biodiversity Conservation (EPBC Act). There are no formal ratings for threatened ecological communities under the NPW Act. The EBS report acknowledges informal state and regional ratings, but concentrates on ratings recognised under legislation.

Two nationally threatened ecological communities, listed under the EPBC Act 1999 were investigated and assessed for qualification within the project boundary. The listed ecological communities being:

- Iron-grass (*Lomandra spp*). Natural Temperate Grassland of South Australia; and
- Peppermint Box (*Eucalyptus odorata*) Grassy Woodland of South Australia.

Iron-grass Natural Temperate Grassland of South Australia are unique to South Australia, with their main distribution on the slopes and hills of the Mount Lofty Ranges, west of the River Murray and throughout the Mid North. The community generally occurs on gentle slopes of low hills above 380 metres above sea level. Major threats to this community include clearance and fragmentation, inappropriate grazing regimes, and weed invasion (DEWR 2007).

The Iron-grass Grasslands is a grassland dominated by iron-grasses (*Lomandra multiflora* ssp. *dura* and/or *Lomandra effusa*), with tussock-forming (clumping) grasses, low shrubs and a range of other native plants in the ground layer. Trees and tall shrubs are generally absent or very sparse (less than 10 % cover). To qualify as the EPBC listed community, patches must be at least 0.1 ha in size and meet native species diversity and density criteria (see DEWR 2007).

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2 Regional conservation ratings are informal and whilst they are not recognised under legislation, they give a better understanding of the status and trend of a species within the local area, and hence the potential impact of proposed developments.
21 sites were assessed within the Lomandra Grasslands across the development site, to confirm whether they qualified as the nationally listed threatened ecological community. One of the 21 sites assessed for the terminal substation qualified as EPBC listed. The terminal substation has been designed to avoid high value Lomandra Grassland. None of the other sites qualified as a threatened ecological community. Thirteen of the Lomandra sites come under Condition class C, which are considered degraded patches amenable to rehabilitation.

The Peppermint Box (*Eucalyptus odorata*) Grassy Woodland of South Australia community was listed as critically endangered under the EPBC Act in 2007, due to a severe decline in distribution and an ongoing loss of integrity. The ecological community is dominated by *Eucalyptus odorata*, however other species of Eucalypt commonly co-occur. A grassy understorey is most often present, although some shrubs may exist such as *Bursaria spinosa* (Sweet Bursaria) and *Acacia pycnantha* (Golden Wattle). The majority of remnants occur between Victor Harbour and Port Augusta, encompassing the mid-north region, as well as the Adelaide region, Mount Lofty Ranges and part of Yorke Peninsula. The key threats to this community are clearing, grazing and invasion by weeds (DEWR 2007).

The site of the development was assessed for any Peppermint Box that may qualify against the criteria outlined in *EPBC Act Policy Statement 3.7, Nationally Threatened Species and Ecological Communities, Peppermint Box (Eucalyptus odorata) Grassy Woodland of South Australia and Iron-grass Natural Temperate Grassland of South Australia*. A patch of Peppermint Box was identified within the principle wind farm infrastructure area, during the 2015 survey. It wasn’t dominated by *Eucalyptus odorata*; it was a large mix of *E. odorata*, *E. porosa* and *E. gracilis*, and therefore did not qualify. Patches of woodland dominated by Peppermint Box were observed during late spring/early summer 2016 survey, whilst surveying additional areas including the proposed transmission line. An assessment against the criteria found them to be Class C which is not listed under the EPBC Act but is ‘amenable to rehabilitation’). Based on the current proposal the final clearance impact in Peppermint Box Woodland is expected to be small (insignificant), fitting with minimum requirements under powerlines and should not require an EPBC referral (subject to spring survey and final design).

6.1.4 Threatened Flora Species

A total of 86 native flora species and 74 exotic flora species were recorded within the project boundary. There was no conservation rated flora species identified within vegetation assessments completed during the September 2015 and November 2016 surveys within the proposed Twin Creek Wind Farm project area.

6.1.5 Threatened Fauna Species

The habitats present within the project area were assessed for the nationally endangered Pygmy Blue-tongue Lizard (PBTL) (*Tiliqua adelaidensis*) and nationally vulnerable Flinders Ranges Worm-lizard (*Aprasia pseudopulchella*). Other than these two species, none of the reptile species recorded within the project area have a conservation rating and can be classed as common in suitable habitats.

The Flinders Worm-lizard is endemic to South Australia but were not detected during the September spring 2015 survey.
6.1.5.1 Pygmy Blue-tongue Lizard

The Pygmy Blue-tongue Lizard is the smallest member of the genus Tiliqua, which consists of seven terrestrial lizard species commonly known as Blue-tongues. The Pygmy Blue-tongue Lizard is a moderate sized skink which has a total length of less than 20 cm. Pygmy Blue-tongue Lizards use un-occupied spider burrows as refuges and the entrance holes are circular in cross section, up to 20 mm in diameter, and lack any sign of excavated soil at the entrances. The Pygmy Blue-tongue Lizard is a largely sedentary species, with most adults moving no greater than 20 m from their burrows (Milne et al. 2003).

The Pygmy Blue-tongue Lizard is endemic to South Australia. Very little information exists on the past distribution of the species, with the few known localities extending from the Adelaide Plains to the North Mount Lofty Ranges (Duffy et al. 2009).

EBS undertook targeted Pygmy Blue-tongue Lizard (PBTL) surveys during the 22 February – 4 March 2016 survey and again in April 2016 (5th, 8th and 14th April). Surveys in summer 2016/2017 were undertaken in relation to the proposed transmission line corridor. These surveys followed the spring 2015 survey which categorised habitat for the entire wind farm development area. The habitat and potential presence of PBTL was assessed during the spring 2015 survey and categorised as: likely, possible or not likely.

A large proportion of the project area is considered possible or likely habitat for the PBTL due to the open grasslands, slopes and spider holes observed across the site. Areas considered unlikely to contain PBTLs are cropping, very steep, very rocky or areas with no evidence of spider holes. Table 10 of the EBS report shown below summarises the known suitable habitat for the PBTL.³

³ References


Table 10. Categorisation of habitat suitability

<table>
<thead>
<tr>
<th>Attributes considered suitable habitat</th>
<th>Attributes considered unsuitable habitat</th>
</tr>
</thead>
</table>
| Spider burrows within native or exotic grasslands; PBTs have also been detected in highly modified treeless grasslands.  
• Soil of heavy sandy loam (red-brown earth).  
• Foot slopes of hills.  
• Sheltered areas of foot slopes. | Areas that have been previously cropped.  
Areas lacking spider burrows.  
Areas containing dense ground cover vegetation.  
Steep terrain and exposed rocky ridgelines.  
Overly rocky areas. |

The southern property has optimal habitat for the species, gentle sloping rolling hills with plenty of spider holes. The northern section of the infrastructure area still has PBTLs present; however, they are typically in lower densities of numbers where infrastructure is proposed.

The potential impacts of a wind farm development within the project area on PBTL individuals or populations may include the following:

**Short-term**

- Potential direct loss of individuals through habitat clearance during construction.
- Sedimentation of burrows from construction run-off (soil).
- Noise and vibration disturbance during construction.

**Long-term**

- Potential loss of habitat.
- Division and isolation of populations by vehicular access tracks.
- Sedimentation of burrows from run-off from access tracks.
- Potential disturbance to populations in close proximity to turbines from blade shadow flicker.
6.1.5.2 Mitigation of Impacts on Pygmy Blue-tongue Lizard

Measures which EBS Ecology recommend to mitigate the impact of the proposed development on the PBTL include:

- areas which are suitable to PBTL, should be avoided. All known locations within possible habitat will need to micro-sited prior to construction to mitigate impact;
- utilising cropping areas as much as possible for wind turbine generators, infrastructure areas and access tracks;
- micro-site where possible around proposed infrastructure including the transmission line;
- an EPBC referral will be submitted as part of this proposed development. A translocation of PBTL from areas of less suitability is being recommended to increase the number of turbines being installed and reduce potential impacts on PBTL; and
- ongoing monitoring of PBTL populations within the project boundary is recommended to detect future impacts on the species.

6.1.6 Birds

EBS observed the following bird species during the three surveys within the project area:

- spring 2015 survey - 1,448 individuals from 48 bird species;
- summer 2016 survey - 1,255 individuals from 24 bird species;
- autumn 2016 survey - 751 individuals from 30 bird species; and
- winter 2016 survey – 743 individuals from 30 bird species.

One species with an EPBC migratory rating, the Rainbow Bee-eater (*Merops ornatus*) and a single species with a state conservation rating of rare, the Blue-winged Parrot (*Neophema chrysostoma*), were observed during the spring 2015 survey. No species of conservation significance were observed during the summer, autumn or winter 2016 surveys.

The Rainbow Bee-eater is listed as migratory under the EPBC Act and a highly mobile species with the ability to undertake long distance movements. It is distributed across much of mainland Australia and will migrate into southern Australia during spring into summer. The Rainbow Bee-eater is predictably a seasonal visitor to the project area, it is considered unlikely regional populations would be impacted upon by the proposed wind farm. Flight height and behaviour is generally unknown for this species to be able to make further conclusions.
The State rated Blue-winged Parrot is partly nomadic and may be encountered in the company of the Elegant Parrot. They are locally nomadic, preferring heathland and open country, open woodland, cropland and semiarid scrub. They feed on the seeds of native and introduced grasses as well as shrubs and herbaceous plants. Blue-winged Parrots nest in the cavities of small trees. EBS recommend that woodland areas with tree hollows be avoided during the construction of the wind farm and existing tracks be used where possible, rather than creating new tracks through pasture grass sites and cropland.

Two records of the Peregrine Falcon are situated outside of the Twin Creek Wind Farm project boundary (to the west), with the latest record from the Biological Database of South Australia dated 2002. No nest locations or individual Peregrine Falcon observations were recorded during any of the seasonal surveys.

A total of three potential Wedge-tailed Eagle nests were located across the proposed Twin Creek Wind Farm site during the spring 2015 survey. These nests are typically found within wooded areas; wooded areas were scarcely scattered across the site. The three nests were situated within *Eucalyptus leucoxylon* open woodland (Association 4).

One out of the three nests recorded was active during the September 2015 and winter 2016 survey; the August 2016 survey recorded a Wedge-tailed Eagle sitting on Nest 3 however, neither eggs nor young were discernable at the time. All three nest locations area situated outside of the area containing wind turbine generators and ancillary infrastructure, however they are within the site of the development. The nests are shown on Figure 3 – Site and Design Analysis Plan, which is contained within Volume 3.

Nests 1 and 2 were situated within 100m of each other. A single adult was observed flying from Nest 3 and an additional pair of Wedge-tailed Eagles were flushed when entering the area whilst undertaking the bird survey in September 2015. The pair was observed flying on thermal's approximately 600m from the point count area (where the nests were recorded), 300m above ground. Breeding pairs often switch between multiple nest sites within their territory from one year to the next.

A range of direct and indirect impacts of wind farms on birds are recognised with mortality via direct collision with turbines being an obvious impact. Other impacts include displacement due to habitat loss and various types of disturbance effects, although there is little available data on the disturbance effects of wind farm developments on birds in Australia.

EBS discuss the potential impacts of the wind farm development on birds and raptors in Sections 6.3 and 6.4, which states:

*Suitable buffers need to be considered in the planning process in order to reduce the likelihood of impacts on birds in the area. Buffers are primarily aimed at reducing the disturbance to the birds during breeding and when juveniles are near fledging. Raptor species such as the Wedge-tailed Eagle and the Peregrine Falcon are considered significant when assessing bird interactions with wind farms as they conduct regular flights at heights coinciding with turbine rotor swept areas (where turbine blades operate).*
The benefit of a buffer around nests is as follows:

- buffers are generally focused around areas of high activity; these are where either species may potentially nest;
- during the construction of the proposed wind farm, raptor species are more likely to be at risk of disturbance from activities conducted within close proximity to nest locations. By implementing a buffer, this would contribute to decreasing disturbance levels to these species;
- Wedge-tailed Eagle and Peregrine Falcons are territorial and typically return to the same area to nest each year. By placing a buffer distance around the nest location, this would assist with lessoning disturbance levels to this species; and
- juveniles are particularly susceptible to collision, as newly fledged chicks have not learnt how to forage on their own nor avoid structures such as turbines. Buffers around nest sites will assist in decreasing the chance of a juvenile eagle or falcon colliding with a turbine.

EBS Ecology have recommended that any wind turbine generator should be at least 500 m from a known Wedge-tailed Eagle nest, to reduce likelihood of impact. A general buffer of 200 m between turbines and woodland habitat is also recommended. The design response and inclusion of buffers is illustrated on Figure 9 – Design Response located with Volume 3.

6.1.7 Bats

The AnaBat surveys confirmed the presence of seven bat species within the project area:

- White-striped Free tail-bat (*Austronomus australis*)
- Gould's Wattled Bat (*Chalinolobus gouldii*)
- Chocolate Wattled Bat (*Chalinolobus morio*)
- Southern Free tail-bat (*Mormopterus species 4 “big dick”*)
- Lesser Long-eared Bat (*Nyctophilus geoffroyi*)
- Large Forest Bat (*Vespadelus darlingtoni*) and
- Southern Forest Bat (*Vespadelus regulus*).

The bat species detected onsite are thought to be common throughout the region with the majority of bats recorded, being within the vicinity of habitat features such as woodlands and open water. None of the recorded bat species have a conservation rating.

EBS notes that the site is subject to a relatively low level of bat activity and this may also be due to the fact the majority of the project area is void of suitable habitat for bats. The EBS report discusses the potential impact of the wind farm on bat species in Section 5.3.9 and notes that adopting buffers between turbines and avoiding identified bat habitat features minimises potential impacts on bat species on the development site.
6.2 VISUAL IMPACT ASSESSMENT

Wax Design and Dr Brett Grimm, referred to in this summary as Wax were engaged by RES Australia to assess the potential visual impact of the proposed Twin Creek Wind Farm project. A copy of the “Landscape Character and Probable Visual Effect Assessment” dated 29 June 2017 is contained within Volume 2 of the application documents. The following summary describes the landscape character, the visual impact of the proposed development from various viewpoints and the likely effect on the physical landscape.

6.2.1 Methodology

The Landscape and Visual Impact Assessment (LVIA) undertaken by Wax comprises of two separate assessments, firstly a landscape character assessment and secondly a visual impact assessment. The landscape character assessment described in the report considers the existing character of the landscape and the site locality. The potential visual impact was assessed using the Grimke matrix methodology (described in detail in the report) and involves onsite assessments, GIS modelling, consultation with relevant stakeholders and interested parties, the preparation of photomontages and a detailed visual impact assessment to illustrate the predicted visual effect of the project within the defined locality.

Wax discuss the “site locality” as the areas around the project from which the wind turbines and associated infrastructure are likely to be visible in the landscape. The report notes that a 20 kilometre site location around the project was defined for assessment purposes. The landscape character assessment and mapping within the report discusses existing character in relation to the local (0-3km), sub-regional (3-10km) and regional (>10km).

Wax also reviewed the extent of the site locality with the Zone of Theoretical Visual Influence (ZTVI) mapping, which provides a reference of the extent or the likely degree of visibility of the project in accordance to topography (excluding vegetation and built form screening). Utilising the ZTVI and following ground truthing and consultation with stakeholders and the public, a total of 7 viewpoints were selected around the locality of the site (wind farm development area, from which a detailed visual assessment of the potential visual effect was made. Each viewpoint represents a typical location where the greatest probable degree of visual change that will be experienced as a result of the proposed development within the existing landscape.

Figure 15 illustrates the selected viewpoints and the local, sub-regional and regional areas around the proposed wind turbine generators.
Figure 15: Viewpoint locations and Wind Turbine numbers
6.2.2 Landscape Character

Section 3.1 of the LVIA report (contained in Volume 2) describes the locality as having five distinct landscape character areas which largely follow the four cardinal directions (north, east, south and west).

To the south of the subject land is the Northern Barossa Valley, which has a denser level of development and high quality agricultural landscape with a variety of visual interest created by the smaller lot sizes and variety of land uses (grazing, vineyards, animal husbandry). The Western Pastoral Lands and Ridgelines stretch along the western edge of the subject land and is defined by a more open agricultural landscape with rolling ridgelines. The site of the proposed wind turbine generators and to the north are the Central Tablelands, these are characterised by rolling land forms and valleys associated with the Northern Mount Lofty Ranges and have a typically open grass grazing land use with minimal vegetation. To the east of the subject land is Mount Rufus and associated north/south ridgelines which transition further west into the Western Murray River Plains, the ridgeline associated with Mount Rufus forms a distinct division between the subject land and the Murray River Plains.

Wax notes that “within this visually contained existing landscape character, the layout of the Twin Creek Wind Farm forms a single compact group of 51 wind turbines” (page 53). Further detailed assessment of five identified landscape character units within the regional landscape are further described in Section 3.4 of the report and shown in Figure 7 (as below).
6.2.3 Visual Impact Assessment

Section 5.9 of the LVIA report, provides the following discussion and summary of the potential visual impact of the wind farm and associated infrastructure.

The layout of the proposed wind turbines will result in a single cluster of large infrastructure elements that form a concentrated visual effect in the rural landscape. Travelling through the landscape, the underlying topography of the surrounding ranges modifies views towards the proposed wind farm. The visibility of the proposed development changes due to the screening effects provided by the adjacent hills and ridgelines or areas of existing vegetation.

The visual assessment undertaken from the seven selected viewpoints demonstrates that a variety of visual impacts will be experienced within the local (0-3km), sub-regional (3-10km) and regional (>10km) landscapes that surround the proposed wind farm site. To the north and south and from distance of greater than five kilometres the visual effect associated with the proposed development will result in wind turbines being seen behind local ridgelines and landforms. In these locations, the potential visual effect will result from visible sections of the hub and blades above the local topography and vegetation.

The potential visual effect reduces over distance with the visual assessment recording the visual effect as slight at a distance more than ten kilometres, particularly to the northeast. This reflects the different landscape characters around the proposed development site and the significant landscape absorption and screening of the ridgelines and vegetation created by the local topography of the areas.

To the south, the distance between the proposed wind farm and the Barossa Valley provides significant management of the visual effect limiting the potential impact that the proposed wind farm may have on the Barossa Valley Character Preservation Zone and the associated areas of higher landscape amenity and cultural value.

Viewed from the east and west the proposed wind turbines will be seen situated on the elevated topography of the Central Tablelands. The scale of the proposed development in relation to the vertical scale of the underlined landscape is prominent due to number of visible wind turbines and the prominence of the tower, nacelle and blades in the landscape. Within five kilometres of the proposed wind farm, the screening provided by local ridgelines and vegetation belts is limited, and the majority of the wind farm is experienced as a visually prominent element in the rural landscape producing a degree of visual change in the order of 43% to 48% which is described as substantial. This substantial visual effect alters the underlying visual character and composition of the landscape through the introduction of new elements. Views will be altered but the sensitivity of the underlying landscape character to change is considered low.

Figure 37 of the LVIA, shown below illustrates the extent of visual effect and its variation throughout the locality of the proposed development.
This figure illustrates the regional visual effect calculated within GEE as a distance-weighted interpolation between the detailed assessment viewpoints. Furthermore, it describes the potential impact with reference to the District Matrix detailed assessment values. Consequently, the figure needs to be interpreted with the understanding that visual impact assessment is a subjective experience. This does not take into account mitigation strategies that could reduce the potential effect, e.g., visual barriers.

Legend
- Visual Effect % Change
  - Outstanding
  - Moderate
  - Slight

Buffer 3km
Buffer 1km
Buffer 500m

Figure 37: Summary of viewpoint visual effect
In addition to the visual effect of the wind turbine generators, the LVIA assessed the visual effect of the substations and transmission line (Section 5.11). The assessment notes that the “site compound and substation will be partially visible from viewpoint 6... and the scale of the on-site substation will be considerably less conspicuous than the turbines....with local landforms screening the majority of the development”. The terminal (or transmission) substation is discussed in Section 5.13 and it is noted that “the visual effect of the substation is increased due to its close proximity to the Sturt Highway. However due to the road alignment which curves both before and after this location, local rigdes and stands of vegetation along the road corridor the substation will only be visible when travelling along a limited section of the Highway”.

The conclusion of the LVIA states:

...Further away from the proposed development local ridgelines and tree belts create visual screens that fragment or remove the visual effects of the proposed wind turbines. The combination of topography and vegetation increases the screening reducing the degree of visual change that ranges from 23% to 33% and is describe as moderate.

At distances of over ten kilometres, the degree of visual changes reduces significantly, and the degree of change is reduced to a range of 12% to 17%, particularly to the north east and south west and is describe as slight.

The associated infrastructure; substations and transmission line, will provide localised impacts to their immediate site localities. These visual effects will be limited to shorter distances (contained viewsheds) to the east and south east or Truro. There will be no visual effect from the township of Truro. Transient experiences will be witnessed along local roads within the south east of the regional site with a small section of the Sturt Highway being impacted by the substation terminal connection to the existing 275kv line. Depending on the viewpoint, local landforms will provide visual screening.

Furthermore the reduced vertical scale of the gantries and transmission pylons in contrast to the turbines, meaning the associated infrastructure will only slightly contribute to the overall level of visual change in the regional landscape.

The visual assessment and visual effect interpolation mapping illustrated the relationship between distance and visual effect and the significance of local of ridgelines in reducing the visibility of the proposed wind farm in the wider locality. The visual effect is represented as bands of visual change radiating from the proposed wind farm. The consistency of the existing landscape character means that distance and visual absorption are the dominant variables in mitigating the visual effect. Although, the visual effect is likely to be moderate to substantial within the local to subregional area, the containment of the effect can be attributed to the visual character of the landscape coupled with uniformity of the agricultural character, meaning that the proposed Twin Creek Wind Farm can be accommodated without significantly altering the underlying landscape character.
6.3 ACOUSTIC ASSESSMENT

An environmental noise assessment of the wind farm has been prepared by Sonus and this report entitled “Twin Creek Wind Farm Environmental Noise Assessment and dated June 2017 is contained in Volume 2. The assessment was undertaken against the requirements of the South Australian EPA Wind farms environmental noise guidelines July 2009 (Guidelines). Sonus notes that the assessment has been based on the following data:

- the proposed co-ordinates of each WTG;
- the location and status of residences in the vicinity of the proposed wind farm;
- the locations of the WTGs relative to the residences;
- Vestas V136 3.6MW platform representative WTGs without serrated blades and a hub-height of 112m; and
- background noise monitoring conducted at 7 representative locations, between 31 August to 14 October 2016 and 22 December 2016 to 2 February 2017.

Sonus prepared “A predictive noise model has been prepared for the proposed wind farm layout, which enables noise predictions to be made at local residences from each noise source including the WTG’s, transformers and battery storage air conditioning units”.

6.3.1 Legislation, Guidance and Standards

In Section 4 of the environmental noise assessment report, Sonus discuss the application of the Environment Protection (Noise) Policy 2007 (EPP) and the Wind Farms Environmental Noise Guidelines 2009 (the Guidelines). The applicability of the Guidelines is particularly relevant given the policies of the relevant Development Plans refer to the EPP.

Sonus succinctly summarise the application of the EPP and the Guidelines as follows:

Although the Development plan references the Environment Protection (Noise) Policy 2007 (EPP), the Environment Protection Authority (EPA) has produced ‘Guidelines’ to specifically assess the environmental noise from wind farms. The EPP refers to these Guidelines. Clause 34.(1) of the EPP applies the Guidelines to wind farms, and clauses 10 and 17 exclude wind farm noise from assessment under the general provisions of the EPP.

6.3.2 Methodology

Section 5 of the Environmental Noise Assessment report describes the methodology of the noise assessment in detail. This methodology is not repeated in this summary, but the following is noted:

- the has been made based the Vestas V136 – 3.6MW WTG (hub height of 112 m). The WTGs have a cut-in wind speed of 3 m/s. The rated power wind speed has been taken to be 13 m/s;
the two transformers at the site substation have been based on units having a maximum rating of 150 MVA each;

the transformer at the terminal substation have been based on a unit capacity of 300 MVA;

the subject to final design prediction has been conservatively made based on 50 air conditioning units serving each battery container with a nominal cooling capacity of 5 kW;

noise predictions for the wind farm use a recognised noise propagation model under worst-case meteorological conditions;

the predictions have been made using the CONCAWE\(^4\) noise propagation model and SoundPLAN noise modelling software;

the sound propagation model considers the following influences:

- sound power levels and locations of noise sources;
- separation distances between noise sources and receivers;
- topography of the area;
- influence of the ground;
- air absorption; and,
- meteorological conditions.

the noise assessment criteria applied to non-stakeholder dwellings in the Wind Farms Environmental Noise Guidelines 2009 (the Guidelines) is:

The predicted equivalent noise level \(L_{A_{eq},10}\), adjusted for tonality in accordance with these guidelines, should not exceed:

- 35 dB(A) at relevant receivers in localities which are primarily intended for rural living, or
- 40 dB(A) at relevant receivers in localities in other zones, or
- the background noise \(L_{A_{90},10}\) by more than 5 dB(A)

whichever is greater, at all relevant receivers for wind speed from cut-in to rated power of the WTG and each integer wind speed in between.

where the wind farm noise exhibits a tonal characteristic, a 5 dB(A) penalty is to be applied to the criteria; and

where background noise monitoring has not been conducted at a residence, the lowest measured background noise levels at any monitoring location have been used to derive the criteria. This is noted to be a conservative approach.

6.3.3 Assessment

Section 5.10 of the Environmental Noise Assessment contains the analysis of the predicted noise levels at residences within the vicinity of the wind farm. Following the analysis of the predicted noise levels at various wind speeds against the relevant criteria, Sonus states that: “based on the predicted noise levels, the wind farm noise, including the WTGs, transformers and air conditioning units associated with battery storage will comply with the criteria at all residences, for all wind speeds”.

A separate analysis has been undertaken in relation to the terminal substation and the nearest residence (house H286). The noise levels of the terminal substation, if considered in isolation, are readily satisfied. Sonus states that “the predicted noise level from the combined operation of the wind farm, the site substation, the terminal substation and the battery storage is less than 30 dB(A) at H286”.

6.3.4 Infrasound and Low Frequency Noise

Sonus provide discussion in their report (Section 6) relating to Infrasound and Low Frequency noise, which are often concerns raised by the community in terms of potential adverse impacts on health and amenity. The following points are noted from this discussion:

• the criteria of the SA Guidelines are established to ensure that any audible wind farm noise is low enough in level such that it does not adversely impact on the health or amenity of the community;

• the SA Guidelines have been tested and accepted in the South Australian Environment, Resources and Development Court as the appropriate tool for the assessment of wind farm noise, in order to protect the acoustic amenity of the community;

• modern WTGs are constructed with blades upwind of the tower resulting in noise levels well below the level of audibility at residential setback distances. International studies have confirmed that the level and character of noise from modern WTGs are not different to the noise encountered from other natural and non-natural noise sources;

• a recent South Australian Government study by the Environment Protection Authority into infrasound (Infrasound levels near wind farms and in other environments, January 2013) found:

  - the measured levels of infrasound from wind farms are well below the threshold of perception (that is, the level of infrasound at a residence is inaudible);
- the measured infrasound levels around wind farms are no higher than levels measured at other locations where people live, work and sleep; and
- the characteristics of noise produced by wind farms are not unique and are common in everyday life.

- noise sources that produce low frequency content (such as a freight train locomotive or diesel engine) have dominant noise content in the frequency range between 20 and 200 Hz. Low frequency noise is often described as a “rumble”;

- aerodynamic noise from a WTG is not dominant in the low frequency range. The main content of aerodynamic noise generated by a WTG is often in the area known generically as the mid-frequencies, being between 200 and 1000Hz; and

- compliance with the SA Guidelines will inherently provide an adequate level of protection of amenity in the surrounding area from low frequency noise impacts.

6.3.5 Construction Noise

The Environmental Noise Assessment report provides the following commentary in relation to construction noise:

The EPP provides an emphasis on implementing reasonable and practicable noise reduction measures and does not set mandatory standards or objective criteria for activity which is conducted during typical day time construction hours. However, the EPP establishes a quantitative approach for night time activity, whereby an average goal noise level of 45 dB(A) and a maximum goal noise level of 60 dB(A) are to be met for activity outside of typical day time hours. The adoption of “all reasonable and practicable” noise mitigation measures during daytime hours... are common(ly) incorporated into the project’s Construction Environmental Management Plan.

The draft Construction Environmental Management Plan (Volume 4) incorporates a range of practical noise reduction measures.

6.3.6 Conclusions

In conclusion, Sonus states that:

“the predicted noise levels achieve the requirements of the Guidelines at all residences”.
Furthermore, Sonus notes that:

“A final noise assessment will be conducted to confirm compliance with the Guidelines when the final WTG, transformer and air conditioning selections are available at the procurement stage of the project, with guaranteed sound power levels provided by the respective manufacturers. The final noise assessment report will be submitted to the relevant authorities prior to the commencement of construction. In addition, noise level monitoring during operation of the wind farm is also typically required by the Environment Protection Authority to confirm ultimate compliance with the Guidelines.

In conclusion, the assessment indicates that the Twin Creek Wind Farm can be readily designed to achieve the requirements of the South Australian EPA’s Wind farms environmental noise guidelines July 2009 (the Guidelines). Should the wind farm be granted approval, there will be a review of the final design of the wind farm prior to construction and it is most likely that a condition of approval will require monitoring during operation to confirm ultimate compliance with the Guidelines”.

6.4 CULTURAL HERITAGE ASSESSMENT

EBS Heritage was engaged by RES Australia to undertake a desktop cultural heritage assessment for the proposed Twin Creek Wind Farm.

The EBS Heritage “Desktop Cultural Heritage Assessment Twin Creek Windfarm Report” is contained in Volume 2 of the development application documents. The purpose of the report was to investigate cultural heritage within the project area, particularly investigations of previous archaeological research relevant to the study area; the identification of the relevant Traditional Owner representative body; the relationship between the study area landforms and Aboriginal sites and incorporates recommendations relating to cultural heritage management within the study area.

The EBS Heritage report contains the results of a detailed cultural heritage desktop assessment for the project area, and includes, the results of searches of the relevant heritage databases, an outline of relevant heritage legislation and a review of background information relating to the occupation and use of the study area.

6.4.1 Traditional Owners and Association with Landform

The traditional owners of the land on which the development is proposed, are the Ngadjuri Nation Aboriginal Corporation.

EBS Heritage identify in Section 7.1 that:

Any parcel of land, whether developed or not, has the potential to contain cultural heritage sites. Aboriginal heritage sites are the physical remains of past cultural activity and use of environmental resources. They also relate to spiritual beliefs and ceremonial activities.
There are some generally accepted principles of association between environmental landforms and Aboriginal sites. The most recognised of these is the correlation between Aboriginal archaeological sites and water courses.

Based on this, the Aboriginal site types known as common to the region (rockshelters, painting & engraving sites, camp sites, hunting hides, culturally modified trees etc.) could be expected to be more prevalent with a greater density of intra-site components in the vicinity of more permanent water sources.

6.4.2 Identified Heritage Places

EBS Heritage undertook a detailed desktop assessment of a variety of heritage registers. The searches and the findings are summarised below.

<table>
<thead>
<tr>
<th>Source</th>
<th>Description of Database</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Register of Aboriginal Sites and Objects</td>
<td>The Central Archive is maintained by DSD-AAR and is a record of previously recorded heritage sites in South Australia.</td>
<td>No entries found for known Aboriginal sites located within the project area or a 1km radius</td>
</tr>
<tr>
<td>The South Australian Museum (SAM)</td>
<td>This database is an inventory of Aboriginal cultural material and skeletal remains</td>
<td>One record for skeletal material that has been found in the general region of the project area (Freeling)</td>
</tr>
<tr>
<td>The Australian Heritage Database</td>
<td>Contains information about more than 20,000 natural, historic and Indigenous places.</td>
<td>No listed heritage places within the project area</td>
</tr>
<tr>
<td>South Australian Heritage Register</td>
<td>Contains information about places of heritage significance in South Australia. It includes places and related objects of State significance and records other categories of heritage places in South Australia (including local, national and world heritage places) which are protected under legislation</td>
<td>There are no listed places of State significance within the project area.</td>
</tr>
</tbody>
</table>

EBS Heritage (Section 5.2) “considers there is a low potential for earthworks to uncover Aboriginal cultural remains within the project area. Although the potential remains low, it increases in the vicinity of water bodies due to a direct correlation between the density of archaeological sites and the presence of fresh water sources.”
6.4.3 Findings

EBS Heritage conclude from the investigations undertaken that “that there is potential for archaeological surface and subsurface features to be present throughout the project area in undisturbed areas. Intact subsurface deposits may also be present below the plough zone in heavily farmed areas, with this potential increasing closer to water sources”.

The report then contains three recommendations. One of these recommendations is to engage with the Ngadjuri Nation Aboriginal Corporation in a field survey/site discovery procedure. This engagement has occurred and field survey work is currently underway. The field survey/site discovery process with the traditional owners is separate and independent of the development application assessment process. However, this process has, to date, and will continue to inform the design of the wind farm and the construction methodology and activity. RES Australia is aware of their obligations pursuant to The South Australian Aboriginal Heritage Act (1988), that states that works must not “damage, disturb or interfere” with an item, object of site of Aboriginal Heritage.

6.5 BUSHFIRE RISK

SA Bushfire Solutions have prepared a Bushfire Management Plan, which is contained within Volume 2 of the development application. The plan focuses specifically to the construction and operation of the proposed development, and defines objectives and recommendations to mitigate the threat that bushfires pose to life, property, the environment and the potential hindrance to suppression operations. The plan makes recommendations that may support and guide management decisions to mitigate potential bushfire risks.

It is noted in the report that evaluation of bushfire risk is extremely complex due to the variety of factors that influence the potential outcome. The site of the development is located within both a general bushfire risk area (within Light Regional Council and Mid Murray Council areas) and within an excluded bushfire risk area within the Goyder Regional Council area. The area of the wind farm has undulating and rocky terrain, minimal vegetation and low overall fuel hazard levels.

There is no recorded fire history for the proposed site of the proposed development. Within the Mid North and Barossa Valley regions there have been significant bushfires in recent years, including Pinery in November 2015, Eden Valley January 2014 and Angaston December 2014. With this knowledge, the Bushfire Management Plan discusses the potential risk of bushfire and considers the:

- the current context of existing risk factors;
- the elements of the proposal that may increase bushfire risk;
- the elements of the proposal that may aid or hinder suppression operations;
- the role of key stakeholders and their legislative responsibilities; and
- current best practice and existing policies.
6.5.1 Context

The Flinders Mid North Yorke Bushfire Management Area Plans (BMAP) covers the Light Regional and Goyder Local Government areas, while the Murray Mallee BMAP covers the Mid Murray Local Government area.

The Bushfire Management Plan outlines the bushfire environment of the wind farm site and locality, and the following is noted:

- The Flinders Mid North Yorke BMAP covers the Light Regional and Goyder Local Government areas, while the Murray Mallee BMAP covers the Mid Murray Local Government area;

- Mt Lofty Ranges is predominantly characterised by Casuarina and Allocasuarina forests and woodlands. Eucalyptus low open woodlands commonly dominate the higher rainfall areas and give way to Allocasuarina species in the more arid parts. The overall fuel hazards with these vegetation types can vary considerably and are expected to have higher fuel loads in the areas of remnant vegetation;

- The neighbouring lower plains (off site further to the west) are predominantly cereal cropping lands and depending on the season can have extreme near surface / elevated fuel loads and have significant bushfire potential, especially during harvesting operations;

- Access and egress throughout many parts of the proposed development area is restricted because much of it is privately owned property with complex terrain. Public roads are limited and existing farm tracks are of varying standards that may not meet the Government Agencies Fire Management Working Group (GAFMWG) standards for emergency response vehicles;

- Construction of the wind farm will include engineered access roads (greater than the identified GAFMWG standards) to each turbine location which will greatly improve fire crew access through the site and difficult terrain areas; and

- There is limited water infrastructure close to the proposed project area. Standpipes in nearby Eudunda and Kapunda are the principal sources of water for firefighting purposes.

6.5.2 Bushfire Risk from the Proposal

The Bushfire Management Plan discusses the bushfire risk of the wind farm from two perspectives, which are:

- Firstly, is the wind farm likely to cause or increase risks of a bushfire (either during its construction or operational phases); and

- Secondly, is the wind farm likely to limit any bushfire suppression operations.
### 6.5.2.1 Bushfire Risks During Construction

Existing land uses and human activity already pose some level of risk of generating a bushfire event during the fire danger season, however the construction phase of the project has the potential to increase bushfire risks primarily by increasing the level of activity in the region, specifically in relation to:

- the use of heavy earthmoving machinery operating in rocky environment;
- increasing the potential for vehicles to drive through dry grass;
- increasing the volume of human activity and vehicle accessing the area;
- storage and use of flammable fuels and materials; and
- the use of grinders and welding equipment.

Increased activity on grassland vegetation during construction, could potentially result in accidental ignition. Depending on the conditions and the location of such an event, a bushfire may become challenging to contain in the steep slopes and within areas of limited access, however, this will be offset by the construction of new roads that will improve emergency vehicle access and increase response times to reported incidents as well as serve as firebreaks.

The increased bushfire risk on the surrounding areas during construction and operation of the wind farm, is not considered to be more prevalent than any other development application or existing general activity (for example farming, contracting or other construction).

In each case the potential of increased risk can be managed and mitigated provided appropriate training, communication and management practices are put into place in accordance with the recommendations identified in this bushfire management plan.

### 6.5.2.2 Bushfire Risks During Operation

The proposed wind farm development will introduce additional elements to the region that have, in theory, the potential to increase bushfire risk. Many of these elements already exist or occur in the region from other industries or operations including:

- introducing infrastructure that can pose difficulties for suppression (e.g. Nacelle fires due to height and OH&S considerations of falling debris and tower infrastructure affecting aerial suppression);
- increase to management and maintenance vehicles and crew working in area;
• increase in the number of turbines, substations and power lines in area (potential for mechanical and electrical failures);

• increasing the potential for lightning conductors; and

• electronics stored with combustible oils and lubricants.

The functioning wind turbines may experience electrical or mechanical failure causing ignition in the nacelle and may lead to subsequent bushfires if not controlled. Whilst there is evidence to prove that wind farms have caught fire from various factors the subsequent risk of these nacelle fires causing uncontrollable bushfires is considered “less than that of many other activities expected in these rural environments” (Australasian Fire and Emergency Service Authorities Council, 2014). It should be noted that in comparison to other power generation e.g. coal or gas, wind energy has a much lower ignition risk (see Hazelwood Mine Fire Inquiry).

The types of fire risks related to wind energy facilities may include:

• nacelle (including turbine oil) fires;

• electrical faults during construction or from connection lines;

• firefighting limitations within and adjoining the wind farm footprint, such as possible limitations on aerial support, and access and egress conditions;

• access to water sources within or adjoining the facility;

• operation of winches and machinery during monitoring and maintenance tasks;

• possible impacts from downwind air turbulence on fire behaviour (see 3.31 below); and

• impacts of lightning.

Suppression of fire in the nacelle by ground crew is impossible; the initial detection of problems that may lead to fire in the nacelle and subsequent fires on the ground is the key to minimising asset and infrastructure loss and ignition of bushfires. Detection and automatic fire protection systems would reduce the risks, increase the ability to contain potential problems and decrease response times to reported incidents.

With the site proposed to be developed on lands with naturally low fuels and construction of roads to turbines increasing access for emergency vehicles through the area the overall potential for operational activities to increase the bushfire risk and impact on the surrounding areas is low, if the recommendations within this plan are implemented.
6.5.3 Operational Constraints and Opportunities

6.5.3.1 Potential Constraints

The report discusses in Section 3.3, a number of possible constraints of an operating wind farm on bushfire suppression, including:

- the operating wind farm could potentially impact bushfire suppression operations by:
  - possible interference with radio transmissions (radio frequency);
  - increasing the total number of assets to be protected in the area;
  - increasing safety risks with nacelle fires and falling debris;
  - affecting aircraft operations (access, efficiency and turbulence); and
  - increasing elevated structures as risk factors (vertical and horizontal).

Matters of potential interference with radio transmission are discussed in the DNV-GL EMI Assessment report, contained in Volume 2 of the application documents. This report concludes that interference to fixed point to point links passing over the project boundaries is unlikely and excluding one operator (SA Water) all responses by service operators indicate that the project is unlikely to have any impact on services. As part of the consultation of stakeholders, the SA CFS were consulted and did not express any concerns.

Similarly, the potential impact on aerial firefighting activities is discussed in the Aviation Impact Assessment report prepared by The Ambidji Group Pty Ltd (contained in Volume 2 of the application documents).

In relation to potential impacts on aerial firefighting, the conclusions of the Aviation Impact Assessment report and the Bushfire Management Plan report are comparable. The Bushfire Management Plan report (Section 3.3) notes that:

- Twin Creek Wind Farm is in the CFS Secondary Response Zone (refer CFS Operations Tri Manual SOP 11.1 Aerial Fire Fighting). This means that bushfire suppression activities may be able to be supported by aerial suppression (rotary and fixed wing) based on a specific request by an Incident Controller and approved at a state level;

- there is no guarantee that aircraft for either suppression or an observation platform will be available for immediate dispatch, particularly in the Secondary Response Zone. This will be determined at the time by the CFS State Air Resource Coordinator (SARC) in consultation with the CFS Regional Office and Incident Management;

- pilots, air attack supervisors and air operation managers constantly undertake dynamic risk assessments to review and consider options and determine appropriate strategies to safely undertake suppression operations. In this context, aerial firefighting will treat turbine towers the same as any other obstacle; and
the CFS fact sheet understanding Aerial Firefighting highlights that "...community perception is that aircraft alone put out bushfires, this is not true" and the CFS website Aerial firefighting defines aerial firefighting as “the use of aircraft and other aerial resources to assist firefighters on the ground in achieving bushfire suppression objectives”. It is important to note, that firefighting aircraft (regardless of their size or type) do not extinguish a bushfire alone, but are deployed to provide an important support function to ground firefighting resources.

6.5.3.2 Potential Opportunities

Topography and terrain currently restrict access and egress to the large portions of the wind farm development site. As noted in the Bushfire Management Plan report (Section 3.3) "post construction the increased number of service tracks to the turbines and substations will improve bushfire suppression operations by increasing vehicle access, emergency assembly points, strategic observation points and safe zones to emergency crews". The report (Section 4.4) also notes that all tracks onsite will exceed the Government Agencies Fire Management Working Group (GAFMWG) requirements for a major fire access track and will be suitable as firebreaks.

6.5.6 Conclusion and Recommendations

The Bushfire Management Plan concludes (Section 7) that like any other construction project there is a potential increase risk of bushfire. "The potential risks and impacts on surrounding areas are significantly reduced if the plan’s recommendations are implemented". Recommendations of the Bushfire Management Plan are noted for inclusion in the Statement of Commitments and/or the Construction Environmental Management Plan.

6.6 SHADOW FLICKER AND BLADE GLINT ASSESSMENT

Garrad Hassan Pacific Pty Ltd (“DNV GL”) were commissioned to independently assess the expected annual shadow flicker duration in the vicinity of the proposed Twin Creek Wind Farm. This assessment is contained in the “Shadow Flicker and Blade Glint Assessment” report, which is contained in Volume 2 of the application documents. The Executive Summary of the DNV GL report, quoted below provides a summary of the methodology and findings in relation to shadow flicker and blade glint.

Shadow flicker involves the modulation of light levels resulting from the periodic passage of a rotating wind turbine blade between the sun and an observer. The maximum potential duration of shadow flicker experienced at a specific location can be determined using a purely geometric analysis which takes into account the relative position of the sun throughout the year, the wind turbines at the site, local topography, and the viewer. This method has been used to determine the shadow flicker duration at sensitive locations neighbouring the Twin Creek Wind Farm.
However, this analysis method tends to be conservative and typically results in over-estimation of the number of hours of shadow flicker experienced at a dwelling. Therefore, an attempt has been made to quantify the likely reduction in shadow flicker duration due to turbine orientation and cloud cover and hence predict the actual shadow flicker duration likely to be experienced at a dwelling.

... the Environment Protection and Heritage Council (EPHC) Draft National Wind Farm Development Guidelines (Draft National Guidelines) released in July 2010, (which) include recommendations for shadow flicker limits relevant to wind farms in Australia.

The Draft National Guidelines recommend that the modelled theoretical shadow flicker duration should not exceed 30 hours per year, and that the actual or measured shadow flicker duration should not exceed 10 hours per year. The Draft National Guidelines also recommend that the shadow flicker duration at a dwelling be assessed by calculating the maximum shadow flicker occurring within 50 m of the centre of a dwelling.

The results indicate that, of the dwellings identified by Twin Creek Energy Pty Ltd (TCE), there are locations within 50 m of a single dwelling, identified as dwelling 147, that are predicted to experience shadow flicker, with a maximum theoretical duration of 29.3 hours per year. Based on information provided by TCE, this dwelling is owned by a project stakeholder, and it is not predicted to experience theoretical shadow flicker durations in excess of the recommended limit of 30 hours per year within 50 m of the dwelling.

When considering the predicted actual shadow flicker duration, which takes into account the reduction in shadow flicker due to turbine orientation and cloud cover, the maximum shadow flicker duration in the vicinity of dwelling 147 is predicted to reduce to 11.7 hours per year, which is above the recommended limit for actual shadow flicker of 10 hours per year within 50 m of the house location. It should however be noted that the Draft National Guidelines considers compliance in cases where the maximum theoretical duration limit is satisfied.

The prediction of the actual shadow flicker duration does not take into account any reduction due to low wind speed, vegetation, or other shielding effects around each house in calculating the number of shadow flicker hours. Therefore, the values presented may still be regarded as conservative. The effects of shadow flicker can also be reduced through a number of mitigation measures such as the installation of screening structures or planting of trees (if not already in place) to block shadows cast by the turbines, or the use of turbine control strategies which shut down turbines when shadow flicker is likely to occur.

It should also be noted that, with regards to shadow flicker impact on passing vehicles, the Draft National Guidelines state that “there is a negligible risk associated with distraction of vehicle drivers show experience shadow flicker”. Therefore, shadow flicker impact on passing vehicles is not expected to be a problem for the proposed wind farm.
Blade glint involves the reflection of light from a turbine blade, and can be seen by an observer as a periodic flash of light coming from the wind turbine. Blade glint is not generally a problem for modern turbines provided non-reflective coatings are used for the surface of the blades.

6.7 EMI ASSESSMENT

DNV GL Australia Pty Ltd (“DNV GL”) has assessed the potential electromagnetic interference (EMI) impacts associated with the development and operation of the proposed Twin Creek Wind Farm.

As stated in EMI Assessment Report (Section 5), “if not properly designed, wind farms have the potential to interfere with radiocommunications services. Two services that are most likely to be affected include television broadcast signals and fixed point-to-point microwave signals. Terrestrial broadcast signals are commonly used to transmit domestic television, while microwave links are used for line-of-sight connections for data, voice and video. The interference mechanisms are different for each of these and, hence, there are different ways to avoid interference”.

6.7.1 Investigations and Methodology

The EMI Assessment report investigates the potential EMI impact of the Project on:

- fixed point-to-point links;
- fixed point-to-multipoint links;
- radiocommunications assets belonging to emergency services;
- meteorological radars;
- trigonometrical stations;
- Citizen’s band (CB) radio and mobile phones;
- wireless internet;
- satellite television and internet; and
- broadcast radio and television.

The investigations were undertaken with reference to:

In relation to EMI, these guidelines provide advice and methodologies to identify likely affected parties, assess EMI impacts, consult with affected parties, and develop mitigation steps to address the likely EMI impacts. DNV GL considers that the recommendations of the Draft National Guidelines meet, if not exceed, the recommendations of the Draft SA Planning Bulletin and Central SA Guidelines, and therefore the Draft National Guidelines were used to inform the methodology adopted in the assessment.

The EMI Assessment report provides extensive details about the methodology engaged, which included direct consultation with identified “likely affected parties”. The consultation and response from parties is contained in Table 4 of the report and quoted below.

**Summary of EMI assessment results for the proposed Project**

<table>
<thead>
<tr>
<th>Licence/Service Type</th>
<th>Assessment Findings</th>
<th>Stakeholder Feedback (to date)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed point-to-point microwave links</td>
<td>Three links crossing Project boundary:</td>
<td>Potential for interference</td>
</tr>
<tr>
<td></td>
<td>SA Water</td>
<td>No concerns raised</td>
</tr>
<tr>
<td></td>
<td><em>No turbines in exclusion zone</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td>W &amp; L Phillips Pty Limited (Flow FM)</td>
<td>No concerns raised</td>
</tr>
<tr>
<td></td>
<td><em>No turbines in exclusion zone</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td>NBN Co</td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>No turbines in exclusion zone</em></td>
<td></td>
</tr>
<tr>
<td>Fixed point-to-multipoint microwave links</td>
<td>222 assignments within 75km of Project boundary</td>
<td>Potential for interference to SA Power Networks point-to-multipoint link; resolved with proposed exclusion zone</td>
</tr>
<tr>
<td></td>
<td>Seven base stations within 20km of Project boundary:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Aussie Broadband (Site ID 9012660)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Barossa Valley Golf Club (Site ID 501154)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SA Water (Site ID 24263 and 9007183)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SA Power Networks / Telstra (Site ID 24227)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The Barossa Council (Site ID 9011554)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Treasury Wine Estates Vintners (Site ID 138906)</td>
<td></td>
</tr>
<tr>
<td>Other licence types</td>
<td>Base to mobile station style communications: unlikely to be affected (see “Emergency services”, “Mobile phones”, “Radio broadcasting”, “Television broadcasting”)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Aeronautical and radiodetermination: to be considered as part of an aviation impact assessment</td>
<td></td>
</tr>
<tr>
<td>Emergency services</td>
<td>Point-to-point microwave links: No links crossing boundary</td>
<td>No concerns raised</td>
</tr>
<tr>
<td></td>
<td>Base to mobile station style communications: unlikely to be affected</td>
<td></td>
</tr>
<tr>
<td>Aircraft navigation systems and radar</td>
<td>To be considered as part of an aviation impact assessment</td>
<td></td>
</tr>
<tr>
<td>Licence/Service Type</td>
<td>Assessment Findings</td>
<td>Stakeholder Feedback (to date)</td>
</tr>
<tr>
<td>----------------------</td>
<td>----------------------</td>
<td>--------------------------------</td>
</tr>
</tbody>
</table>
| Meteorological radar | Nearest station: ‘Buckland Park’ (Adelaide), 63km from nearest turbine  
Unlikely to be affected | Potential for interference to Buckland Park radar; satisfied with proposed turbine locations |
| Trigonometrical stations | 56 stations within 20km of Project boundary  
Electronic equipment: unlikely to be affected  
Sight lines to other stations: may be blocked by turbines | No concerns raised |
| Citizen’s band radio | Unlikely to be affected | - |
| Mobile phones | Fair to good coverage across site  
Unlikely to be affected, may experience interference in areas with marginal coverage | No concerns raised |
| Wireless internet | Likely service providers: Agile Communications, Aussie Broadband  
NBN: currently available in areas surrounding Project  
May experience interference in areas with marginal coverage | No concerns raised |
| Satellite television and internet | Services intended for Australia: unlikely to be affected  
Other services: no signals intercepted | - |
| Radio broadcasting | AM signals: unlikely to be affected  
FM signals: may experience interference (low level hiss or distortion) in close proximity to turbines  
FM signals from nearby Flow FM transmission tower: may experience interference in areas with poor or marginal reception to the north and northeast of the Project  
Digital radio signals: unlikely to be affected | AM and digital radio signals: no consultation required  
FM signals: potential for interference to Flow FM signal |
| Television broadcasting | Digital signals: may experience interference in areas with poor or marginal reception  
Adelaide Tower: ‘variable’ to ‘good’ coverage across site  
Eight dwellings (three belonging to associated landholders) in potential interference zone Eudunda, Renmark/Loxton, and Waikerie towers: ‘variable’ coverage to north and east of site  
No dwellings with coverage in potential interference zone | - |
6.7.2 Findings and Potential Mitigation

The EMI assessment has found that the project has the potential to cause interference to digital television signals received at dwellings in the vicinity, and FM radio broadcasts to the west and northwest of the Project. Potential EMI impacts on other services considered in the assessment, including meteorological radar, trigonometrical stations, CB radio, and mobile phones, are either considered to be minor or have been assessed through consultation with the service operators.

DNV-GL discuss in their report that “although DTV signals are generally unlikely to be susceptible to interference from wind turbines in areas of adequate coverage, interference could be encountered in areas where coverage is marginal and antennas at dwellings may receive a reflected signal from a turbine that is of sufficient power to interfere with the signal received directly from the transmitter. Based on the coverage maps for the area around the Project, it is possible that some areas could be deemed to have marginal reception, and interference could be encountered” (Section 5.14.4).

The EMI report provides several mitigation options in the event of television interference (Section 5.14.5), including:

- Realigning the householder’s television antenna more directly towards their existing transmitter;
- Tuning the householder’s antenna into alternative sources of the same television signal or a substitute signal;
- Installing a more directional and/or higher gain antenna at the affected house;
- Relocating the antenna to a less affected position;
- Installing cable or satellite television at the affected house; and
- Installing a television relay station.

DNV-GL further state that “in the event that terrestrial DTV reception cannot be improved, satellite television represents another potential amelioration option. Satellite based television comprises of both free to air and subscription based broadcasts. Residents in areas which are unable to receive DTV through their normal television antenna due to local interference, terrain or distance from the transmitter in their area may be eligible to access the Australian Government funded Viewer Access Satellite Television (VAST) service”.

Section 6 of the EMI Assessment report states that “the turbines at the project may interfere with digital television broadcast signals received from the Adelaide broadcast towers at houses surrounding the Project, particularly in areas where the residents currently experience poor or marginal reception. Interference to the FM radio signal broadcast by the nearby Flow FM transmission tower may also be experienced near the edges of the signal coverage area to the west and northwest of the Project”.

103
The EMI Assessment report (Section 5.13.2) proposes that “if interference to FM radio signals is experienced, mitigation options include installing high-quality antennas and/or amplifiers at affected residences, increasing the broadcast signal strength from the Kapunda transmitting tower or the nearby Maitland or Hallett towers, moving the Kapunda tower to a new location more than 4 km from any turbine, or installing a signal repeater on the opposite side of the Project”.

Furthermore, the report summary and conclusions note:

> Although base to mobile station style communications such as television and radio broadcasting and commercial and private mobile telephony services are generally unlikely to be affected by wind farms, interference may be experienced in areas of poor or marginal reception. If interference to television and radio reception is increased as a result of the project, a range of options are available to rectify difficulties.

> This EMI assessment has found that the project has the potential to impact on a number of radiocommunications services in the vicinity of the project. Specifically, the turbines at the project may interfere with digital television broadcast signals received from the Adelaide broadcast towers at houses surrounding the project, particularly in areas where the residents currently experience poor or marginal reception. Interference to the FM radio signal broadcast by the nearby Flow FM transmission tower may also be experienced near the edges of the signal coverage area to the west and northwest of the project.

> DNV GL has assessed the potential EMI impacts on point-to-multipoint links, emergency services, and wireless internet services through consultation with service operators. DNV GL has also consulted with other organisations operating services that may be affected by the development and operation of the project to seek feedback regarding any potential EMI-related impact the project could have on their operations and services. While DNV GL considers that interference to fixed point-to-point links passing over the project boundaries is unlikely, it is noted that one operator, SA Water, has expressed concerns regarding potential impacts on their links. All other responses received to date indicate that the project is unlikely to have any impact on the relevant services.

### 6.8 AVIATION IMPACT ASSESSMENT

The Ambidji Group Pty Ltd (Ambidji a division of Landrum and Brown Worldwide) were engaged to prepare an Aviation Impact Assessment (AIA), Aviation Impact Statement (AIS), Qualitative Risk Assessment (QRA) and an Obstacle Lighting Review (OLR) for the proposed Twin Creek Wind Farm (TCWF).

In relation to the proposed development, the aviation assessment notes the following:

- the highest ground in the project area is at wind turbine generator T38 and in combination with a tip height of 180 metres the overall highest point is 660.22 m (2166ft) above the Australian Height Datum (AHD);
- there are no military, certified or registered aerodromes within 30nm (56km) of the TCWF;
- the nearest aerodrome is the Edinburgh Military base (YPED) 31nm (57.4km) south west of the TCWF;
- there are three Aeroplane Landing Areas (ALA) identified within 30km of the TCWF including:
  - Truro Flat Sport Aviation
  - Stonefield - Gliding
  - Kapunda - Private [rarely used]
- the Gawler Aeroplane Landing Area (ALA) is 42km south west of the TCWF and is used extensively for gliding and sport aviation activity. Whilst it is beyond the 30km distance it was considered in the investigations due to its volume of aviation activity;
- the TCWF does not impact any Obstacle Limitation Surfaces (OLS);
- the TCWF does not impact any PANS-OPS surfaces (Procedures for Air Navigation Services - Aircraft Operations);
- there are no Airservices Australia (AsA) communications facilities located at or within 30nm of the TCWF;
- the TCWF will not impact on the performance of any communication facilities;
- there are no Radio Navigation Aids (NAVAIDs) in the vicinity of the TCWF. Airservices Australia have advised that the wind farm will not adversely impact the performance of any Airservices Precision/Non-Precision Nav Aids, Anemometers, HF/VHF/UHF Comms, ASMGCS, Radar, PRM, ADS-B, WAM or Satellite/Links;
- the nearest Airservices Australia (AsA) Radar installations are at Adelaide Airport, 84km to the south west, and Summerton, 75.5km to the south south west of the TCWF. Both radars are too far from the TCWF for the wind turbines to have any impact on radar performance;
- Airservices Australia (AsA) have advised that the wind farm will not affect any air route, sector or circling altitude, nor any instrument approach or departure procedure at any airport;
- the Department of Defence have advised they have no objection to the proposed TCWF.
- a Military Restricted Area (R265B) is sited above the TCWF. This Restricted Area is designated for military flying operations and flights would not operate below 4500ft. A civil aircraft is permitted to transit at the lower limit of 3500ft for R265B when it is active;
- an aerial agricultural operator advised and noted that there is very little aerial applications undertaken in the area of the wind farm;
• the Australian Fire and Emergency Service Authorities Council (AFAC) Wind Farms and Bushfire Operations Position Paper 30 October 2014 states: “Aerial firefighting operations will treat the turbine towers similar to other tall obstacles. Pilots and Air Operations Managers will assess these risks as part of routine procedures. Risks due to wake turbulence and the moving blades should also be considered. Wind turbines are not expected to pose unacceptable risks.”;

• the turbines and meteorological monitoring towers used in the TCWF must be reported to Civil Aviation Safety Authority (CASA) and the RAAF in accordance with AC 139-08(1) Reporting of Tall Structures and marked on the appropriate aeronautical charts; and

• the risk assessment for the TCWF indicates that the overall risk to aviation is Low. A risk assessment of Low indicates that the wind farm is ‘not a hazard to aircraft safety’. The TCWF is not a hazard to aircraft safety; therefore there is no need to install additional obstacle marking or obstacle lighting.

The conclusion of the aviation assessment undertaken is that with the tallest wind turbine generator at a tip height of 660.22m (2166ft) above the Australian Height Datum (AHD), the proposed Twin Creek Wind Farm does not interfere with any airspace procedures or aviation related communications, navigation or surveillance facilities for both civil or military aerodromes and airspace.

The aviation assessment does include a recommendation in relation to ensuring any new or additional wind monitoring masts are appropriately marked to increase visibility.

6.9 TRAFFIC IMPACT ASSESSMENT

A Traffic Impact Assessment (TIA) has been prepared by AECOM Australia Pty Ltd (AECOM), which details the impacts of the transport related activities associated with the life cycle of the wind farm development through construction, operation and decommissioning phases. A copy of the Traffic Impact Assessment is contained with Volume 2 of the development application documents.

The Traffic Impact Assessment Report examines existing conditions in the locality of the site, an assessment of the likely access routes during the construction phase (from the port to the wind farm), an assessment of access points; and recommendations regarding mitigation measures required to enable proper access to the development site.

The greatest volume of heavy vehicle access will occur during the construction phase. Components that are transported during this construction phase include: wind turbine components; substation components; battery storage containers; and miscellaneous construction equipment and materials.

Overall, it is estimated that approximately 175,000 trips will be generated in total for the construction phase of the development, with approximately 1,500 over dimensional or over mass vehicle trips, 32,000 truck trips, and 53,000 car trips.
6.9.1 Existing Conditions

The TIA identifies that the “main townships that will be most impacted by the wind farm development are Kapunda, Truro, Eudunda and also the Koonunga area. The surrounding arterial road network is primarily state-managed, high speed rural roads, with Thiele and Sturt Highways experiencing the highest daily traffic volumes. All minor roads in the area are primarily unsealed and unmarked.”.

The Thiele Highway, Sturt Highway and Truro Road are state controlled arterial road. Belvidere Road and Eudunda Roads, which are managed by Light Regional Council and the Regional Council of Goyder respectively are classified as regional collector roads. Heavy vehicles (Performance Based Standards (PBS) Level 2B vehicles, such as 26 m B-double trucks) may travel along Sturt and Thiele Highways, Belvidere and Truro Roads to gain access to the site. Eudunda Road is not classified as PBS approved route.

The site is bounded and intersected by multiple minor roads, which are unsealed and unmarked. The TIA reviewed the conditions of the following roads in its examination of potential access routes to the development site.

- Flagstaff Hill Road
- Mosey Road
- Camel Farm Road
- Weaver Road
- Bagot Well Road
- Teagle Road
- Noack Road
- Leakes Pass
- Holding Road
- Travers Road
- Ben Lomond Road

6.9.2 Preferred Access Route

The TIA considered several access routes, particularly for transport of components during construction. The TIA considers options for delivery of components during construction from both the Port of Adelaide and Port Pirie. The access routes considered through metropolitan Adelaide include:

- route out of the Adelaide metropolitan region via: Main North Road, Port Wakefield Road and the Fatchen Northern Expressway (Northern Expressway); or
- route to site via Thiele Highway or Sturt Highway.
The preferred route is from the Port of Adelaide, via the Port River Expressway, Port Wakefield Road, the Northern Expressway to Sturt Highway as it:

- reduces the number of traffic signals encountered on the trip;
- minimises the impact of other road users; and
- avoids the transportation of oversize and over mass loads through Kapunda.

The TIA considered several access routes from the surrounding highways to the development site for the construction phase of the project. Consideration of the appropriate route has taken account of the various road layouts and capacities and potential impacts. AECOM has considered the following in this assessment:

- road layout such as intersection turn constraints, capacity of pavements, water crossings and culverts, and vertical road alignment;
- vegetation and low level powerline clearance; and
- generation of noise and dust.

The preferred access route from Sturt Highway is via Truro Road, Bagot Well Road, Camel Hill Road, Flagstaff Hill Road and Mosey Road to the site access. This route minimises the impact of heavy vehicles on local roads and the surrounding landowners, by limiting the number of journeys past existing dwellings.

Delivery of substation components has also been assessed in the TIA. The wind farm comprises two substations, the first is within the wind farm infrastructure area, on the south-eastern side of the wind farm site near the wind farm access point. The second substation is the terminal substation, which is located adjacent the Sturt Highway near the township of Truro at the 275 kV tee in point. Substation components are both over dimensional and over mass, requiring permits to be transported to the site. The wind farm substation can be accessed via the selected route from the Sturt Highway. The terminal substation can be readily accessed from the Sturt Highway. The current junction at the Sturt Highway has recently been upgraded to provide a sheltered right turn lane and therefore will be adequate to support the delivery of material for construction of the substation.

The preferred route has also been the subject of discussions with the Department of Planning, Transport and Infrastructure, Light Regional Council and the Regional Council of Goyder.

This summary report discusses the preferred route as outlined above. The AECOM TIA also discusses the alternate routes considered.
6.9.3 Traffic Impact Assessment

A detailed assessment of the traffic impact assessment is contained within Section 6 of the AECOM report. In summary, the Executive Summary of the TIA states that “the traffic generated during the construction phase represents the greatest demand for the site, occurring over the assumed 18 month period. Overall, it is estimated that there will be 175,000 one-way vehicle trips, comprised of:

- 1,500 over dimensional and over mass trips;
- 32,000 truck trips; and
- 53,000 car trips.

This relates to an approximate daily volume of 7 over dimensional or over mass vehicles, 60 heavy vehicles and 140 car trips.

The expected impacts on road users and the community are discussed in the TIA report and the following discussion is noted:

- "It is expected that, because of the large numbers of heavy vehicles required during the construction and decommissioning phases, there is the potential for the development to have a large impact on road users and the local community. In general, the construction phase will increase daily traffic volumes, which may result in more congested routes for local road users. The most significant impact would be for the sections of the access route that is contained within the metropolitan region, since the vehicles will be required to share main arterial routes with general traffic. By selecting the access route via the Northern Expressway, the impact on road users will be reduced, as this route allows for significant overtaking capacity and reduces the likelihood of frequent stops (Section 5.5).

- The transportation of components and construction materials may also cause noise and dust impacts during the construction and decommissioning phases that will impact the local residents closer to the wind farm site (Section 5.5).

- As local school bus routes also exist in this area, there may be impacts on these transportation routes. These impacts can be minimised by scheduling over dimensional/mass and heavy vehicle transport during off-peak times to avoid commuter traffic and school bus movements (Section 5.5).

- The increase in daily traffic along most routes is less than 10%. The largest percentage increase occurs along Truro Road, as this is the only access route from the Sturt Highway and is not currently heavily used. The increase in daily traffic on Truro Road is;
  - from the west, 6% increase in total traffic (15% increase in heavy vehicles), and
  - from the east, 11.25% increase in total traffic (40.8% increase in heavy vehicles) (Section 6.2.3)
As no traffic data was available for Teagle Road or Bagot Well Road, the percentage increase has not been calculated; however it is likely that the current traffic volumes are low. As a result there is likely be a noticeable impact from the development construction phase (Section 6.2.3).

Truro Road,… will experience a significant increase in heavy vehicle use, as it is not currently a high use heavy vehicle route. In this situation, the increase in heavy vehicles may cause some damage to the road, particularly if high volume movements are undertaken in wetter conditions. Pre and post construction assessments should be undertaken to assess the required rehabilitation of road pavements. All unsealed roads are expected to require upgrades as they will experience a significant increase in daily traffic. Over-mass loads should ideally be transported in dry weather only to avoid excessive damage to unsealed roads (Section 7.1.3).

Bagot Well Road crosses St Kitt’s Creek … this crossing … is bridge structure. Given the current low traffic volumes of this local area road and Council do not have a load rating for the bridge, a structural assessment will need to be undertaken to ensure that it can sustain the over mass vehicle loads. If the Bagot Well Road access option is chosen as the access route, any upgrades recommended by the structural assessment would need to be designed to support these loads (Section 7.1.3).

The majority of arterial roads on the proposed access route have adequate vegetation and power line clearances as these routes are designed for high speed and high volume traffic. However, some vertical envelope restrictions currently exist along Truro Road and the start of Bagot Well Road. … In most instances, the clearance restrictions are a result of overhanging trees on both sides of the road, which will require pruning to achieve adequate clearance (Section 7.1.4).

The use of heavy vehicles on these routes will generate an increase in noise and dust from the current level, particularly on rural roads off Truro Road, where the majority of the network is unsealed. There are a number of measures that can be taken to reduce noise and dust including:

- restrict vehicle movements to and from the site to off peak times to reduce the impact of noise on surrounding residents;
- provide for clear turning circles to reduce engine noise associated with revving and reversing beeping and generation of excess dust;
- no vehicles shall be left idling on any roads in the vicinity of residential properties;
- enforce vehicle speed limits on the construction site and rural roads off Truro Road to minimise the generation of dust; and
- minimise soil deposit on surrounding roads, using rumble grids if needed (Section 7.3).
The TIA notes that “the decommission phase is likely to generate a similar amount of traffic, but it is recommended that another traffic impact assessment be carried out closer to the decommissioning date to better captures the changes of traffic usage and road conditions over time. The operations and maintenance phases is likely to generate the lowest traffic impact, as it is expected that only a small number of vehicles will be required on a daily basis to carry out monitoring and basic repairs (Section 6.1)“.

6.9.4 Conclusions

Section 10 of the TIA comprises the following conclusion of the traffic assessment:

The traffic generated by the Twin Creek wind farm development is likely to have a noticeable impact on the road network both in the local area and the broader transport network. The largest impact is generated by the construction phase of the development while other phases (operations and maintenance work) will have little impact. During the construction phase the impact will extend over approximately an 18 month period, requiring an estimated 175,000 trips, made up of approximately:

- 1,500 over dimensional and over size trips;
- 32,000 truck trips; and
- 53,000 car trips.

The decommission phase is likely to generate a similar amount of traffic, however it is recommended that another traffic impact assessment be carried out closer to the decommissioning date.

In considering the route options, from either Port of Adelaide or Port Pirie to the Sturt Highway and from the Sturt Highway to the Wind Farm site the preferred access route for the transportation of wind turbine components and substation components is from the Port of Adelaide, via Port River Expressway, Port Wakefield Road, the Northern Expressway, Sturt Highway, Truro Road, Bagot Well Road, Flagstaff Hill Road and Mosey Road to the site access point (ie. Option A to Sturt Highway and Option 1 from Sturt Highway to the site)

The majority of vehicles accessing the site will be either staff vehicles or semi-trailers, however, for the over dimensional and over mass vehicles, the appropriate permits and assessments must be sought and carried out. Permits are required for each vehicle and each trip, and assessments into the structural capacity of the roads and bridges along the route will be needed for the over mass trips. The permits outline the necessary safety considerations for the movement of these vehicles, such as use of a police escort, pilot vehicles, appropriate signage and hours of transport operations.
Access for these over dimensional trips is generally adequate along the recommended route. The majority of the route is on restricted vehicle access approved routes, however, some tree trimming, movement of street furniture and access into private land is likely to be required in isolated locations. The St Kitts Creek crossing on Bagot Well Road will require a detailed structural assessment and potential upgrade for over dimensional and over size vehicles. In general, the sight distances along the route are considered adequate for all vehicles, given the appropriate escorts are used for over dimensional vehicles. All movement of over-dimensional and over-mass components should be undertaken with regard to weather conditions to avoid excessive damage to unsealed road pavements.

In conclusion, allowing for the implementation of mitigation measures and compliance with permit conditions, the impacts from traffic and traffic related activities are considered acceptable for the area in which the Twin Creek Wind Farm is proposed.

6.10 CIVIL, GEOLOGY AND HYDROLOGY ASSESSMENT

AECOM Australia Pty Ltd (AECOM) have prepared a Civil, Geology and Hydrology assessment of the proposed development site. A copy of this assessment is contained in Volume 2 of the application documents.

6.11.1 Natural Features

The AECOM report describes (in Section 5 of the report) the natural features of the site as follows:

- the topography of the site is hilly, with numerous incised creek valleys typically draining towards the west into the Light River. The elevation of the Light River near the site varies from about RL 270 m to 290 m AHD, whereas the ridge lines and hills within the project site typically have elevations in the range of about RL 400 m to 450 m AHD;
- the hills and ridge tops are generally rounded, but become steeper towards the valleys where creeks are incised in relatively steep sided channels. In general the terrain undulates somewhat more steeply in the southern part of the site;
- rock outcrops are visible throughout the site, ranging from rocky hill tops and ridges, to rocky creek beds. Orange clay typically overlay the rock, with the soil thickness varying up to about 3 m in some creek beds, but reducing to close to zero on the hill tops;
- at the time of the site visit, vegetation typically comprised low grass with occasional, scattered mature trees;
- numerous small farm dams, some windmills and old stone ruins were also present across the site;
- access tracks across the site appeared to have been constructed from local materials, and typically comprised a mixture of gravel and exposed clay. The main tracks/roads had been sheeted with gravel that resembled local site won crushed/sorted rock. Trafficability was general acceptable for a light 4WD vehicles in dry conditions, but the more clayey tracks were slippery when wet;
• no evidence of significant landslides was observed from either the stereo pairs of aerial photographs, or from the areas of the site observed during the walk-over, although considerable erosion and ‘wombat holes’ were observed in the orange clay, particularly near the creeks;

• watercourses within the site area are predominantly fed by rainfall and are ephemeral, ceasing to flow in dry weather. The Light River flows along the western boundary of the site, entering from the north-western corner and leaving at the south-western corner. The Light River has a catchment of approximately 1820 km². The majority of the catchment is used for dryland agriculture, with cereal and canola crops as well as livestock grazing;

• Freshwater Creek enters the site in the north-eastern area, flows in a south westerly direction through the site and contributes the Light River approximately halfway along the western boundary of the site. The catchment for Freshwater Creek is approximately 34.66 km² in size with approximately 20 km² of the catchment within the site boundary. Spring Creek originates in the south-east area of the site, flows west and contributes to the Light River just outside the south west corner of the site. The catchment for Spring Creek is approximately 9.26 km²;

• Other watercourses within the site originate from the ridge on the eastern side of the site and flow through naturally occurring valleys before contributing to the Light River, or Freshwater Creek or Spring Creek. The watercourses throughout the site have catchment sizes ranging from 1 km² to over 30 km² for Freshwater Creek;

• it is noted that the site is located north and outside the Barossa Prescribed Water Resources Area, which covers groundwater, water courses and surface water;

• The site is located within the Adelaide Geosyncline, comprising thick sedimentary and minor igneous rocks that were formed during the late Precambrian (between about 1,100 Ma and 600 Ma). These rocks later became folded, metamorphosed, intruded and uplifted...; and

• two former mines are located within the project boundaries, namely Benita Copper and Newlands Barite and a further mine, Julia Creek Barite is located close to the eastern boundary of the site.

6.11.2 Geotechnical Constraints and Opportunities

The AECOM report utilise the data collected and described above in providing advice for the design of the wind farm, the siting of access tracks, siting of the substation, operations and maintenance compound, temporary compounds and associated infrastructure.

The findings of the investigations are discussed in Section 7.0 of the report in terms of geotechnical constraints and opportunities, as summarised below.

• rock is expected to be present either at the surface or at very shallow depth at all turbine locations, which should make anchored footings a viable option for many turbines;
if the rock is highly fractured or deeply weathered, the anchors may need to be excessively deep and/or the associated overall rock mass may have a low stiffness which would result in excessive deflections of the base of turbine. In such areas gravity footings may be required;

the majority of footing excavations for the turbines are expected to be in rock, which will require the use of rock excavation techniques, such as hydraulic rock breakers mounted on large excavators. The use of blasting should be avoided however, as it may loosen the rock mass and lower the stiffness of the rock below the footing level;

future geotechnical investigations will be required to assess the condition of the rock at each turbine location. Similar investigations at key points along proposed access road tracks and at the proposed substation site should also be performed;

potential borrow pit sites that are suitable for producing aggregate for unsealed road construction are expected to be readily available throughout the project area;

due to the higher quality demands on concrete aggregate, it is expected that off-site sources of concrete will be used;

the ability to utilise surface water for construction is expected to be limited to the wetter months of the year;

a number of existing bores are present throughout the project area that are currently used for stock watering or other agricultural purposes. Should the installation and development of new bores be required during construction, a South Australian Government permit (from the Department of Water and Natural Resources) will be required for each new bore;

the stability of turbine footings in close proximity to steep slopes must also be assessed, particularly where the rock mass is highly fractured or has unfavourably orientated defects; and

any new excavations that expose the soil profile must be provided with protection from erosion, and mitigation measures such as silt fences may be required down gradient of active earthworks areas to avoid fouling the natural creeks.

A number of the findings of these investigations will be incorporated into the Construction, Environmental Management Plan for the site.

6.11 SOCIO-ECONOMIC IMPACT ASSESSMENT

Hudson Howells Strategic Management Consultants have prepared a Socio-Economic Impact Assessment for the Twin Creek Wind Farm project and this report is included in its entirety in Volume 2 of the application documents. The Executive Summary of the Socio-Economic Impact Assessment report, as quoted below, provides a succinct summary of the socio-economic impacts of the project.
This socio-economic impact assessment focuses on the effect of the Twin Creek Wind Farm Project on regional incomes and employment associated with the construction and operating phases of the project. This effect arises through the primary expenditure directly associated with the project, and then from further ‘rounds’ of indirect expenditure that this direct expenditure stimulates as it flows to supplying industries and into incomes and consumption.

The economic modelling for the project has been undertaken using indicative assumptions with respect to labour supply. The commitment of the project developers is that there will be prioritisation of local contractors wherever possible, but the modelling assumes that the wind turbine generators are imported from interstate or overseas, and the major local impact is based on transport and assembly.

From a State perspective, economic modelling indicates that the project will generate $209 million of value added (which is a net contribution to Gross State Product) in the State of South Australia over the period of construction and that this would happen over three years (allowing for lagged flow through effects). 1,447 person years of employment in South Australia would be supported — or an average of over 4803 jobs sustained per year over three years. Once operational the project is estimated to support annually $15.5 million of value added in South Australia, and support directly and indirectly in the order of 105 jobs per year.

The impact at the national level would be similar to the state level, unless there are constraints in national labour and capital markets with such constraints likely to be limited in the current macroeconomic environment.

From a regional perspective, the modelling indicates that the project will generate $64 million of value added (contribution to Gross Regional Product) in the region (Barossa and Lower North) over the period of construction and, again allowing for lagged flow through effects, this would happen over three years. 477 person years of employment would be supported, or an average of over 159 jobs sustained per year over three years. Once operational the project is estimated to support annually $6.2 million of value added in the region, and support directly and indirectly (including the multiplier impact) approximately 44 jobs per year.

From a local perspective, based on the assumptions used (which involve the project drawing labour from both the Goyder and Light areas) the modelling indicates that the project will generate:

- $18 million of value added (contribution to Gross Regional Product) in the LGA of Goyder over the period of construction and, again allowing for lagged flow through effects, this would happen over three years. 130 person years of employment for local residents would be supported, or an average of 43 jobs sustained per year over three years. Once operational the project is estimated to support annually $1.8 million of value added in the region, and support directly and indirectly (including the multiplier impact) approximately 12 jobs per year.
• $20 million of value added (contribution to Gross Regional Product) in the LGA of Light over the period of construction over three years. 146 person years of employment for local residents would be supported, or an average of 49 jobs sustained per year over three years. Once operational the project is estimated to support annually $2.3 million of value added in the region, and support directly and indirectly (including the multiplier impact) approximately 16 jobs per year.

The above economic modelling results are summarised in the following tables:

### 3 Year Construction Impacts

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<td>$209.1 million</td>
<td>1447; or 482 per annum</td>
<td>$64.3 million</td>
<td>477; or 159 per annum</td>
<td>$18.3 million</td>
<td>130; or 43 per annum</td>
<td>$20.1 million</td>
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### Annual Operational Impacts

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<td>$15.5 million</td>
<td>105 per annum</td>
<td>$6.2 million</td>
<td>44 per annum</td>
<td>$1.8 million</td>
<td>12 per annum</td>
<td>$2.3 million</td>
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These outcomes are based on assumed levels of local supply, and where more of the activity can be retained in the region (while acknowledging the specialist nature of the construction itself), the more extensive the degree of regional economic activity.

Wind farms can have other positive and negative socio-economic impacts depending on a variety of factors and the specific communities being impacted by the developments. For example, farmers hosting turbines may receive positive financial benefits while other communities might be subject to visual impacts from windfarm infrastructure with no financial benefits. In addition to employment and income generation, property values and carbon emissions are socio-economic externalities of wind farms.
In relation to property values, many studies by independent organisations around the world have failed to find any correlation between wind turbines and declining property values. Some studies have found positive property value impacts associated with:

- improved regional amenities and infrastructure including local roads, firefighting access roads, etc;
- increased regional incomes, jobs and property demand (as assessed above);
- additional rental income from hosting wind turbine generators;
- provision of a drought-proofing income streams;
- provision of post-retirement income for farmers;
- improved biodiversity via less intensive farm activity;
- prevention of land subdivision and slowing down the process of productive agricultural land changing to rural residential uses in the short to medium term with the shift caused by the additional income generated from the wind farm providing additional cash streams to underpin agricultural use; and
- erosion control and passive wind protection for stock from sub stations and turbine wind turbine generators structures.

There will be localised positive and negative impacts associated with wind farms depending on individual property locations. Some may appreciate faster than market trends due to improved farm incomes from hosting wind turbine generators and improved access to infrastructure. Some may fail to keep pace with market trends due to visual and noise impacts.

Potential disruption during wind turbine generator assembly and infrastructure establishment is also noted. However, the evidence supports no overall long term negative impact on property values associated with wind farm developments.

Finally, renewable wind energy generation has significant environmental benefits through carbon emissions reduction where it replaces coal or gas generated electricity.

It is assumed that the Twin Creek Wind Farm will have the following operating characteristics:

- total wind farm capacity of up to 183 megawatts;
- annual average utilisation rate of 40%; and
- total generation of 613 Gigawatt hours (Gwh) per annum.
It is conservatively assumed that when electricity is generated through coal fired stations, it produces 0.8 tonnes of carbon per megawatt hour of electricity generated. So the generation of 613 Gwh per annum through coal generation would produce in the order of 0.491 million tonnes of carbon emissions. At a carbon price of $20 per tonne (historically conservative relative to international trading schemes, and much lower than what is expected in the longer term – but matching current prices), the value of carbon emission savings associated with the Twin Creek Wind Farm is estimated to be $9.8 million per annum or a net present value of $104 million over a 20 year period (discount rate of 7% real).

6.12 DEVELOPMENT PLAN ASSESSMENT

The site of the Twin Creek Wind Farm and Energy Storage Project is located across three Local Government Areas, including the Light Regional Council, the Regional Council of Goyder and the Mid Murray Council. Infrastructure including wind turbine generators, on site substation, operations and maintenance compound, temporary construction compounds (including concrete batching plant) are located within the Light Regional Council and Regional Council of Goyder area. The transmission line transverses from within the Light Regional Council area to the Mid Murray Council area and terminates with a terminal substation east of Truro.

In each of the three Council areas, the site of the proposed development is within a Rural or Primary Production Zone. Within these zones, a “wind farm and ancillary development such as substations, maintenance sheds, access roads and connecting power lines (including to the National Electricity Grid)” is a consent land use.

More specifically, the site of the proposed Twin Creek Wind Farm is located within the following zones:

• Primary Production Zone, General Farming Policy Area 3, Light Regional Council Development Plan (consolidated 8 December 2016);

• Primary Production Zone, Goyder Council Development Plan (consolidated 24 November 2016); and

• Rural Zone, Hills Policy Area 14, Mid Murray Council Development Plan (consolidated 14 June 2017).


An assessment of the merits of the wind farm must be undertaken against the relevant provisions of each of the three Development Plans.

Following an assessment of the proposed development against the provisions of the Light Regional Council Development Plan, the Goyder Council Development Plan and the Mid Murray Council Development Plan, it is considered that the proposed development is not significantly at variance with the Development Plan.
In summary, MasterPlan conclude that the proposed development has substantial planning merit when assessed against the relevant provisions of the three Development Plans, including:

- a wind farm and ancillary development is an envisaged land use within the Primary Production and Rural Zones;
- the site of the development is outside of the Barossa Valley Character Preservation District;
- retention of the principal and underlying land use of the locality, that is primary production;
- the proposal is unlikely to adversely impact on aerial agriculture within the locality;
- the development is a renewable energy facility that provides a benefit to the community and the state;
- the siting and design of the wind farm and energy storage facilities adequately minimise the impact on the natural environment;
- the proposal contains suitable methodology for minimising and managing impacts on Pygmy Blue Tongue Lizards;
- the development does not adversely affect safety of water or air transport;
- the minimum setback of 1,000 metres to all non-associated (non-stakeholder) dwellings for a wind turbine generator is exceeded by the development which incorporates a minimum 2,000 metre setback;
- there are no known tourist accommodation facilities within the locality (that is, within 1,000 metres of the nearest wind turbine generator);
- there are no townships, settlements or urban zones within 2,000 metres of any wind turbine generators;
- predicated noise levels are compliant with relevant noise criteria for sensitive receivers;
- the turbines are designed to minimise glare/blade glint;
- the wind farm is compliant with guidelines for theoretical and actual shadow flicker to owners and occupiers of non-stakeholder dwellings;
- the proposal contains suitable methodology that minimises impacts such as dust, noise and vibration through the construction phase;
- the proposal contains suitable methodology for managing traffic movements, particularly during construction;
• the proposal contains suitable methodology for minimising the visual impact of the infrastructure (other than wind turbine generators) via new vegetation planting in appropriate locations;

• the proposal contains suitable methodology for minimising and managing impacts of EMI; and

• the proposal contains suitable methodology for managing bushfire risks.

On balance, the proposed Twin Creek Wind Farm and Energy Storage project is a suitable form of development within the Primary Production and Rural Zone, that appropriately addresses potential impacts and thereby warrants the granting of Development Plan Consent.
CHAPTER 7 –

CONCLUSIONS
CHAPTER 7 – CONCLUSIONS

The following provides an overview for the acceptability of the environmental and other impacts of the proposal, as detailed throughout this Volume 1 summary of the development application.

The Twin Creek Wind Farm and Energy Storage project is being developed as a commercially viable project. At a national level, the project will contribute to Australia’s economic health through reduced reliance on non-renewable resources. The Twin Creek Wind Farm will provide close to an additional 613 Gigawatt hours (Gwh) per annum, over the operating life of the wind farm. This generation is equivalent to the electricity needs of approximately 118,000 South Australia homes each year, (assuming the average annual household electricity use is 5,200 kWh per annum).

In addition to the electricity generation, the battery storage with an indicative capacity of 215 MW aligns with the South Australia Government Energy Plan to ensure that energy can be dispatched as it is needed to provide energy security.

The project will have a direct and tangible contribution to both the Australian Government’s South Australia Governments Renewable Energy Target. In accord with the goals of the South Australian Energy Plan of March 2017 the project will assist South Australia to provide reliable, competitive and clean power into the future.

The value of carbon emission savings therefore associated with the proposed development is estimated to be $9.8 million per annum or a net present value of $104 million over a 20 year period (real discount rate of 7%)”. Emission savings will directly assist the achievement of state, national and global targets for reduced greenhouse gas emissions.

The project area comprises approximately 5,600 hectares; the majority of which is used for grazing or cropping. Of the total project area, approximately 2.0 percent of the land will be utilised for the wind farm development. Accordingly, existing land uses can largely continue without effect. Wind farm and ancillary infrastructure are envisaged land uses within the Primary Production and Rural Zones of the Light Regional Council, Regional Council of Goyder and Mid Murray Council Development Plans.

The project has been designed to avoid vegetated areas which provide important habitat as far as possible, and micro-siting of project elements will further assist in avoiding vegetated areas. Impacts on avifauna have been assessed and the project is not expected to cause effect to any threatened species which occur, or may occur within the project area. The proposal is unlikely to diminish biodiversity values of the region, and has been assessed as unlikely to impact threatened species/communities identified within the project area including the Pygmy Blue-Tongue Lizard.

Although visual effect of the wind turbine generators and associated infrastructure is likely to be moderate to substantial within the local and subregional area, as distances increase, the degree of visual change reduces significantly and in most areas, is described as slight. The wind farm is not expected to be detrimental to the landscape and wider amenity of the region. There are no visually sensitive or scenic areas in the region.
Vegetation screen planting along roadsides and adjacent infrastructure elements such as compounds and substations will further assist minimising visual impacts.

There are no wind turbine generators proposed within 2.0 kilometres of any non-stakeholder dwelling. There is no adverse impact on any non-stakeholder dwelling from blade glint, shadow flicker or noise.

An assessment of the noise levels of the wind farm has been undertaken and the predicted noise levels achieve the requirements of the Wind Farms Environmental Noise Guidelines 2009 at all residences. Compliance with the SA Guidelines will inherently provide an adequate level of protection of amenity in the surrounding area from low frequency noise impacts.

Potential impacts have been identified on television transmission for some dwellings with areas of poor or marginal reception, and those in the down range diffraction zone of the wind farm. Mitigation measures are available for those dwellings affected. Similarly, mitigation options are available to address the potential impacts identified on Flow FM radio signal broadcast.

There are unlikely to be any unreasonable impacts to soil, water and air quality as a result of the proposed development, as the project has been designed according to the physical features of the project area. A range of mitigation and management measures will be incorporated into the Construction Environmental Management Plan to minimise airborne dust events, erosion, and soil discharge into watercourses.

A desktop heritage assessment of Aboriginal and non-Aboriginal heritage was undertaken for the development area. There are no items of European heritage within the boundaries of the project area. The assessment did not identify any specific locations of Aboriginal heritage within the project area, but recognised that earthworks may uncover Aboriginal Cultural remains. Although the potential for this to occur is low, the assessment recommended engagement with the Ngadjuri Nation Aboriginal Corporation. A field survey/site discovery procedure is currently underway with the traditional owners, however this is separate and independent of the development application assessment process.

The construction phase of the project will result in increased traffic to and from the site including the movement of restricted access vehicles. A Traffic Management Plan will be prepared as part of the Construction Management Plan to ensure the works can be undertaken safely and with minimal disruption to local traffic. Once operational, the traffic entering the wind farm site will be negligible.

The potential for bushfire risks, physical safety issues and aircraft safety have also been reviewed, and management measures proposed as necessary. Following the implementation of management measures, these risks are expected to be ‘low’. Recommendations of the Bushfire Management Plan will be incorporated as part of the Operational Environmental Management Plan.
A mix of positive and negative opinion has been expressed in relation to the project to date from the public consultation processes undertaken. Some amendment to the design of the project has occurred as a direct result of the consultation process. The proponent is aware of the necessity for an effective and genuine ongoing public consultation programme, and has outlined a methodology for continued meetings with neighbours and community stakeholders, updates to local media providers, notices to community, and liaison with local government regarding the future stages of the project.

The project will provide for a range of flow-on economic effects, particularly during the construction phase of the project, including income to local service providers, employment to a large temporary workforce, improvements to local infrastructure, and benefits related to the financial agreements of the land owners within the project area.

In a broader sustainability sense and with consideration of the broader ‘public interest’, the project can be implemented with minimal environmental impacts to the project area and its location, and is a sustainable energy development. The wind farm will assist in addressing global concerns about climate change, and assists in inter-generational and social equity through reducing society’s consumption of finite resources.

Whilst there will be some effects to the region as a result of the wind farm and energy storage project, these are generally limited to short term transport and construction effects, which will be managed through Construction and Operational Environmental Plans. Overall, it is considered that any adverse impacts will be relatively minor and will be outweighed by the positive longer term environmental, social and economic benefits of the project.
CHAPTER 8 –

STATEMENT OF COMMITMENTS
**CHAPTER 8 - STATEMENT OF COMMITMENTS**

The Statement of Commitments (Commitments) relate to overall project management and specific measures, during final design and pre-construction planning, construction, operation, and decommissioning. RES Australia will work with all stakeholders during compliance reviews and if by chance there is non-compliance, measures will be taken to rectify the problem.

The Statement of Commitments will be finalised to address the planning authorities conditions of Development Plan Consent (if granted). Implementation of the Commitments and the performance of the project’s environmental management system will be subject to periodic reviews and corrective action if/as required.

### 8.1 General and Administrative Commitments

<table>
<thead>
<tr>
<th>Issue</th>
<th>Commitment</th>
<th>Timing</th>
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<tbody>
<tr>
<td>Scope of development</td>
<td>RES will carry out the development in accordance with the information contained within development application and in compliance with the conditions of Development Plan Consent.</td>
<td>Ongoing</td>
</tr>
<tr>
<td>Minimising harm to the environment</td>
<td>RES will implement all practicable measures to prevent and minimise any harm to the environment that may result from the construction, commissioning, operation, maintenance and decommissioning of the development.</td>
<td>Ongoing</td>
</tr>
<tr>
<td>Statutory requirements</td>
<td>RES will ensure compliance with all relevant environmental requirements and ensure that all necessary approvals, licences and permits are obtained and are kept up to date as required throughout the life of the development. Copies of these documents will be maintained at the Site Office and Environmental Management Plans (EMP's) will include measures to ensure compliance.</td>
<td>Ongoing</td>
</tr>
<tr>
<td>Decommissioning</td>
<td>At the end of its economic life, all equipment will either be replaced with comparable new equipment, or the wind farm will be decommissioned. Replacement may be subject to new approvals.</td>
<td>Upon decommissioning</td>
</tr>
<tr>
<td></td>
<td>A decommissioning and rehabilitation plan would be prepared and submitted to the relevant planning authority for approval (if/as required) prior to decommissioning commencing. This plan would include relevant technical reports that are required to inform the decommissioning process and minimise environmental harm and impact on the amenity of the community within the locality or as maybe affected.</td>
<td>Prior to decommissioning</td>
</tr>
<tr>
<td></td>
<td>Decommissioning would involve dismantling or removal of all equipment, and site rehabilitation. Turbine footings would be retained at a level below the ground surface, as acceptable to the land owner. Access tracks may be retained depending on the land owners’ wishes. Any overhead wires no longer required will be removed.</td>
<td>During decommission</td>
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126
## Community Consultation

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<tr>
<th>Issue</th>
<th>Commitment</th>
<th>Timing</th>
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<tbody>
<tr>
<td>Notice of construction activities</td>
<td>RES will ensure that the local community and businesses are advised of construction activities that could cause disruption prior to those activities occurring. Communication methods will be detailed within the final CEMP. Information will include: - details of traffic disruptions and controls; - construction of temporary detours; and - work approved to be undertaken outside standard construction hours, particularly noisy works.</td>
<td>Prior to disruptive works.</td>
</tr>
<tr>
<td>Periodic project updates</td>
<td>The following will be updated to local media providers, as update newsletters circulated to local papers: - periodic updates of work progress, consultation activities, and planned work schedules when significant changes in noise or traffic impacts are expected.</td>
<td>As required</td>
</tr>
<tr>
<td>Periodic project updates on project website</td>
<td>RES will maintain a project website until construction ends. The website will contain: - periodic updates of work progress, consultation activities, and planned work schedules when significant changes in noise or traffic impacts are expected. The website will indicate the date of the latest update and expected frequency of updates; - a description of the relevant approval authorities and their areas of responsibility; - project reports and plans that are publicly available for download; - contact names and phone numbers of relevant communications staff; and - a 24 hour toll-free complaints contact telephone number.</td>
<td>Ongoing until construction is complete</td>
</tr>
<tr>
<td>Construction noise communication requirements</td>
<td>Prior to the commencement of construction, neighbours to the wind farm site will be informed of the construction works, the nature and duration of components of the construction phase, the potential impacts and contact details for registering components or enquires. The developer will provide noise and vibration elements into the community consultation process. The aim of consultation will be to ensure adequate community awareness and notice of expected</td>
<td>Prior to construction commencing and as required</td>
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<td>Issue</td>
<td>Commitment</td>
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<tr>
<td>construction noise. Consultation will include:</td>
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<td>- regular community information newsletters providing details of the construction plan and duration;</td>
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<tr>
<td>- a site notice board in a community location(s) providing copies of the newsletters, updated construction programme details, contact details of the project team members, and an ability to register for email updates of the newsletter;</td>
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<tr>
<td>- a feedback mechanism for the community to submit questions to the construction team and for the construction team to respond;</td>
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<tr>
<td>- regular updates on the construction activities to local authorities to assist in complaint management if necessary; and</td>
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<tr>
<td>- contact details of the project manager and/or site ‘environmental representative’.</td>
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<tr>
<td>Complaints management</td>
<td>Prior to construction commencing, RES will ensure the following is available:</td>
<td>Prior to construction commencing</td>
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<tr>
<td>BWFPL will keep record of a Complaints Register for a period of at least four years after the complaint was made. This will include:</td>
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<td>- the date and time of the complaint;</td>
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<td>- whether the complaint was via mail, email or telephone;</td>
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<td>- any personal details provided (if any) or a note if no details were provided;</td>
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<td>- the nature of the complaint;</td>
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<td>- any action(s) taken by BWFPL in relation to the complaint, including follow-up; and</td>
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<tr>
<td>- if no action was taken in relation to the complaint, the reason(s) why.</td>
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<tr>
<td>The Complaints Register will be made available for inspection upon request of the planning authority or other relevant government agency.</td>
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<tr>
<td>Additional consultation requirements communications</td>
<td>Additional consultation for the communication aspects of the project, as recommended by DNV GL in its EMI Assessment Report and the Ambidji Aviation Assessment report.</td>
<td>Prior to construction commencing</td>
</tr>
</tbody>
</table>
## 8.3 Design and Miscellaneous Measures

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<tr>
<th>Issue</th>
<th>Commitment</th>
<th>Timing</th>
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<tbody>
<tr>
<td>Project layout</td>
<td>The Twin Creek Wind Farm project is based upon the layout shown in the application documents and incorporates up to 53 wind turbine generators. The candidate turbine selected for all investigations is the Vestas 136. The actual turbine model and number to be installed may vary slightly dependant on the final design conditions. Micro-siting of individual turbine locations up to 100 metres is proposed, however any micro-siting changes will be consistent with consent, otherwise a modification will be sought. Adjustment will consider relevant sensitivities of the location. The final design will be subject to Building Rules Consent and Development Approval.</td>
<td>Prior to construction commencing</td>
</tr>
<tr>
<td>Cable routes</td>
<td>Cable routes will be located alongside access tracks to minimise site disturbance.</td>
<td>During construction</td>
</tr>
<tr>
<td>RES</td>
<td>RES will require the design of facilities and services buildings to incorporate the collection of roof drainage.</td>
<td>Prior to construction commencing</td>
</tr>
<tr>
<td>Wastewater systems</td>
<td>Wastewater systems would be designed in accordance with Council requirements. Approvals will be obtained prior to installation.</td>
<td>Prior to construction commencing</td>
</tr>
<tr>
<td>RES design</td>
<td>RES will confirm design and siting of temporary construction site offices prior to obtaining Development Approval.</td>
<td>Prior to construction commencing</td>
</tr>
<tr>
<td>Project contractor</td>
<td>If the project contractor seeks to utilise the approval for the temporary concrete batching plant on site, the contractor will be required to obtain any further licenses required.</td>
<td>Prior to construction commencing</td>
</tr>
<tr>
<td>Permanent tracks</td>
<td>Permanent tracks will be located to achieve suitable grades on stable slopes and design to that they will not exacerbate erosion. Location will be chosen to minimise visual impact from the surrounding countryside as far as possible. Earth batters on any tracks that are benched into slopes will be revegetated to prevent erosion and to reduce visibility of the constructed tracks.</td>
<td>Prior to construction commencing</td>
</tr>
<tr>
<td>Aboriginal Heritage</td>
<td>Complete a site discovery procedure with the Ngadjuri Nation Aboriginal Corporation</td>
<td>Prior to construction commencing</td>
</tr>
<tr>
<td>Undertake construction</td>
<td>Undertake construction in accordance with the South Australian Aboriginal Heritage Act (1988), which establishes site reporting requirements during construction so that the works does not “damage, disturb or interfere” with an item, object of site of Aboriginal Heritage</td>
<td>During construction</td>
</tr>
<tr>
<td>Staff information</td>
<td>Ensure staff undertaking construction are appropriately inducted to be aware of the risks and have idea of how to identify Aboriginal cultural heritage.</td>
<td>Prior to construction commencing</td>
</tr>
<tr>
<td>Issue</td>
<td>Commitment</td>
<td>Timing</td>
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<tr>
<td>Visual impact measures</td>
<td>Measures to mitigate the visual impact of the project will include:\n- turbines to be a matt white (non-reflective) finish and a three-bladed design;\n- underground cabling will be used throughout the wind farm wherever practical;\n- areas of existing native vegetation will be preserved as far as possible;\n- earthworks will be restored as soon as practical following the completion of construction;\n- cable trenches will be backfilled as soon as practical; and\n- access roads will be selected according to the pattern of existing tracks within the project area and to reduce visual impact.</td>
<td>During construction</td>
</tr>
<tr>
<td>Visual screen planting</td>
<td>Visual screen planting will be located in the following locations including:\n- between the terminal substation and Sturt Highway\n- to the south of the on-site substation Additional screen planting will be undertaken subject to land owner and neighbour’s requests. A landscape management plan will be prepared to manage the establishment and maintenance of newly established landscape areas.</td>
<td>During construction</td>
</tr>
<tr>
<td>Shadow Flicker</td>
<td>If shadow flicker presents a problem for stakeholder Dwelling 147, mitigation strategies to reduce the duration of shadow flicker experienced will be undertaken. The mitigation measures may include:\n- installation of screening structures or planting of trees to block shadows cast by the turbines,\n- use of turbine control strategies which shut down turbines when shadow flicker is likely to occur</td>
<td>Post construction and during operation</td>
</tr>
<tr>
<td>Aviation safety</td>
<td>Final details of the height and location of each wind turbine generator and wind monitoring towers be provided to CASA, Department of Defence, AirServices Australia, the Aerial Agricultural Association of Australia and operators of Gawler, Stonefield and Truro Flat ALA’s. The wind monitoring towers be constructed with appropriately marked, preferably using high visibility balls on the guy wires</td>
<td>Before erection of the wind turbine generators Construction of wind monitoring towers</td>
</tr>
</tbody>
</table>
### 8.4 Flora and Fauna Mitigation Measures

<table>
<thead>
<tr>
<th>Issue</th>
<th>Commitment</th>
<th>Timing</th>
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<tbody>
<tr>
<td><strong>Acoustics</strong></td>
<td>A final noise assessment will be conducted to confirm compliance with the Wind Farms Environmental Noise Guidelines 2009 when the WTG, transformer and air conditioning selections are available at the procurement stage of the project, with guaranteed sound power levels provided by the manufacturers. The final noise assessment report will be submitted to the relevant authorities prior to the commencement of construction.</td>
<td>Prior to construction</td>
</tr>
<tr>
<td><strong>Flora and Fauna Mitigation Measures</strong></td>
<td></td>
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<tr>
<td><strong>Issue</strong></td>
<td><strong>Commitment</strong></td>
<td><strong>Timing</strong></td>
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<tr>
<td><strong>Project layout</strong></td>
<td>Submit a EPBC referral for the project in relation to PBTL</td>
<td>Prior to construction commencing</td>
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<td></td>
<td>Submit and obtain approval for the clearance of native vegetation as required by the Native Vegetation Act 1991. Identify SEB offset areas.</td>
<td>Prior to construction commencing</td>
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<td></td>
<td>Micro-site wind turbine generators and other infrastructure and access tracks to avoid PBTL</td>
<td>Prior to construction commencing</td>
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<td></td>
<td>During final design, construction and operation of the project, provide a 500 metre buffer from any wind turbine generator to the three known Wedge Tailed Eagle nests within the development site</td>
<td>Ongoing</td>
</tr>
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<td></td>
<td>During final design, construction and operation of the project, provide a 200 metre buffer between wind turbine generators and woodland habitat</td>
<td>Ongoing</td>
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<td></td>
<td>Avoid removal of woodland areas that contain tree hollows that may provide nesting cavities.</td>
<td>Construction and ongoing</td>
</tr>
<tr>
<td><strong>Management Plans</strong></td>
<td>Development a Weed Management Plan/Rehabilitation Plan. Management of declared and environmental weeds maybe part of the SEB options.</td>
<td>Prior to construction</td>
</tr>
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<td></td>
<td>Development a Construction Environmental Management Plan (CEMP) which incorporates best practice environmental management measures including:</td>
<td>Prior to construction</td>
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<td>- vehicles and equipment should be cleaned to ensure they are free of plant material and soil, to reduce the dispersal of exotic flora species into, out of, and within the project area</td>
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<td></td>
<td>- Control of declared and environmental weeds found within the site</td>
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<td>- Minimise the construction footprint e.g. along access roads, in turn-around areas and around turbine pads</td>
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<td>- Staff training to ensure they are aware of the threatened flora and fauna species and ecological communities present and potentially present; and the potential and actual impacts of</td>
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<td>Issue</td>
<td>Commitment</td>
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<tr>
<td></td>
<td>construction, operation and maintenance of the proposed wind farm on flora and fauna species and habitats.</td>
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</table>

### 8.5 Bushfire Mitigation Measures

<table>
<thead>
<tr>
<th>Issue</th>
<th>Commitment</th>
<th>Timing</th>
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</table>
| Bushfire Risk Management: Design Components | The potential fire risk associated with electrical failure will be managed by the following measures:  
- use of fully enclosed electrical equipment on turbine structures and pad-mount transformers;  
- extensive use of underground cabling between turbines;  
- design of any overhead lines in accordance with industry standards;  
- exclusion of vegetation from within the substation enclosure; and  
- use of circuit breakers and fuses to interrupt any electrical fault. | During project design |
| Project Design | In consultation with the CFS, identify the appropriate size and location of static water points onsite | During final design |
| | Install agreed static water storage tanks (as appropriate) in the form of above ground water tank constructed of concrete or steel. | During construction |
| Bushfire Management Plan | In consultation with the CFS, prepare a Bushfire Management Plan that addresses the following during construction:  
- Activities to be undertaken during the Fire Danger Season are appropriate under the Fire and Emergency Services Act and Regulations 2005 Division 4 - Fire Prevention of the regulations.  
- Staff, contractors and site visitors to be informed of fire response procedures that follow identified legislative requirements, policies and procedures.  
- Works during the fire danger season to have appropriate permits from Local Government, (Goyder, Light Regional and Mid Murray Councils).  
- Construction and operational works follow appropriate Work Health and Safety requirements.  
- Principal Contractor to ensure there is a bushfire survival plan for personnel at the site.  
- Facilitate a high standard of communication with landowners, relevant stakeholders and the | Prior to construction |
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<th>Timing</th>
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| community regarding daily activities through community liaison groups or similar. | • Primary contact person for the community to contact with concerns, questions or issues to be established.  
• Ensure all contractors:  
  - Are appropriately briefed and understand their legal obligations in relation to managing bushfire risks.  
  - Have appropriate procedures, safe work practices, contingency plans, MSDS for operation of all equipment, chemicals, flammable materials that may contribute to bushfires.  
• Have appropriate “initial” suppression equipment available on site i.e. fire extinguishers or firefighting equipment in vehicles.  
• Carry emergency communications equipment.  
• Vehicles should keep to the tracks whenever possible.  
• Restrict low clearance vehicles with catalytic converters from entering the site on high fire danger days.  
• Restrict smoking to prescribed areas.  
• Consider a policy of “no work” or “essential work only” on declared Catastrophic Fire Danger Days.  
• Provide appropriate bushfire training for contractors and staff.  
• Establish an “APZ” of at least 40 m around each turbine (Clear vegetation, such as scrub, trees, etc. within 40 m of a turbine) and consider other zoning strategies to assist bushfire mitigation (e.g. BBZ as per DEWNR zoning policy).  
• Ensure all building construction is in line with CFS regulations and Minister Specifications of building in Bushfire risk areas.  
• Ensure appropriate bunding in areas where there is potential for flammable fuels and oils to leak and create bushfires or other environmental risks.  
• Ensure all access roads and tracks are identified and meet GAFMWG standards for emergency vehicle access. (Govt SAd, 2008).  
• Consider appropriate signs (as per GAFMWG standards) to assist emergency response crews determine track names, location and turbines etc.  
• Establish emergency assembly areas.  
• Consider the option to have all power lines underground.  
• Ensure all environmental risks of construction have been considered and approved by relevant authority.  
• Consider security fencing as necessary around |        |
## Issue

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| Turbines and substations to prevent public access.  
- Provide adequate access tracks to assist CFS in responding to and managing fires on site.  
- Ensure adequate access to water for CFS, and/or for sprinklers, and the provision of onsite static water supplies.  
- Consider early fire/smoke detection systems, in built fire protection systems, remote alarming and notification systems in turbines to report potential bushfire risks from any mechanical or electrical failures. | Prior to commission and ongoing |
| Ensure that the Bushfire Management Plan incorporates the following for the operation phase of the project:  
- Invite local brigades on regular site familiarisation tours.  
- Communicate to community the bushfire risk mitigation works undertaken.  
- Provide site plans to CFS marking assets, access points, tracks, firebreaks, hazards and water points once facility is constructed.  
- Undertake regular inspections and maintain records of all turbines, the substation, and power lines (including easements).  
- Ensure suitable firefighting equipment is available onsite or readily accessible  
- Ensure staff and contractors are trained in firefighting equipment and have appropriate personal protective clothing.  
- Ensure the maintenance of fuel load management zones (A and B zones).  
- Consider remote shut down possibilities of turbine operations during high bushfire risk days, actual bushfires or reported faults.  
- Consider lightning conductors to dissipate electricity to ground and reduce turbine damage and bushfire risk.  
- Ensure all access roads and tracks are maintained to meet GAFMWG standards for emergency vehicle access. | Prior to commission and ongoing |

### 8.6 Traffic Management

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<tr>
<th>Issue</th>
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<tr>
<td>Infrastructure Deed</td>
<td>Enter into an Infrastructure Deed with the Light Regional Council and Regional Council of Goyder in relation to upgrades of local roads proposed to be utilised during construction of the project</td>
<td>Prior to Development Approval</td>
</tr>
<tr>
<td>Issue</td>
<td>Commitment</td>
<td>Timing</td>
</tr>
<tr>
<td>------------------------------</td>
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<tr>
<td>Traffic Management Plan</td>
<td>Prepare a more detailed Traffic Management Plan will be developed once Development Approval is obtained. This Traffic Management Plan would incorporate:</td>
<td>Prior to construction</td>
</tr>
<tr>
<td></td>
<td>- Pre construction assessments of road pavements and infrastructure (such as structural assessment of the bridge on Bagot Well Road where it crosses St Kitt’s Creek) along access route to assess the required upgrading or likely rehabilitation.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Undertake further consultation with stakeholders and community</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Details of noise and dust mitigation.</td>
<td></td>
</tr>
<tr>
<td>Decommissioning</td>
<td>Prepare a Traffic Management Plan for the decommissioning of the development</td>
<td>Post economic life of the development</td>
</tr>
</tbody>
</table>

### 8.7 Communications and Television

<table>
<thead>
<tr>
<th>Issue</th>
<th>Commitment</th>
<th>Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Telecommunication mitigation measures</td>
<td>Prior to construction, RES will ensure that the final turbine layout is assessed in terms of their potential impact on fixed path radio links in the locality to ensure services are not disrupted or degraded. Where necessary, the relevant communication service operator will be contacted to confirm operational details.</td>
<td>Before construction commences</td>
</tr>
<tr>
<td>Television Reception</td>
<td>RES to rectify television reception of dwellings affected by the project via one of the following options:</td>
<td>Post construction</td>
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<tr>
<td></td>
<td>- Realigning the householder’s television antenna more directly towards their existing transmitter.</td>
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<td></td>
<td>- Tuning the householder’s antenna into alternative sources of the same television signal or a substitute signal.</td>
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<td></td>
<td>- Installing a more directional and/or higher gain antenna at the affected house.</td>
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<td></td>
<td>- Relocating the antenna to a less affected position.</td>
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<tr>
<td></td>
<td>- Installing cable or satellite television at the affected house.</td>
<td></td>
</tr>
</tbody>
</table>