



Trustpower

Palmer Wind Farm
Development Application Report

Volume 3
Impact Assessment

August 2014

Executive Summary

The indicative layout for the Palmer Wind Farm has evolved in response to the issues identified through the community consultation and impact assessment process. Where possible the layout has avoided highly sensitive areas or Trustpower have agreed to adopt detailed design criteria or management practices to manage or minimise impacts. A summary of the impact assessment approach and layout refinements is also provided in Chapter 2 of Volume 1 of this application.

In general, the overall project is considered to have minimised its impacts to the extent that it warrants favourable consideration.

The Development Plan Assessment analysis concluded that the proposed development is not significantly at variance with the Mid Murray Council Development Plan. In addition it identifies that the proposed Palmer Wind Farm adequately and appropriately addresses potential impacts, particularly those associated with noise, protection of flora and fauna, European and Aboriginal heritage and traffic movements in a manner sought by the Development Plan.

Impact Assessments

A range of impact issues were considered and assessed with specialist input. These included:

- Landscape and Visual Impact Assessment
- Flora and Fauna Assessment
- Noise Impact Assessment
- Cultural Heritage Site Assessment
- Traffic Impact Assessment
- Civil, Geology, Geotechnical and Hydrology Assessment
- Electromagnetic Interference Assessment
- Aeronautical, Aviation and Qualitative Risk Assessment and Obstacle Lighting Review
- Shadow Flicker and Blade Glint Assessment
- Economic Impact Assessment
- Fire and Bushfire Impact
- Health Impacts

These matters are addressed in the relevant Sections of this Volume and Volume 4. Each section includes a summary of the issue, sets out key findings and lists agreed management responses which have then formed the basis of the Statement of Commitments in Volume 1. The relevant specialist reports are included in each section, except four reports that have been provided separately in Volume 4 to enable easier referencing.

The following is a summary of the key findings:

With respect to **Landscape and Visual impact** it was concluded that the proposed wind farm, for the majority of the regional landscape, is likely to be experienced as a moderate visual effect. Areas of potential substantial effect were identified, particularly around Harrison Gorge, where the turbine layout was refined and number of turbines removed to minimise impacts. These visually effected locations remain defined within well contained topographic landscapes where views of the wider wind farm are often partially or completely screened.

The EBS Ecology study on **Flora and Fauna impact** identified matters for further consideration in relation to a number of locations proposed for infrastructure in the initial layout. These have been resolved through the redesign of the turbine layout and infrastructure corridors. Appropriate exclusion zone buffers to turbines and seasonal construction activity for Peregrine Falcons and Wedge-tailed Eagles have been agreed and incorporated. The majority of the project will be located within grazing land with minimal or no native vegetation component. Some native vegetation clearance will be unavoidable and separate Native Vegetation Clearance and EPBC referral approvals will be secured prior to construction commencement. The report includes recommendations as to how a number of matters can be resolved and managed at the detailed siting stage and during the construction and operation phases.

Noise impact was a key consideration in the evolution of the conceptual layout. A noise impact assessment has been undertaken for the final planning application layout as contained in Volume 1. This assessment concluded that *the predicted noise levels achieve the requirements of the SA Guidelines at all relevant locations*. Furthermore, Trustpower have committed to ensuring that the final layout continues to comply with the SA Guidelines.

Substantial investigations have been undertaken with respect to **Cultural Heritage** and this will continue as the detail of the project is refined. While the desktop investigations found no recorded sites within the site of the project, the on-ground surveys identified a number of sites of Aboriginal significance. These are protected under the *Aboriginal Heritage Act* and will not be disturbed by the project. Trustpower will continue to work with ACHM and MACAI to finalise the detailed survey work and manage these sites via an agreed process and in accordance with the relevant Act. It should be noted that the information presented in this application respects confidentiality around sensitive matters as agreed with MACAI.

Further, it was recognised that there are places of community heritage value (not listed) which may be important in the context of general landscape and amenity values, including the dry stone walls. Trustpower has committed to avoid or minimise impact on these places through detailed design, careful siting and agreed management responses.

The **Traffic Impact** investigations found that the most significant impact on traffic will be during the construction phase, but that no major impacts are expected post construction as the access requirements will be minimal. The surrounding network is capable of providing access, although works are likely to be required to up-grade the road infrastructure to support access in various locations. The overall impacts and disturbance to infrastructure and other road users will be managed via an agreed Traffic Management Plan and Environmental Management Plan (traffic related). However, it was also observed that there will be a need to undertake a heavy vehicle assessment in accord with DPTI requirements to ensure issues are managed appropriately.

The **Civil, Geology, Geotechnical and Hydrology** assessment identified a number of construction related matters that will need to be addressed in the detailed design process and the lead up to the construction phase. These issues and potential site specific impacts are considered manageable within the context of a comprehensive Construction Environmental Management Plan.

An assessment of **Electromagnetic Interference** issues was undertaken for the final planning application layout as defined in Volume 1. This layout mostly avoids specific locations where interference may have been an issue. In one case, turbine (C21), has been identified as potentially having an impact on microwave point-to-point service, depending on the blade length selected. Trustpower, in consultation with the relevant telecommunication service provider, will ensure that the final turbine dimensions and associated layout and micro siting will not result in significant telecommunication service degradation. Consequently the current layout has only minor or no impact on EMI issues. The detailed layout design process will include an approach that continues to avoid or manage any potential impacts. The **Aeronautical,**

Aviation and Qualitative Risk Assessment and Obstacle Lighting Review found that the final planning application wind farm layout, as presented in Volume 1, is not of operational significance to aircraft safety, does not require obstacle lighting, does not impact on aviation communications, navigation and surveillance equipment, has a minimal impact on some low level military flying training, and does not impact on defence communications equipment. Final detailed design information will be provided to CASA and RAAF as the project evolves and post construction.

Consideration was given to **Shadow Flicker and Blade Glint** issues. Blade glint is no longer considered an issue for contemporary turbines as they use non-reflective coatings on the surface of the blades. The potential for shadow flicker was assessed using a geometric, theoretical analysis. When this theoretical analysis was combined with considerations such as turbine orientation changes and cloud cover, the predicted actual estimate for the most affected residences complies with the recommended limits. Trustpower will ensure that the final layout for construction will comply with the recommended limits for non-host dwellings and limits as agreed with host landowners.

The **Economic Impact Assessment** included economic modeling which identified that the project will generate \$407 million of value added (contribution to Gross State Product) in the State and \$107 million of value added (contribution to Gross Regional Product) in the region. It would support regionally an average of 320 jobs per year over 3 years during construction and 60 jobs per year during its 25 year operational time. In addition to an overall annual community benefit scheme that Trustpower has committed to once the project is constructed, Trustpower has also offered a financial benefit to direct neighbours through a Neighbouring Benefit Scheme agreement. The economic impact assessment also included a high level assessment of the impact on property values. While there are many factors that influence property values, the report identified that many robust studies, by independent organisations around the world, have failed to find any link between wind turbines and declining property values.

Chapter 13 contains an evaluation of **Fire and Bushfire impact**. In essence, there are numerous management responses available to minimise the potential for wind farms to cause fires including the preparation of a Bushfire Management Plan. With respect to the impact of wind farms on firefighting operations two key points were identified: the provision of additional access tracks aids the logistics of firefighting; and the presence of WTG are viewed by the CFS as just another structure (added to power lines, radio masts, tall trees) in the environment that needs to be considered. An agreed operational protocol will include measures in the final Bushfire Management Plan that will be agreed with the CFS, including turbine shutdowns where required for firefighting activities.

The final Chapter of this Volume briefly addresses **Health impacts**, having regard to a number of recent studies and investigations. The studies concluded “*there is no evidence linking the noise from the wind farm to adverse impacts on residents*” and that the EPA criteria for wind farm noise are adequate to ensure wind farms will not cause health issues. The most recent findings on wind farms and health were released in a draft information paper by the National Health and Medical Research Council in February 2014. The paper concludes that “*there is no reliable or consistent evidence that wind farms directly cause adverse health effects in humans.*” Trustpower will ensure that the Palmer Wind Farm will comply with the SA EPA noise criteria and shadow flicker limits identified in the respective reports.

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1. Impact Assessment Approach

1.1 Overview

The approach to the impact assessment for this project has been undertaken in an iterative manner. In general, the specialist consultants were first requested to consider an initial layout which was the 130 wind turbine layout that was released publically in the first newsletter in December 2013 (a copy of this layout is contained in Volume 1, Figure 2.3).

This assessment resulted in a set of recommendations with respect to the refinement of the location of the various elements of the wind farm project. These recommendations included:

- The identification of exclusion zones for various aspects of the project (i.e. those areas that needed to be avoided for at least one specific impact reason);
- The identification of areas of potential sensitivity within which elements might be located subject to more detailed considerations; and
- Consider various management or detailed design requirements that aim to avoid or manage impacts.

Trustpower then responded to this advice by avoiding exclusion zones, acknowledging the areas of sensitivity and agreeing to adopt the management and design criteria for the detailed layout process.

The exclusion zones are identified on the three A3 Figures that follow. The exclusion zones are areas that have been recommended as areas to be avoided by either turbines only or any infrastructure. These areas will also be avoided as a criteria of the detailed layout plan.

Areas of potential sensitivity are those areas that are likely to contain issues or matters of importance but it has been accepted that detailed siting can avoid unacceptable impacts. For example, some remnant vegetation may remain but a detailed siting process can help to identify locations of suitable cleared patches.

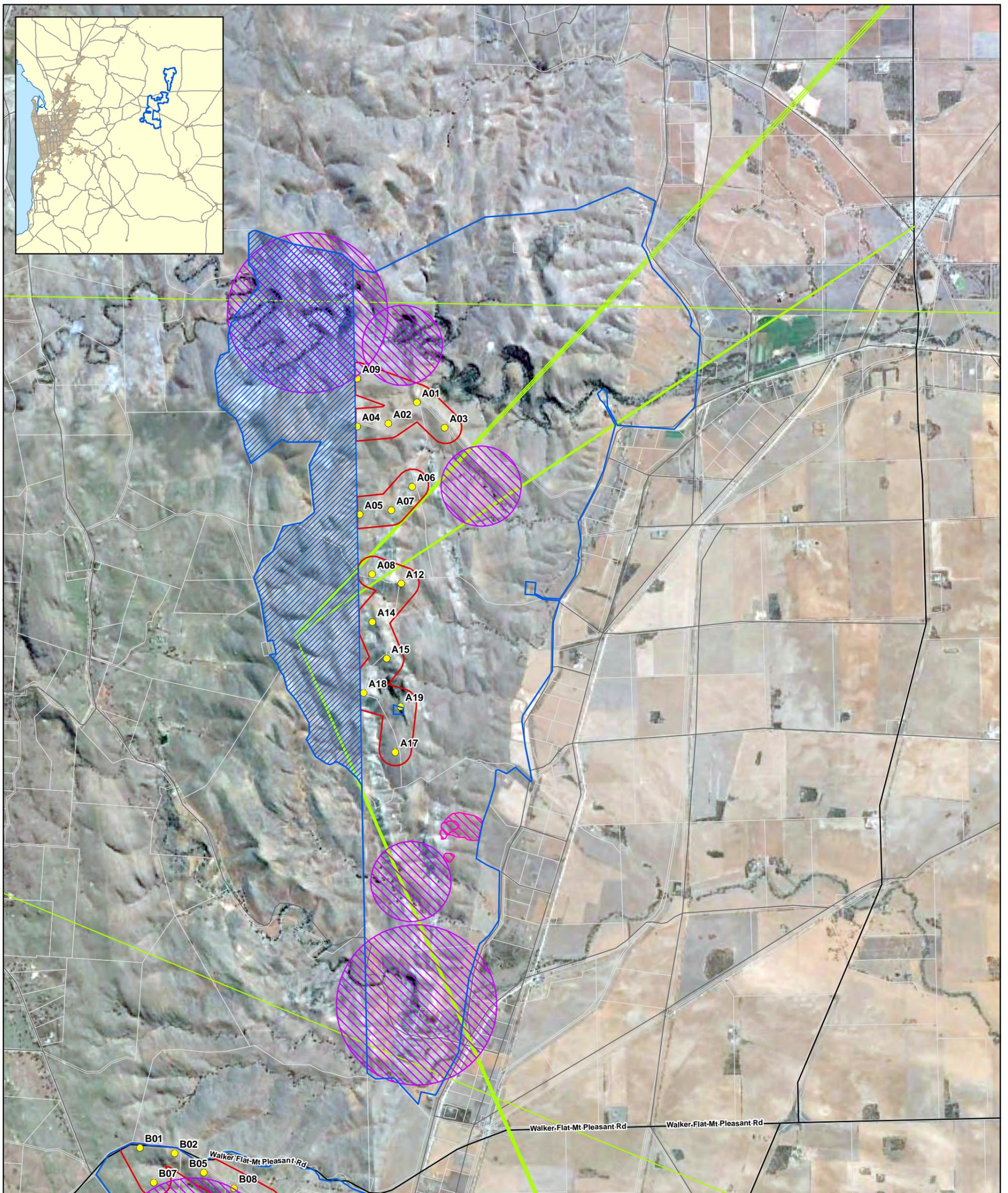
Areas of exclusion or sensitive areas are an important aspect of the impact assessment approach. In addition, the consideration of meeting accepted impact levels, criteria or policy is also an important aspect of impact management. Some elements of the impact assessment, such as noise, have identified specific criteria that needs to be achieved.

1.2 Agreed Impact Management Response

Where possible, the design approach for the indicative layout (as defined by the plans lodged in Volume 1) has been to address the impact issues in the following manner:

- Avoid turbine and other infrastructure exclusion zones;
- Minimise intrusion into potentially sensitive areas;
- Where intrusion into potentially sensitive areas cannot be avoided then seeking to minimise impacts through additional detailed survey work or criteria to guide detailed design (minimising impacts);
- Ensure that design criteria can be met (e.g. noise); and
- Adopt management responses where impacts can be further managed, mitigated or offset.

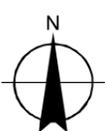
The specific, agreed measures are identified in this Volume and Chapter 6 of Volume 1.



Legend

- | | | |
|-----------------------------|--|-----------------|
| Project Boundary | Barossa Character Preservation District | Secondary Roads |
| Turbine Corridor | Recommended Exclusion Zones (EPBC Referral Required) | Minor Roads |
| Indicative Turbine Location | Flora & Fauna Turbine Exclusion Zone | Cadastre |
| | EMI Turbine Exclusion Zone | |

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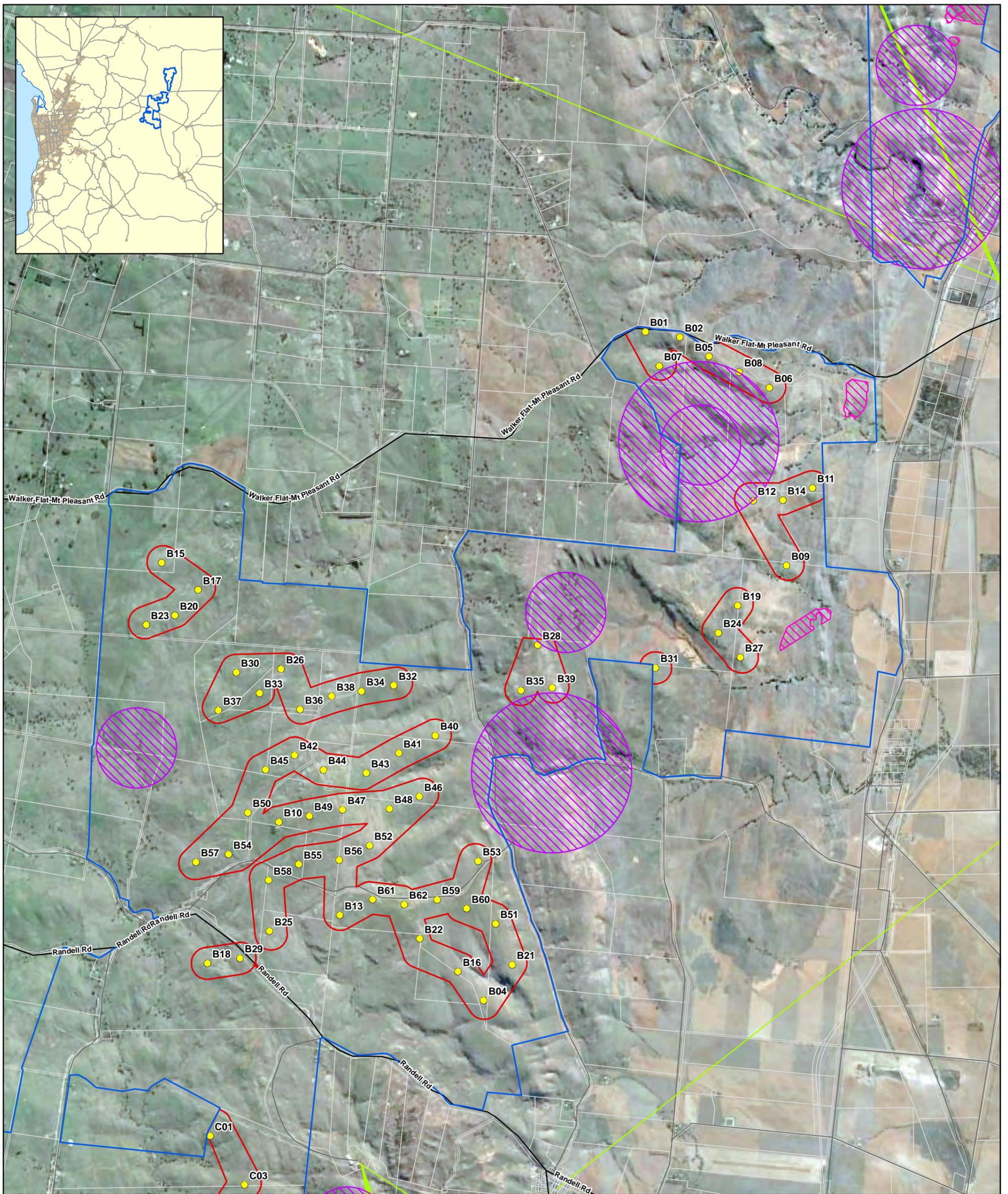


TrustPower Australia Holdings Pty Ltd
 Palmer Wind Farm Technical Studies

Job Number 33-17234
 Revision 0
 Date 15 Aug 2014

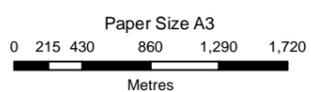
**Palmer Wind Farm
 Constraint Map**

Figure 1

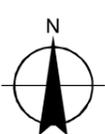


Legend

- | | | |
|-----------------------------|--|-----------------|
| Project Boundary | Barossa Character Preservation District | Secondary Roads |
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| Indicative Turbine Location | Flora & Fauna Turbine Exclusion Zone | Cadastre |
| | EMI Turbine Exclusion Zone | |



Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 54

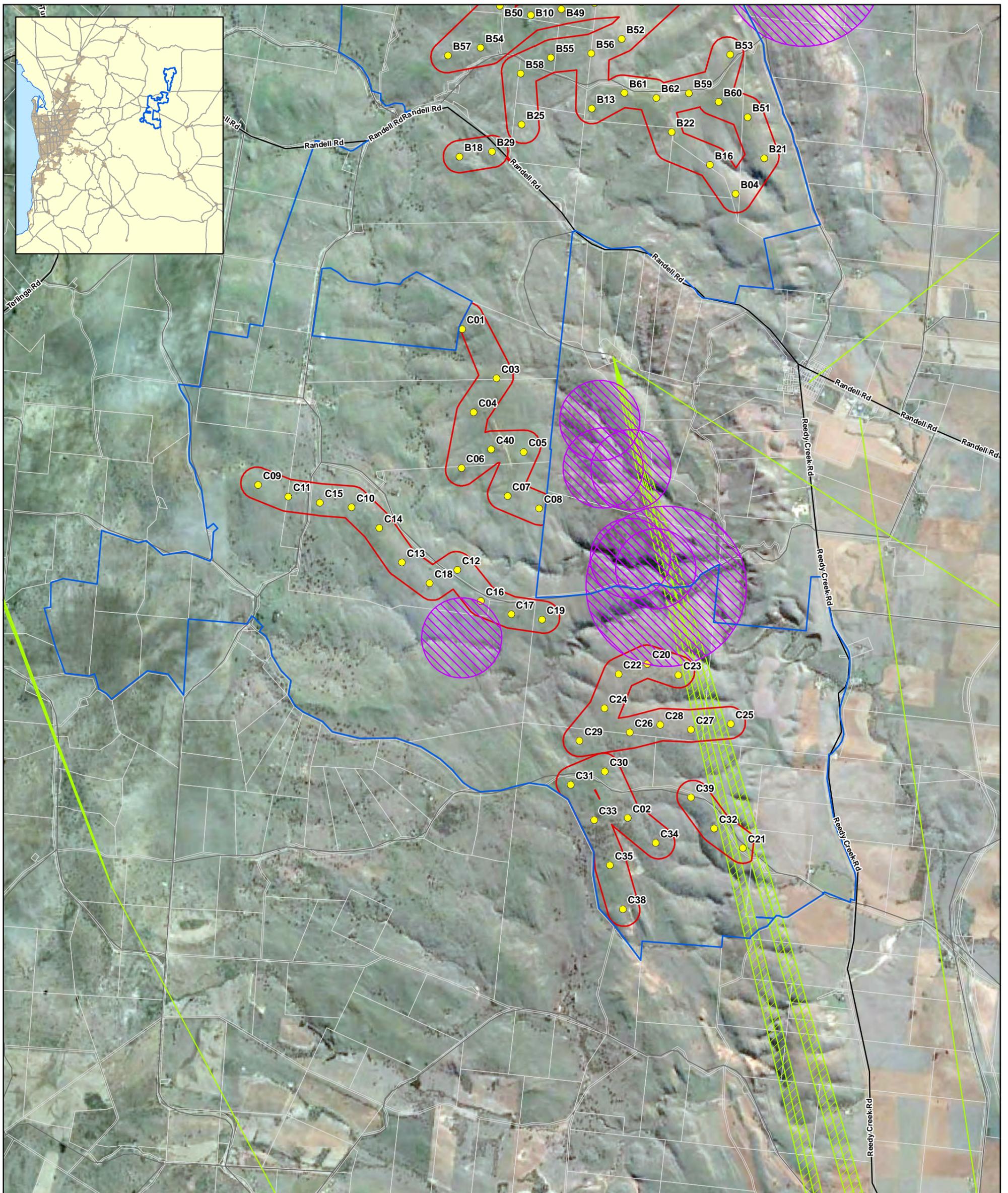


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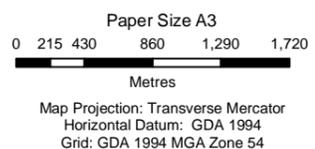
**Palmer Wind Farm
Constraint Map**

Figure 2



Legend

- | | | |
|-----------------------------|--|-----------------|
| Project Boundary | Barossa Character Preservation District | Secondary Roads |
| Turbine Corridor | Recommended Exclusion Zones (EPBC Referral Required) | Minor Roads |
| Indicative Turbine Location | Flora & Fauna Turbine Exclusion Zone | Cadastre |
| | EMI Turbine Exclusion Zone | |



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**Palmer Wind Farm
Constraint Map**

Figure 3

2. Development Plan Assessment

2.1 Overview & Assessment Methodology

A Development Application is required to be assessed against the relevant policies contained in the applicable Development Plan. In this case the relevant Development Plan is the Mid Murray Council Development Plan (24 October 2013).

The process of assessment includes:

- Evaluating the nature and features of the proposed development;
- Review of all policies in the Development Plan to identify those relevant to the proposal;
- Undertake an “on balance” assessment of the proposal against the policies.

An “on balance” assessment reviews all policies contained in the Development Plan. These policies are guidelines for achieving the desired planning outcomes rather than being strictly applied “rules”.

Rarely does any project, of any scale, align with all the policies within a Development Plan. The key question is whether the proposal, on balance, achieves the land use planning outcomes sought by the policies in the Development Plan and minimises any potential impacts.

The planning staff of the Council will undertake their own Development Plan Assessment which will be provided to the Council Development Assessment Panel for their consideration and determination.

Trustpower engaged Masterplan SA Pty Ltd to undertake an independent review of the Development Plan policies as they relate to the proposed wind farm. The purpose of this assessment is to inform the applicants as to the extent and degree of alignment with these policies.

The other specialist reports contained in this Volume and Volume 4 address specific issues highlighted by the Development Plan policies.

2.2 Key Findings

The subject land of the proposed Palmer Wind Farm is located within the Rural Zone of the Mid Murray Council Development Plan dated 24 October 2013. 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 Rural Zone.

Following an assessment of the proposed development against the whole of the Mid Murray Council Development Plan, it is considered that the proposed development is not significantly at variance with the Development Plan.

The proposed Palmer Wind Farm adequately and appropriately addresses potential impacts, particularly those associated with noise, protection of flora and fauna, European and Aboriginal heritage and traffic movements in a manner sought by the Development Plan.

2.3 Agreed Impact Management Response

The Development Plan Assessment draws together all of the responses proposed under the specific impact sections and considers whether the proposal has made sufficient effort to align with the intent of the policy contained within the Development Plan.

In this case, the agreed impact management responses are considered to adequately address the impact management policies contained in the Development Plan.



Trustpower
Palmer Wind Farm
Development Application Report
Volume 3

Development Plan
Assessment Report

PALMER WIND FARM

Development Plan Assessment Report

August 2014



MASTERPLAN
TOWN + COUNTRY PLANNERS



DEVELOPMENT PLAN ASSESSMENT REPORT

Palmer Wind Farm

for Trustpower Australia Holdings Pty Ltd



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EXECUTIVE SUMMARY

The subject land of the proposed Palmer Wind Farm is located within the Rural Zone of the Mid Murray Council Development Plan dated 24 October 2013.

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 Rural Zone, if it is located outside of the Barossa Valley Character Preservation District as defined by Character Preservation legislation. All infrastructure associated with the Palmer Wind Farm is outside of the Barossa Valley Character Preservation District and therefore a consent land use to be assessed on merit.

Following an assessment of the proposed development against the whole of the Mid Murray Council Development Plan, it is considered that the proposed development is not significantly at variance with the Development Plan.

The proposed Palmer Wind Farm adequately and appropriately addresses potential impacts, particularly those associated with noise, protection of flora and fauna, European and Aboriginal heritage and traffic movements in a manner sought by the Development Plan.

On balance, the proposed Palmer Wind Farm is a suitable form of development within the Rural Zone that appropriately addresses potential impacts and thereby warrants the granting of Development Plan Consent.



1.0 INTRODUCTION

MasterPlan SA Pty Ltd has been engaged by Trustpower Australia Holdings Pty Ltd (Trustpower) to undertake an assessment of the proposed Palmer Wind Farm against the Mid Murray Council Development Plan.

In preparing this report I have:

- reviewed the development application documents, including plans and reports by:
 - GHD Plans:
 - Plan 1: Overall indicative Project Layout
 - Area A Indicative Project Layout – Map of Area A – Ref: 33-17234 Rev D dated 14 August 2014.
 - Area B Indicative Project Layout – Map of Area A – Ref: 33-17234 Rev D dated 14 August 2014.
 - Area C Indicative Project Layout – Map of Area A – Ref: 33-17234 Rev D dated 14 August 2014.
 - Substation and Operations & Maintenance Facility: A101: Site Layout; A102: Site Section; A103: Stormwater and Landscape Concept; A104: OM Office Floor Plan; A105: OM Office Elevations; A106: Workshop Floor Plan; A107: Workshop Elevations.
 - Construction Elements: A108: Main Construction Site – Indicative Layout; A109: Laydown Area – Indicative Layout; A110: Tower Site – Indicative Layout; A111: Office Floor Plan; A112: Office Elevations; A113: Lunchroom Floor Plan; A114: Lunchroom Elevations; A115: Toilet Floor Plan; A116: Toilet Elevations
 - Other Structures: A117: Meteorological Mast Elevation; A118: Meteorological Mast Footprint; A119: 275kV Typical Elevation & Footprint; A120: 33kV Typical Elevation & Footprint
 - GHD - Palmer Wind Farm Development Application Report;
 - GHD - Palmer Wind Farm Electromagnetic Interference Assessment;
 - GHD - Palmer Wind Farm Civil, Geology, Geotechnical and Hydrology Assessment;
 - GHD - Palmer Wind Farm CEMP;
 - GHD – Traffic Impact Assessment;
 - EBS Ecology - Palmer Wind Farm Flora and Fauna Survey;
 - Ambidji Air Transport Innovation – Palmer Wind Farm Aeronautical Impact Assessment, Aviation Impact Statement, Qualitative Risk Assessment and Obstacle Lighting Review;
 - Sonus Acoustics – Environmental Noise Assessment;



- Sonus Acoustics – Environmental Noise Assessment Construction Noise and Vibration Management Plan;
 - Sonus Acoustics – Operational Noise Management Plan;
 - Australian Cultural Heritage Management – Trustpower Palmer Wind Farm Cultural Heritage Desktop Assessment;
 - WAX Design -.Landscape Character and Probable Visual Effect Assessment;
 - GL Garrad Hassan – Shadow Flicker and Blade Glint Assessment for the Proposed Palmer Wind Farm; and
 - Hudson Howells - Economic Impact Assessment.
- reviewed relevant legislations, including the *Development Act 2003*, *Development Regulations 2008*, the *Environment Protection (Noise) Policy 2007* and Wind Farms Environmental Noise Guidelines (EPA July 2009);
 - undertaken a site and locality inspection;
 - reviewed the provisions of the Mid Murray Council Development Plan consolidated 24 October 2013;
 - reviewed the provisions of The Barossa Council Development Plan consolidated 21 February 2013, as the wind farm adjoins The Barossa Council area;
 - reviewed the Barossa Valley Character Preservation District General Registry Office Plan G42012 (June 2012); and
 - reviewed the Murray and Mallee Region Plan (Addendum dated December 2013).

2.0 DESCRIPTION OF PROPOSED DEVELOPMENT

The proposed Palmer Wind Farm is to be located approximately 62 kilometres north-east of Adelaide and in the proximity of the townships of Palmer, Sanderston, Cambrai, Tungkillo, Mount Pleasant, Eden Valley and Springton.

The proposed development incorporates the following elements:

- The wind turbine generators (WTG) extend approximately 28 kilometres from north to south along the escarpment of the Eastern Mount Lofty Ranges.
- Corridors have been identified for the wind turbine generators and the transmission lines, which include:
 - Turbine Corridors – 200 metres surrounding (400 metres wide);
 - 275kV Line Corridor – 100 metres either side of line;
 - 33kV Corridor (overhead and underground) – 100 metres either side of line;



- internal access roads – 100 metres either side; and
- any other infrastructure outside of the turbine, road or transmission corridors
- 200 metres surrounding.

The final position of turbines and transmission lines within these corridors will be the subject of final design.

- Up to 114 wind turbine generators in three clusters (albeit that the final design may alter the number of turbines in each cluster) comprising:
 - Area A (northern) – 15 WTGs;
 - Area B (central) – 61 WTGs; and
 - Area C (southern) – 38 WTGs.
- Wind turbine generators with an indicative capacity of 3.3 Megawatts (MW). The final selection of the make and model of the turbine is yet to be finalised. The development application is based on a wind farm capacity of up to 375MW.
- Turbines are three-bladed, semi-variable speed, pitch regulated machines with a rotor and nacelle mounted on a reducing cylindrical steel tower.
- Overall height of turbines would be up to 165 metres at the blade tip, with indicative dimensions of the tower being approximately 100 metres and blades approximately 63 metres long (with 2.0 metre hub).
- Each turbine would be placed within a hardstand area of approximately 50 metres by 30 metres.
- A network of internal tracks (5.0 to 6.0 metres in width, post construction) linking turbines and to provide access to and from public roads. The total length of track is approximately 70 kilometres. Where possible existing tracks will be utilised and upgraded for this access.
- 33kV electrical cables (underground and overhead lines) linking turbines to the on-site substation. Overhead lines, comprising a single pole line with steel poles of up to 25 metres in height and spaced approximately 250 – 300 metres apart over a distance of approximately 27 kilometres.
- 275kV overhead transmission line for approximately 10 kilometres from the on-site substation to the Tungkillo substation, comprising of either lattice towers up to 46 metres high (similar to existing high voltage towers in the area) or steel or spun concrete monopoles up to 32 metres high and spaced approximately 275 – 375 metres apart.
- Substation and operations and maintenance facilities including; office, control room, staff facilities, car park area for staff and visitors and workshop.
- Temporary laydown and construction facilities.



- Up to seven meteorological masts up to 100 metres in height.

The substation and operations and maintenance site is approximately 3.25 hectares in area and within Area B of the development site. The substation and the permanent operations and maintenance facility for the wind farm is to be located on Allotment 205 in Certificate of Title Volume 5756 Folio 280. Plans of the indicative layout of the substation and operations and maintenance facility are incorporated in the development application documents.

A range of elements are contained within this substation and operations and maintenance facility, including:

- one permanent 33kV/275kV substation with approximate dimensions of 150 metres x 150 metres;
- operations and Maintenance Facility of approximately 100 metres x 100 metres comprising:
 - buildings (including office, control room, staff facilities);
 - car park area for staff and visitors;
 - workshop;
 - stormwater management;
 - perimeter fencing; and
 - vegetation screening planted and maintained around the perimeter of the combined substation and Operations and Maintenance Facility.

There are a number of temporary laydown and construction facilities proposed throughout the development site. One main temporary construction compound of approximately 300 x 300 metres is anticipated. Three additional smaller compounds are also incorporated throughout the development site. 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.

Up to three temporary concrete batching plants of around 100 metres x 100 metres may be required (if material is not sourced off-site). The need for on-site concrete batching plants will depend on the final selected civil contractor requirements. (The indicative potential locations have been agreed with landowners). A separate Environment Protection Authority (EPA) licence approval will be sought for any on-site concrete batching plants should they be required.

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:

Area A

- Temporary laydown facility: Allotment 267 in Certificate of Title Volume 5350 Folio 879, south-east of WTG A17 and west of R097.



- Concrete batch plant and construction facilities: Allotment 276 in Certificate of Title Volume 5381 Folio 422, east of WTG A15 and west of R003.
- Temporary laydown facility: Allotment 280 in Certificate of Title Volume 6087 Folio 92 - south of R001 and R002.

Area B

- Temporary laydown facility: Allotment 142 in Certificate of Title Volume 5404 Folio 721, north of WTG B26.
- Laydown/construction facility: Section 387 in Certificate of Title Volume 5854 Folio 170, west of WTG B07.
- Construction facility: Allotment 204 in Certificate of Title Volume 5756 Folio 279, south-west of WTG B55.
- Temporary laydown facility: Allotment 135 in Certificate of Title Volume 5895 Folio 323, south-east of WTG B56

Area C

- Construction facilities: Allotment 22 in Volume 5906 Folio 62, south of dwelling R056.
- Temporary laydown facilities: Allotment 21 in Certificate of Title Volume 5906 Folio 61– north of WTG C02.
- Temporary laydown facility: Section 482 in Certificate of Title Volume 5385 Folio 990 – south of WTG C12.
- Temporary laydown facility: Allotment 480 in Certificate of Title Volume 5421 Folio 815 – between WTG C04 and C40.
- Batch plant/construction facilities: Allotment 480 in Certificate of Title Volume 5421 Folio 815 – north of WTG C15 and south of dwelling R50.

Trustpower are seeking a period of five years in which to substantially commence the development from the operative date and substantial completion to be extended to eight years from the operative date of the consent.

The layout of the proposed wind farm is shown on the plans attached to this report, in **Attachment 1**. A detailed description of the wind farm is incorporated in the Development Application Report – Volume 1 Project Description and Approach.



3.0 PROCEDURAL MATTERS

In accordance with Part 4 of the *Development Act 1993*, the application is a form of development to be determined by Mid Murray Council as the relevant planning authority. The subject land of the proposed Palmer Wind Farm is located within the Rural Zone of the Mid Murray Council Development Plan dated 24 October 2013.

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 Rural Zone, if it is located outside of the Barossa Valley Character Preservation District as defined by Character Preservation legislation. All infrastructure associated with the Palmer Wind Farm is outside of the Barossa Valley Character Preservation District and therefore a consent land use to be assessed on merit.

3.1 Public Notification

Pursuant to the Mid Murray Development Plan, within the Rural Zone a wind farm is assigned Category 2 for notification purposes subject to the satisfaction of locational criteria, as stated in Principle of Development Control (PDC) 47:

PDC 47. For the purposes of public notification, the following activities are assigned Category 2:

Wind farms and ancillary development such as substations, maintenance sheds, access roads and connecting power-lines (including to the National Electricity Grid) located outside of the Barossa Valley Protection District as defined by Character Preservation legislation 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**
- (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)**

Wind monitoring mast and ancillary development located outside of the Barossa Valley Character Preservation District as defined by Character Preservation legislation.

The Palmer Wind Farm does not achieve separation of 2,000 metres from all non-stakeholder dwellings and also abuts the Rural Living (Sanderston) Zone. Consequently the proposed development defaults to a Category 3 form of development for notification purposes.

3.2 Barossa Valley Character Preservation District

The Character Preservation (Barossa Valley) Act 2012 defines the Barossa Valley district by the plan deposited in the General Registry Office at Adelaide and number GP 4 of 2012 (the GRO Plan) and became operational on 18 January 2013 (**Attachment 2**). Part of the Barossa Valley Character Preservation District extends into the Mid Murray Council area.



As illustrated in the application documents, the site¹ of the wind farm is not within the Barossa Valley Character Preservation District.

The Barossa Valley Character Preservation District is only referenced in the Mid Murray Development Plan (consolidated 24 October 2013) in relation to wind farms and ancillary development within the Rural Zone.

A “wind farm and ancillary development such as substations, maintenance sheds, access roads and connecting power lines (including to the National Electricity Grid) located within the Barossa Valley Character Preservation District as defined by Character Preservation legislation” is a non-complying form of development within the Rural Zone of the Mid Murray Council Development Plan.

No part of the development is contained within the Barossa Valley Character Preservation District. On this basis the proposed development is not a non-complying form of development.

Further regard to the Barossa Valley Character Preservation District is provided in Section 6.6.6.

3.3 Nature of the Development - Question of Industrial Activity

A question has been raised on other non-related wind farm proposals in South Australia as to whether the wind farm is an “industry”. Industry as defined in the *Development Regulations 2008* is:

“industry means the carrying on, in the course of a trade or business, of any process (other than a process in the course of farming or mining) for, or incidental to—

- (a) the making of any article, ship or vessel, or of part of any article, ship or vessel; or*
- (b) the altering, repairing, ornamenting, finishing, assembling, cleaning, washing, packing, bottling, canning or adapting for sale, or the breaking up or demolition, of any article, ship or vessel; or*
- (c) the getting, dressing or treatment of materials (and industrial will be construed accordingly);”*

The Environment, Resources and Development (ERD) Court in its determination of an appeal against a wind farm within the District Council of Grant (ERDC Number 106 of 2010, decision dated 17 June 2011) considered whether a wind farm was an industrial activity in the form of a general industry.

¹ “site” as defined in Schedule 1 of the *Development Regulations 2008*.



In considering this matter, the ERD Court stated that:

"50... we would view the process of making an article in the definition of 'industry' to contemplate and be limited to the production of something physical or tangible.

51... accordingly, we do not regard the operation of a wind farm, where the activity in question is the conversion of wind energy into electrical energy, to be 'caught' by the definition in the Regulations."

On this basis, the development is not deemed to be an industrial activity.

3.4 Time to Commence and Complete Development

Due to long lead times for detailed design, tendering for turbine supply, transmission connection modelling, commercial offtake agreement negotiations and delivery and construction, Trustpower are seeking an extension of time in which to commence and complete the development.

Pursuant to Regulation 48(1) of the *Development Regulations 2008*, any consent or approval granted under Part 4 of the Development Act, will lapse at the expiration of 12 months from the operative date of the consent or approval. If the relevant development has been lawfully commenced within 12 months from the operative date of the approval, the approval will not lapse if it is substantially or fully completed within three years from the operative date of the approval. The period prescribed to commence or complete a development may be extended by the relevant authority either when the relevant consent or approval is given or at a later time (Regulation 48(2)).

Requests for extensions of time in which to commence and complete developments are reasonably common for large developments which have numerous and complex issues to resolve.

Trustpower are seeking a period of five years in which to substantially commence the development from the operative date and substantial completion to be extended to eight years from the operative date of the consent.

In accordance with the Development Regulations, the request for an extended period of time in which to commence and complete the development can be determined by the relevant planning authority at the time the consent is given.

3.5 Referrals

3.5.1 Environment Protection Authority

Pursuant to Schedule 8 of the *Development Regulations 2008* a "wind farm means an undertaking where one or more wind turbine generators (whether or not located on the same site) are used to generate electricity that is then supplied to another person for use at another place".



The proposed development is consequently a wind farm in accordance with this definition. A wind farm is a form of development listed in Schedule 8(9) of the *Development Regulations 2008* requiring referral to the EPA. The planning authority in determining the application must have regard to the response of the EPA.

A referral to the Environment Protection Authority is also required pursuant to Schedule 8 – Part 2(11) of the *Development Regulations 2008* as the proposed concrete batching plants constitute an activity listed in Schedule 22 of the *Development Regulations 2008*.

3.5.2 State Heritage

Within the site of the development, there is one place of State Heritage significance, namely the “Granite Boulders Area Geological Site (State Heritage ID 13197)” on Allotment 100, Filed Plan 169859 in Certificate of Title Volume 5705 Folio 899. The Heritage Places Database search states the significance of this property as:

“This remarkable landscape is the result of the weathering process of granite. With the lowering of the land the weathered rock is removed and massive core stones remain strewn over the landscape as boulders and tors. Various features associated with exposed granites are well displayed here including tors exfoliation of surface-hardened layers, cavernous weathering (tafoni) and development of granulated products of disintegration of granites (grus). The tor development here is better and more extensive than in most areas of South Australia.”

In addition to this place of State Heritage significance within the site of the development, there are other State Heritage places within the locality of the wind farm, including:

- Milendella Creek Railway Bridge (concrete girder), off Milendella Road, Milendella – State Heritage ID 14604;
- Kitticoola Mine, off Mine Road, Palmer – State Heritage ID 10835;
- Reedy Creek Railway Bridge (concrete arch), off Western Boundary Road, Palmer – State Heritage ID 14603; and
- Shearing shed, former Terlinga station, Hoads Woolshed Road, Tungkillo – State Heritage ID 14484.

In accordance with the Section 37 of the *Development Act 1993* and Schedule 8 of the *Development Regulations 2008*, the application requires referral to the Minister administering the *Heritage Places Act 1993*. The planning authority must have regard to the report from the Minister (delegate being the State Heritage Unit of the Department of Environment, Water and Natural Resources), in its determination of the application.



3.5.3 Commissioner of Highways

The planning authority is required to refer the application to the Commissioner of Highways (Department of Planning, Transport and Infrastructure - DPTI), in accordance with Section 37 of the *Development Act 1993* and Schedule 8 of the *Development Regulations 2008*, as the site of the development adjoin a secondary arterial road. In determining the application, the planning authority must have regard to the report from the delegate of the Commissioner of Highways.

Trustpower has identified the need to liaise with the Department of Planning, Transport and Infrastructure (DPTI) and discussions have informed the development application, as outlined in the Traffic Impact Assessment report within the application documents.

3.5.4 Office of the Technical Regulator

Pursuant to Schedule 8 of the Development Regulations, a referral is required to the Office of the Technical Regulator. The proposed development incorporates electricity infrastructure that would be developed adjacent to existing infrastructure. Given the proximity of the proposal to existing infrastructure, the application is not accompanied by a statement regarding the compliance or otherwise of this infrastructure for the purposes of section 86 of the *Electricity Act 1996*.

3.5.5 Minister administering the River Murray Act

The site of the development is located within the River Murray Tributaries Area. Pursuant to Schedule 8, Part 2 (20) of the Development Regulations, the development requires referral to the Minister administering the *River Murray Act 2003*.

3.5.6 South Australian Murray-Darling Basin Natural Resources Management Board

The planning authority may refer the application to the South Australian Murray-Darling Basin Natural Resources Management Board (NRM Board) for comment.

It is understood that Trustpower engaged with the NRM Board as a stakeholder during the community consultation phase of the projects development.

3.5.7 Country Fire Service (CFS)

The Mid Murray Council Development Plan contains Bushfire Protection Area (BPA) maps of bushfire risk. The subject land is partly within the Medium Bushfire Risk area, and also partly within the General Bushfire Risk area.

Referral to the CFS is required for certain forms of development, particularly dwellings, tourist accommodation and other forms of habitable buildings in a High Bushfire Risk Area of a Bushfire Protection Area.



Given the wind farm proposal does not involve any of these forms of development, formal referral to the CFS is not required. However, it would be the planning authority's discretion to refer the application to the CFS for comment.

Trustpower has identified the need to liaise with the CFS with regard to bushfire management of the proposed development. It is understood discussions have commenced with the CFS.

3.6 Approvals Pursuant to Other Legislation

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.

3.6.1 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.

Trustpower 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.

3.6.2 Aboriginal Heritage Act 1998

The *Aboriginal Heritage Act 1998* places a duty of care on Trustpower as proponents of the development to address the likelihood of any impact on heritage. It is understood that Trustpower have already undertaken extensive survey work of the site of the development in association with the local aboriginal community. This process is ongoing and Trustpower 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.

3.6.3 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.



4.0 SITE OF THE DEVELOPMENT

Details of the site of the wind farm development, often referred to in specialist reports forming part of the development application, as “the project boundary” or “project area”, are set out in the Development Application Report Volume 1.

The site of the development takes the meaning of “site” as defined in Schedule 1 of the *Development Regulations 2008*². That is, the site means the area of land incorporated in the development, but is not necessarily the entire allotment.

The distinction between the generic reference to “project boundary/area” and the specific “site of the development” is important in respect of Area A of the wind farm. Within Area A the proposed wind farm infrastructure does not extend into the area of the Barossa Valley Character Preservation District.

The boundary of the Barossa Valley Character Preservation District dissects three of the allotments hosting the proposed wind farm infrastructure in Area A, namely:

- Allotment 8, Deposited Plan 3806 in Certificate of Title Volume 5615 Folio 892;
- Allotment 280 and Pieces 278 and 279, Filed Plan 170028 in Certificate of Title Volume 5868 Folio 563; and
- Allotment Piece Q272 in Filed Plan 170020 in Certificate of Title Volume 6031 Folio 198.

The boundary of the Barossa Valley Character Preservation District is illustrated on the development application plans, contained within **Attachment 1**.

The subject land and locality of the proposed wind farm is outlined below.

4.1 Description of Site of the Development

A total of 26 land owners are proposed to host wind farm infrastructure, including wind turbine generators, access roads, transmission lines, operation and maintenance buildings, substations and temporary construction facilities. **Attachment 3** tabulates the involved properties.

² Schedule 1, *Development Regulations 2008* “site means the area of land (whether or not comprising a separate or entire allotment) on which a building is built, or proposed to be built, including the curtilage of the building, or in the case of a building comprising more than 1 separate occupancy, the area of land (whether or not comprising a separate or entire allotment) on which each occupancy is built, or proposed to be built, together with its curtilage.”



The indicative locations of the proposed wind turbine generators are identified in a table in **Attachment 4**. These locations are also reflected on the mapping throughout the application documents.

The project boundary of the wind farm is estimated to be across approximately 12,000 hectares of the land. Each wind turbine generator occupies a site of approximately 1,500 square metres in area, totalling some 17.1 hectares.

The substation and operations and maintenance site is approximately 3.25 hectares in area and within the Area B of the development site.

A number of the properties listed in the table in **Attachment 3** may not be proposed to contain specific wind farm infrastructure at this time, but form part of the development site to provide the applicant with sufficient flexibility for future detailed design of the turbines and transmission lines within the defined corridors, as well as minor deviations of access road, internal reticulation and the like.

All dwellings within the site of the development are owned by involved land owners and noted as stakeholder dwellings on the plans accompanying the application. It is noted that an existing dwelling located on Allotment 203 Certificate of Title Volume 5756 Folio 278, located approximately 150 metres south of turbine WTG B10 within Area B (labelled "R139") would not be inhabited during the life of the wind farm project if the final wind farm layout gives rise to a wind farm noise level at the dwelling that exceeds 45dB(A); or should the house experience exceedance of the shadow flicker guideline limits, unless an agreement is reached with this landowner on a reasonable level of shadow flicker above the guidelines.

The wind farm is located within the Eastern Mount Lofty Ranges. As described by the Murray and Mallee Region Plan, *"the dominant landscape consists of sandy soils and mallee scrub and the dominant activities are broadacre irrigation using groundwater and dry-land farming"*. Detailed landscape and environmental assessments of the wind farm site has been undertaken by WAX Design and EBS Ecology and these reports form part of the application documents. It is noted however that the wind farm development site is a modified landscape which contains the following elements:

- the escarpment of the Eastern Mount Lofty Ranges;
- heavily cleared and grazed land with scattered pockets of remnant vegetation, isolated trees and scattered rocky outcrops;
- grazing as the dominant land use with associated residential properties and farming buildings located in the landscape;
- physical infrastructure including:
 - the Mannum Adelaide pipeline;
 - a 275kV power line that runs north/south; and
 - 11kV and other distribution power lines.



- A range of major regional and collector roads, including:
 - Adelaide-Mannum Road (B35);
 - Randell Road (B36);
 - Walker Flat- Mount Pleasant Road;
 - Milendella Road;
 - Reedy Creek Road; and
 - Ridley Road.

- A range of minor roads, including:
 - Three Chain Road;
 - Bundilla Road;
 - Miller Road;
 - Sanderston Road;
 - Glen Roy Road;
 - Gap Road;
 - Palmer-Cooke Hill Road/Devonport Road;
 - Borthwick Brae Road;
 - D Collins Road;
 - Hoads Fire Track;
 - Botroff Hill Road;
 - Pebbly Range Road;
 - Camel Hump Road;
 - Henschke Road;
 - Brinkworth Road;
 - John Rolland Road;
 - Ayers Road;

Detailed analysis of the road network is contained in the GHD Traffic Impact Assessment report.

- Randell Road is a designated tourist route with scenic lookout;
- a place of heritage significance, including the Granite Boulders as State Heritage place;
- although not heritage listed, the dry stone walls particularly in the area of Pine Hut Road;
- Aboriginal historic sites (as shown indicatively in the Mid Murray Council Development Plan); and
- areas of natural and scenic importance including:
 - tributaries of the River Murray within the River Murray Protection Area;



- Marne River and surrounding creek;
- Sanderston Gorge and creek;
- Harrison Gorge and Reedy Creek;
- Marne River and Saunders Creek Prescribed Water Resources Area;
- Eastern Mount Lofty Ranges Prescribed Water Resources Area;
- The Gap (Rathjen Gap); and
- Camel Hump Road and surrounding landscape areas.

The WAX Design report describes the landscape character of the wind farm site as follows:

"The predominant land use of the local, sub-regional and regional landscape is agricultural, containing slight variations in cultivation and management techniques that create a number of land use characters in and around the site. This in turn leads to a series of defined rural landscape characters that extend across the regional landscape context and landscape locality.

The land use and land cover across the proposed development site and the locality immediately (<3km) surrounding the proposed wind farm is defined by a heavily cleared and grazed landscape with scattered pockets of remnant vegetation, isolated trees and scattered rocky outcrops. Grazing is the dominant land use with occasional residential properties and farming buildings located in the landscape.

The grazed agricultural landscape cover continues across the Eastern Mount Lofty Escarpment and east towards the low lying plains of the Murray River. The absence of vegetation creates an exposed landscape character that reinforces the agricultural character of the area. While pockets of vegetation do exist across the escarpment, particularly in relation to larger creek lines and drainage catchments, these areas remain isolated and do not create a dominant vegetation cover within the locality of the development site.³"

The development site is further described in detail in the Flora and Fauna Assessment Report (by EBS Ecology) which forms part of the application documents. The EBS Ecology Report notes that 155 native and 94 exotic flora species were identified within the wind farm project area. In summary the findings of the EBS report note the following regarding the wind farm project area:

- *"Twenty vegetation associations representing Woodland, Mallee, Shrubland and Grassland communities.*

³ Section 3.2 of the WAX Preliminary Landscape Character and Opinion of Probable Visual Effect report.



- One nationally threatened ecological community listed under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act), namely the Iron-grass Natural Temperate Grassland of South Australia (critically endangered) - identified at two locations within Area A and at two potential location within Area B.
- A total of 155 native flora species and 94 exotic flora species, including three threatened flora species listed under the National Parks and Wildlife Act 1972 (NPW Act):
 - *Eucalyptus fasciculosa* (Pink Gum) (state rare) – occurs as very scattered large trees within Area C
 - *Mentha diemenica* (Slender Mint) (state rare) – observed from one location within Area A
 - *Ptilotus erubescens* (Hairy-tails) (state rare) – observed in various locations as scattered individuals within Area C.
- A total of 1,923 birds representing 66 species were observed. One of the bird species, the Rainbow Bee-eater (*Merops ornatus*) is listed as migratory under the EPBC Act, and five are listed as threatened under the NPW Act:
 - *Diamond Firetail* (*Stagonopleura guttata*) (state vulnerable)
 - *Elegant Parrot* (*Neophema elegans*) (state rare)
 - *Hooded Robin* (*Melanodryas cucullata*) (state rare)
 - *Peregrine Falcon* (*Falco peregrinus*) (state rare)
 - *White-winged Chough* (*Corcorax melanorhamphos*) (state rare).
- Five Peregrine Falcon nesting sites were recorded: two in close proximity to Area A, one within and one in close proximity to Area B and one bordering Area C.
- Twelve Wedge-tailed Eagle nests were recorded across the project area. Three nests were located near Area A, three within Area B and six within the surroundings of Area C.
- seven bat species were confirmed in the project area⁴

In general terms, the area in which the wind farm is proposed is one of a pleasant open rural character, comprising a variety of natural and man-made features, although highly modified by agricultural activities and clearance of native vegetation.

⁴ Executive summary of EBS Palmer Wind Farm Flora and Fauna Survey



5.0 DESCRIPTION OF LOCALITY

A locality, for the proposed development, is difficult to accurately define, not only because of the combined height of the turbine and blades (up to 165 metres), but also because of the topography and the overall area covered by the proposed wind farm. Between the northern most and southern most turbines, there is approximately 28 kilometres (including spacing between turbines). There is approximately 28-30 kilometres between the most north-eastern and south-western turbine, which are on two separate ridgelines. The transmission line extends approximately 10 kilometres from the wind farm to the Tungkillo substation.

Within this locality, the prominent features/elements include:

- open agricultural landscape dominated by grazing and open paddocks;
- areas of native vegetation, generally along ridgelines, road verges and creek lines;
- farm buildings including dwellings and other structures;
- the townships of Palmer, Sanderston, Cambrai, Tungkillo, Mount Pleasant, Eden Valley and Springton.
- existing bulk handling facilities at Palmer;
- a range of secondary arterial, major local roads and minor local roads;
- Private mines (including Kitticoola mine)
- infrastructure including the Mannum - Adelaide pipeline; and
- 275kV and 11kV electricity transmission lines.

The closest Department of Environment, Water and Natural Resources defined reserves to the site of the wind farm are the Cromer Conservation Park (approximately 11 kilometres west) and Charleston Conservation Park (approximately 14 kilometres west). There are also existing Heritage Agreements under the *Native Vegetation Act 1991* located west of Area A, south-east of Area B and just outside of Palmer Township. All of these areas are outside of the site of the development.

In addition to the existing natural features and constructed elements, to the north of the development site is the proposed Keyneton Wind Farm. Approved in November 2013, the wind farm is not yet constructed, but is likely to be a feature of the character of the locality in the future.

The locality can broadly be defined around the extent to which the turbines may be visible; however this will vary from different positions and with varying degrees of clarity. The Zone of Theoretical Visual Influence (ZTVI) prepared by WAX Design, which is part of the application documents, illustrates the visibility of the wind turbine generators.



Landscape character varies throughout the locality, as this is described by WAX Design, which notes the change in landscape character west of the escarpment, which extends into the Barossa Council Area and the Barossa Character Preservation Area and then the Murray Plains to the east.

"In sharp contrast to the land cover and general landscape character of the escarpment, the Murray Plains that exist to the east of the development site is defined by a mixture of large open paddocks, vegetation belts and isolated tree groups. This creates a distinctly rural landscape character.

To the west the land cover is wooded, with large areas of vegetation creating an attractive rural landscape of trees and open paddocks that is synonymous with the Barossa Valley and Adelaide Hills. This character is illustrated by the landscape that surrounds Mount Pleasant and extends to Eden Valley to the north of the proposed development site.

The amenity of the rural woodland setting is also reflected in the land use and smaller scale operations that occur amongst the belts of vegetation. These include small areas of cropping, hobby farming, horse agistment and some vineyard production.⁵

A detailed landscape assessment by WAX Design which accompanies the application documents identifies a number of different landscape character units, taking account of land use, topography, vegetation, visual patterning, texture and scale.

"The regional landscape context surrounding the Palmer Wind Farm contains five major landscape character units and a number of other areas of specific landscape character in relation to townships and unique landscape features (refer to Appendix A). The following provides a description of each unit and the responding landscape and visual character. In order to provide clarity in the description of the landscape, the major landscape character units have been described sequentially from the west to the east.⁶"

3.5 Mount Crawford Forest, Barossa Valley and Adelaide Hills (sub-regional and regional – west)

⁵ Section 3.2 of the WAX Preliminary Landscape Character and Opinion of Probable Visual Effect report.

⁶ Section 3.4 of the WAX Preliminary Landscape Character and Opinion of Probable Visual Effect report.



- 3.5.1 *The topography of the south eastern edge of the Mount Lofty Ranges in and around Mount Torrens to the north is defined by a complex series of inter-related landforms that create a complex landscape of rolling and eroded ridgelines and wide valleys that criss-cross the regional landscape that surrounds the development site. These landscape features form the eastern extent of the Barossa and Adelaide Hills regions*
- 3.5.6 *The sub-regional and regional western landscape character units provide a significant degree of scenic value to the west of the proposed development site. This is primarily due to the extent of Eucalypt and coniferous vegetation and interrelationship with topography and the visual amenity provided by the rural land uses such as horse rearing and farming. While the underlying land use is rural and expresses agricultural characteristics, these productive land uses are offset by the extent of vegetation cover that creates a semi-naturalistic character to the agricultural landscape.*
- 3.6 *Mount Pleasant and Eden Valley Ridgeline- transitional landscape (sub-regional – west)*
- 3.6.1 *Between the well vegetated landscape character of the Adelaide Hills, Barossa Valley and the tablelands of the Ranges is a transitional landscape defined by complex topographic variations of low undulating landform, creeks and rocky outcrops and scattered belts of vegetation.*
- The dominant land use is pastoral in character with grazed paddocks creating cleared hillsides with small groups of vegetation to valleys and creeks. The area is open in visual character to the north with little screening provided by remnant vegetation. The topography to the north is defined by closely spaced narrow ridgelines that run east west. These ridges have an undulating form with low lying valleys formed between elevated ridges, which enclose the field of view.*
- 3.7 *Eastern Mount Lofty Ranges Tablelands (local and sub-regional)*
- 3.7.1 *The landscape character unit is defined by numerous topographic variations that form a complex undulating landform with low hills, small valleys, rocky outcrops and a general absence of vegetation (except for a grazed herb layer).*
- 3.7.8 *While the landscape is agricultural and denude of vegetation, the elevated location and expansive views provide the landscape with scenic value when viewing the wider landscape from the Eastern Mount Lofty Escarpment edge towards the Murray Plains.*
- 3.8 *The Eastern Mount Lofty Ranges Escarpment (local and sub-regional – east)*



- 3.8.1 *The Eastern Mount Lofty Ranges escarpment is a prominent north/south landform that defines the eastern edge of the Mount Lofty Ranges. The escarpment provides pronounced topographic elevation within the region rising approximately 360 m above the low lying land of the Murray Plains.*
- 3.8.6 *The denuded land cover reinforces the agricultural context, which is typical of the Murray Plains and Mid North agricultural areas of South Australia.*
- 3.9 *Murray Plains (regional – east)*
- 3.9.1 *The Murray Plains area is formed by an expansive low-lying landscape that extends from the foothills of the Eastern Mount Lofty Ranges Escarpment east towards the Murray River and beyond.*
- 3.9.7 *The visual character of the Murray Plains is defined by localised views to adjacent ridgelines and vegetation belts. The combination of a horizontal landform and defined containment creates a specific visual character. The panoramic qualities associated with the escarpment are limited and a framed visual character is created throughout the landscape creating glimpsed views to surrounding regional landscapes and across fields from on top of the local ridgelines.*
- 3.10 *Specific Landscape Character Areas, Features and Townships*
- 3.10.1 *Throughout the locality of the proposed development site are a number of specific and in some cases unique landscape features. For the purposes of the landscape character assessment these features have been described separately from the general description contained within the assessment of the landscape character units.*
- 3.11 *Mount Pleasant and Mount Crawford (west)*
- 3.11.1 *To the west of Mount Pleasant Township is the Mount Pleasant summit and the River Torrens corridor which forms a defined landscape corridor running through the sub-regional landscape character of the area. The landscape character surrounding the summit of Mount Pleasant is defined by large strands of remnant eucalypt woodland vegetation and interspersed with open paddocks over an undulating landscape character that is punctuated with rock outcrops and small scale creeks and water providing a variety of natural elements within an attractive rural landscape setting. This combination of topography and vegetation provides an attractive pastoral and woodland character to the locality*



3.11.6 *The scenic value of the landscape is moderate due to the agricultural character of the forestry which further enhances the scenic value of the surrounding remnant eucalypt woodland*

3.12 *River Marne (north)*

3.12.1 *The landscape character of the Marne River corridor is defined by significant belts of vegetation consisting of mature eucalypts. The river is one of only a handful that runs east- west from the Mount Lofty Ranges and forms an incised and eroded river corridor as it traverses through the Eastern Mount Lofty Ranges. This area is of important scenic value that is recognised by the local community.*

3.12.4 *While the river represents a natural corridor within the landscape, its natural characteristics remain isolated, contrasting the surrounding agricultural land uses and although these land uses do not detract from the landscape character, neither do they enhance the amenity and scenic value of the landscape*

3.13 *Sanderston Gorge (east)*

Sanderston Gorge represents a local area of complex topographic form. The rolling incised nature of the land form contrasts at a local scale with the horizontal north south orientation of the escarpment. The drainage lines associated to the topography provide local areas of amenity with some scattered vegetation. Sanderston Gorge is not as prominent as the Marne River and Harrison's Gorge, but still provides a vertical and horizontal separation of the escarpment.

3.14 *Harrison Gorge (southeast)*

3.14.1 *Harrison Gorge forms a significant natural landscape feature that is part of the Eastern Mount Lofty Ranges escarpment. The Gorge is formed by a number of deeply incised water courses that run east/west across the underlying topography of the escarpment.*

3.14 *Harrison Gorge (southeast)*

3.14.1 *Harrison Gorge forms a significant natural landscape feature that is part of the Eastern Mount Lofty Ranges escarpment. The Gorge is formed by a number of deeply incised water courses that run east/west across the underlying topography of the escarpment.*

3.15 *Keynes Gap (north)*



- 3.15.1 *Keynes Gap is defined by a series of large rocky outcrops that form a pronounced ridge between the landscape areas of Eden Valley and the Eastern Mount Lofty Ranges Escarpment to the east.*
- 3.15.2 *These large elevated landforms create a defined sense of visual enclosure which separates the more sensitive landscape amenity and scenic value of Eden Valley to the west and the agricultural low scenic character of the escarpment and Murray Plains.*
- 3.15.4 *While the rocky outcrops of Keynes Gap provides a defined visual separation between the surrounding landscape areas; from locations on the rocky outcrop ridgeline, panoramic views can be experienced both east and west.*
- 3.23 *Scenic Roads - Camel Hump Road, Mine Road and Pine Hut Road.*
- 3.23.1 *To the south of Palmer are Camel Hump Road and Mine Road. These roads provide access to local landscape features. Throughout the locality of the roads the undulating grazed landscape with rocky outcrops is replaced by areas of woodland that consist of Callitris, Sheoak and Eucalypts as well as other remnant vegetation. In addition to the change in vegetation, the presence of large boulders creates a unique landscape feature.*
- 3.23.2 *The landscape amenity provided by natural features increases the importance of the areas in relation to scenic quality and its community value.*
- 3.23.3 *To the north of the proposed development site is Pine Hut Road. This road corridor forms an east west corridor through and over the Eastern Mount Loft Ranges escarpment.*
- 3.23.5 *Pine Hut Road provides a scenic drive through the landscape and is punctuated by extensive lengths of stone walls and vegetation groups. The visual quality of the landscape is more open and becomes increasingly expansive as the edge of the escarpment is reached."*

As previously outlined in this report, Area A of the site of the proposed development immediately adjoins the Barossa Valley Character Preservation District. This Preservation District seeks to protect the "special character" of the area. Five character values are identified in the legislation, which have been considered in determining the special character of the district, namely:

- *"the rural and natural landscape and visual amenity of the district*
- *the heritage attributes of the district*
- *the built form of the townships as they relate to the district*



- *the viticultural, agricultural and associated industries of the district*
- *the scenic and tourism attributes of the district."*

The "special character" of this Eastern Mount Lofty Ranges area is not defined in the Murray and Mallee Region Plan or the Mid Murray Development Plan with specific reference to the five character values of the Preservation District. The character of the Eastern Mount Lofty Ranges is included in the Desired Character Statement of the Hills Policy Area within the Mid Murray Development Plan, which states: *"the eastern face of the Mount Lofty Ranges, and the ranges themselves, are a dramatic and attractive landscape feature of the Council area and region generally"*. There are also further provisions of the Development Plan which discuss natural landscape, visual amenity and scenic attributes, but there is no discrete reference or discussion in the Mid Murray Development Plan about each of these five character values.

Similarly, the Desired Character Statement of the Primary Production Zone within the Barossa Council Development Plan (consolidated 21 February 2013), which is the adjoining zone to the west of the Palmer wind farm locality, does not contain any specific discussion about the five character values of the Preservation District. These attributes are more clearly stated in the Barossa Council Development Plan – Character Preservation Overlay.

Given the lack of clear definition of the "special character" of the Eastern Mount Lofty Ranges with reference to the five character values of the Preservation District within the Mid Murray Council area; it is considered that the Character Preservation District seeks to generically retain and protect highly valued scenic and rural landscapes; promote long term use of land for primary production; retain the heritage attributes of the district and incorporate buildings and structures that complement the landscape. Whilst these attributes are incorporated in the Barossa Council Development Plan, Character Preservation Overlay, they are not directly relevant in the assessment of the proposed development against the provisions of the relevant Mid Murray Council Development Plan. On this basis, the visual assessment and potential impact of the Palmer wind farm on the locality, utilises the detailed analysis undertaken by WAX Design and assesses these findings against the relevant Mid Murray Development Plan.

The summary from the WAX Design report, quoted above is considered important in understanding the locality and in the discussion of the impact of the proposed wind farm on the character and amenity of the locality.

It is noted that in determining the character and amenity of the locality, the following extracts from *Taralga Landscape Guardians Inc v Minister for Planning and Anor ((2007) 161 LGERA 1, at para 1)* cited in the *ERDC No 106 of 2010 R Paltridge and Anor v District Council of Grant (June 2011 at para 25)*, illustrates how a wind farm development can create disparate views that impact on the rural character:



"The insertion of wind turbines into a non-industrial landscape is perceived by many as a radical change which confronts their present reality. However those perceptions come in differing hues. To residents, such as members of Taralga Landscape Guardians Inc (the Guardians), the change is stark and negative. It would represent a blight and the confrontation is with their enjoyment of their rural setting.

To others, however, the change is positive. It would represent an opportunity to shift from the societal dependence on high emission fuels to renewable energy sources. For them, the confrontation is beneficial - being one much needed step in policy settings confronting carbon emissions and global warming."

6.0 DEVELOPMENT PLAN ASSESSMENT

The site of the proposed Palmer Wind Farm, including wind turbine generators, transmission lines and other ancillary components, is located within the Rural Zone of the Mid Murray Council Development Plan dated 24 October 2013.

Within the Rural Zone the wind farm is located within two policy areas, namely Marne Watercourse Policy Area 13 and the Hills Policy Area 14 of the Mid Murray Council Development Plan. In addition, some components of the proposal are within the area described as the Hills Face, recognised within both Policy Areas. The Hills Face is an area of land within both the Marne Watercourse Policy Area and the Hills Policy Area.

	Area A - Northern Cluster	Area B - Central Cluster	Area C - Southern Cluster
Zone	Rural Zone	Rural Zone	Rural Zone
Policy Area	Marne Watercourse Policy Area 13	Hills Policy Area 14	Hills Policy Area 14
Hills Face	Within the Hills Face	Within the Hills Face	Within the Hills Face

An assessment of this application against the Development Plan requires the consideration of the following issues:

- land use;
- efficient energy generation;
- visual amenity;
- noise and infrasound;



- health and the precautionary principle;
- shadow flicker, reflection and blade glint;
- electromagnetic interference with telecommunications;
- impact on flora and fauna;
- soil erosion, water supply and stormwater management;
- traffic and access;
- indigenous and European heritage; and
- bushfire.

These matters are discussed and assessed below.

Due to the extensive nature of the provisions of the Development Plan relevant to the assessment of the proposed Palmer Wind Farm, not all of them are quoted in this report. **Attachment 6** contains extracts of the Mid Murray Council Development Plan (consolidated 24 October 2013), which have been considered in the preparation of this assessment.

6.1 Land Use

The subject land is located entirely within the Rural Zone. The Objectives and the Desired Character Statement for the Rural Zone anticipate wind farm development.

Sustainable Industry

Objective 1: Long-term operation and sustainability of rural production and primary industries.

Objective 2: Accommodation of wind farms and ancillary development outside of the Barossa Valley Character Preservation District as defined by Character Preservation legislation.

No elements of the Palmer Wind Farm are located within the Barossa Valley Character Preservation District. Given the development is outside of the Preservation District, a wind farm is an expressly envisaged land use with the Rural Zone, as stated by Objective 2.

Sustainable rural production predominantly in the form of grazing activities can continue within the site of the development, largely unaffected by the wind farm development. Although the wind farm transverses a large area, its footprint is relatively small. The wind turbine generators comprise a small footprint, with a construction area of approximately 1,500 square metres (30 x 50 metres) per turbine. It is estimated that the footprint of the turbines would comprise approximately 17 hectares of area within the site of the development which is estimated to be 12,000 hectares.



Following construction, it is not uncommon for the area surrounding the turbines to be reseeded with pasture that is then available for grazing (in suitable and accessible locations). This further reduces the already minimal area removed from productive capacity.

Each turbine is linked by an access track, which during construction is approximately 10 metres in width to accommodate the large and heavy vehicles required for construction. Wherever possible, the tracks would follow existing farm access tracks to minimise intrusion into existing paddocks. Following the construction phase these access tracks are maintained, but at a reduced width of 5.0-6.0 metres.

Given a large number of these tracks are located on elevated areas of poor pasture the loss of land to grazing is considered minimal. Furthermore, the tracks and turbines are not fenced and therefore stock grazing within paddocks that accommodate wind turbine generators are not restricted in their movement.

Within each cluster of wind turbine generators, the electricity generated is collected via a series of underground 33kV cables, which then link to the overhead 33kV lines. The approximate total length of 33kV overhead electricity line is 27 kilometres (north section 18 kilometres and south section 9.2 kilometres). From the substation in the south-western section of Area B, the electricity would be carried via overhead 275kV lines to the Tungkillo substation approximately 10 kilometres further south-west.

The combination of internal undergrounding of electricity infrastructure and designated corridors for overhead transmission lines does not significantly impact on the land available for primary production, particularly given the predominant land use within the area is grazing and animal can graze under electricity transmission lines.

The small site required for the substation and operations and maintenance facilities, which is estimated to be 3.5 hectares, is also a minimal intrusion in the context of the overall land size of the development. Temporary laydown and construction facilities would be rehabilitated and therefore be available for primary production purposes following construction.

Wind turbine generators and ancillary infrastructure co-exist with primary production activities within other wind farms in South Australia, Australia and internationally. Given the principal land use within the site and the locality is grazing, the minimal reduction in productive land is not considered to be a significant impediment to the continued achievement of sustainable primary production activities. Wind farms and grazing activities can co-exist and to this end it is considered that Objective 1 of the Rural Zone is satisfied.

In addition to the objectives, the Rural Zone contains an extensive Desired Character Statement. Objective 1 and the Desired Character Statement reinforce the primary purpose of the Rural Zone and the region is sustainable primary production. Objective 2 clearly supports the development of wind farms within the Rural Zone.



Support for the development of wind farms is further stated in the Desired Character Statement which envisages “wind farms and ancillary development...” (as shown in the paragraphs underlined in this statement) and Principle of Development Control (PDC) 22 .

Desired Character

The zone is the location of the majority of dry land agricultural production within the Council area but it also includes irrigated orchards, vegetables, vineyards and pasture where there is access to water supplies for irrigation. The processing of agricultural product is envisaged which, subject to compliance with environmental criteria, could include value-adding enterprises such as packing and processing works and wineries. Other forms of small-scale industry may be appropriate in association with existing residential development, on allotments which are not suited to primary production, or as an adjunct to an existing primary production operation.

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 that part of the zone outside of the Barossa Valley Character Preservation district (as defined by Character Preservation legislation) and constitute a component of the desired character of this part of the zone.

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 Zone adjoins the River Murray and agricultural uses in the vicinity of the River must be managed to ensure that the River's water quality does not further deteriorate through accelerated groundwater inflows, irrigation run-off, chemical over-spray, erosion and siltation and other impacts. Due to the potential for adverse impacts on areas of native vegetation, olive production should be sufficiently separated from environmentally sensitive areas such as the Murray River and Conservation Zones.

The Zone encompasses the eastern face of the Mount Lofty Ranges which contributes significantly to the district's visual qualities. The location and design of development on the hills face is therefore a matter of importance, as is the retention of remnant bushland and native vegetation for aesthetic and conservation purposes.

New landscaping or agro-forestry plantings should not change the bold and exposed character of the Hills Face. The use of local native species should be used in preference to introduced species for these purposes.



The zone's rural and natural character lends itself to tourism activities, such as the interpretation of the natural environment, the sale or sampling of produce and on-farm tourism which will enhance the value of local production and add to the quality and range of experiences available to the visitor in the region. These value-added activities however should not be undertaken in a way which would prejudice the long-term operation of primary production.

Scenic vehicular routes transverse and define the zone. Land adjoining a defined scenic route or which can be viewed from the routes, should only be developed to enhance their function.

Other than where qualified by the provisions for the Policy Areas, the following forms of development are acceptable in the Rural Zone:

- infrastructure to support acceptable uses ...
- wind farm and ancillary development outside of the Barossa Valley Character Preservation District; and
- wind monitoring mast and ancillary development outside of the Barossa Valley Character Preservation District. ...

Form of Development

PDC 1 Development should not be undertaken unless it is consistent with the desired character and acceptable forms of development for the zone and the relevant policy area.

Building Development

PDC 22. Wind farms and ancillary development should be located in areas outside of the Barossa Valley Character Preservation District as defined by Character Preservation legislation which provide opportunity for harvesting of wind and efficient generation of electricity and may therefore be sited:

- (a) in visually prominent locations;
- (b) closer to roads than envisaged by generic setback policy.

Impacts of the proposed wind farm on vegetation and landscape character, both in terms of visual and flora and fauna, have been extensively examined by specialist consultants and their methodologies and findings are discussed in detail in the following sections of this report.

Vegetation and Landscape Character

Objective 5: Retention and maintenance of wetlands and existing native vegetation for its conservation, biodiversity, and habitat value and environmental management function.

Objective 6: Maintenance and enhancement of the landscape character.

Built Form and Design

Objective 21: Buildings and structures compatible with the environmental qualities, built form and character of the surrounding area and landscape.



In addition to the expansive provisions of the Rural Zone, the Palmer wind farm development is proposed to be sited within two policy areas being: the Marne Watercourse Policy Area 13 and the Hills Policy Area 14. The development site is also located within the area recognised as the Hills Face, across both Policy Areas.

The envisaged land uses within both the Marne Watercourse Policy Area 13 and the Hills Policy Area 14 are reasonably consistent, seeking the continuation of low intensity agricultural land uses, including grazing.

Rural Zone – Policy Area Number 13 – Marne Watercourse

Background

The Marne Catchment can be defined in four distinct ecological and hydrological units

(a) The Upper Catchment

Most of the water is collected in the upper catchment in the Mount Lofty Ranges, in the tributaries of the Somme and the high rainfall tributaries of the Marne.

(b) The Gorge and Hills Face

The main drainage lines join to form a gorge at the start of the descent from the upper catchment. The Marne falls 130 metres over a distance of 12km and has formed a deep gorge through metamorphic rock. The gorge is also representative of the eastern hills face of the ranges.

(c) The Floodplain and River Channel

The Marne forms a floodplain at the base of the gorge to where the river meets the Mallee Plain at Cambrai. The river flows infrequently to the mouth on the Murray. Groundwater is recharged by the Marne's flows in the local Cambrai to Kongolia area.

(d) Marne Mouth or Wongulla Wetland (see River Murray Zone)

Watercourses in the Policy Area have been impacted by agricultural land use including clearing, grazing, dam construction and groundwater use for irrigation. The plant biomass and diversity have reduced the habitat value for fauna. Dam construction in the upper catchment has reduced stream flows considerably and groundwater use near Cambrai has lowered the local watertable. Development policies therefore need to take account of the requirement to make allowance for the environmental needs of the rivers' systems and existing water users.

Desired Character

Apart from the hills face see Figs HF(MWPA)/1 to 5 and associated gorge, the Policy Area is suitable for a range of agricultural and horticultural uses.



The hills face is unsuitable to intensive agricultural uses that would change the existing open and exposed character of the landform. Low intensity uses like grazing of sheep should continue.

Tree plantations on the hills face should be confined to gullies and watercourses and building development should, in addition to meeting design criteria, be limited to very large holdings. Local species should be used such as Sheoaks (*Allocasuarina verticulata*).

Water harvesting and use to support agricultural development is appropriate within sustainable limits.

The following forms of development are unacceptable in that part of the Marne Watercourse Policy Area that comprises the hills face and gorge as defined in Figs HF(MWPA)/1 to 5 (additional to unacceptable use for the Rural Zone):

- **horticulture, particularly viticulture and olive production;**
- **forestry;**
- **buildings on allotments less than 200ha in size.**

Both the Marne Watercourse Policy Area and Hills Policy Area seek to protect the land from inappropriate intensive agriculture, horticulture and forestry, which may have adverse environmental impacts on the watercourses (which form part of the River Murray tributaries)/gorge and hills within the area. The proposed wind farm development does not involve any of these forms of development.

Both Policy Areas list land uses which are considered to be unacceptable. It is further noted that the Desired Character Statement for the Rural Zone specifically states that *"other than where qualified by the provisions for the Policy Areas, the following forms of development are acceptable in the Rural Zone"*. Since the acceptable land uses within the Rural Zone include wind farms and ancillary development and infrastructure to support acceptable uses, and neither Policy Area lists wind farms and infrastructure as unacceptable; the wind farm is consistent with the intent of the zone and not in conflict with the provisions of the policy areas.

It is noted that buildings on allotments of less than 200 hectares are also inappropriate within the Marne Watercourse Policy Area. Area A of the proposed wind farm is located within this Policy Area. Within Area A there are 10 involved properties. Infrastructure, including the wind turbine generators, access roads, transmission lines and temporary construction facilities are all located on allotments which exceed 200 hectares. On this basis, the wind turbine structures proposed within Area A on the subject properties do not offend the Desired Character Statement of the Marne Watercourse Policy Area.

A range of allotment sizes are contained within Areas B and C of the proposed wind farm. Although some of the allotments on which wind farm infrastructure is to be located are less than 200 hectares, the development does not fundamentally alter the pattern of development or underlying land use.



As discussed previously, the wind farm does not adversely impact on the intent of the Rural Zone to facilitate land for primary production purposes. The continuation of primary production land uses is sought by Principle of Development Control 7 of the Marne Watercourse Policy Area and the Desired Character Statement and Objective 1 of the Hills Policy Area. The development is consistent with the underlying land use intent of both the Marne Watercourse Policy Area and the Hills Policy Area, as primary production in the form of grazing can continue to be the principal and underlying land use.

Marne Watercourse Policy Area

PDC 7 Development should be for primary production purposes which are compatible with the Policy Area's role as a water catchment or recharge area, and should not be undertaken if such development is likely to pollute water resources or lead to a diminution of the water resource.

Hills Policy Area

Desired Character Statement

Open grazing of the eastern hills face see Figures HF(HPA)/1 to 5 and very limited or no built form to preserve the eastern backdrop of the Murray Plains. The hills face is unsuitable to intensive agricultural uses which would change the existing open and exposed character of the land form. Low intensity uses like grazing of sheep should continue. These plantations on the hills face should be confined to gullies and water courses and building development should, in addition to meeting design criteria, be limited to very large holdings.

Behind the eastern face of the range a wider range of agricultural and horticultural uses are appropriate where built form, providing it relates to primary production, will be evident, but at low densities. These uses include grazing and animal keeping, cropping, viticultural and dairying.

Objective 1: Retention of the open rural character as derived from large land holdings used for primary production and dispersed isolated built form.

There are numerous provisions in the Marne Watercourse Policy Area and the Hills Policy Area, which seek to preserve and enhance the character of the gorge and the open rural landscape. To maintain the desired character, it appears the Principles seek to limit built form on the hills face.

Within the Marne Watercourse Policy Area and the Hills Policy Area, there is inconsistency in the policies, as some provisions seek to limit buildings to allotments in excess of 200 hectares, whilst others seek to restrict buildings altogether on the eastern face of the ranges. This is further inconsistent with the Rural Zone provisions which acknowledge that wind turbine generators may be sited in visually prominent locations.

Marne Watercourse Policy Area

Objective 4: Protection of the open rural character of the hills face of gorge.

PDC 2 Development should preserve and enhance the character and amenity of the River Marne and River Somme and its environs.



Hills Policy Area

Objective 2: No building development on the eastern face of the Mount Lofty Ranges.

In addition to the provisions of the Marne Watercourse Policy Area, the Hills Policy Area and the definition of the Hills Face within the Development Plan, the establishment of the Barossa Valley Character Preservation Area incorporates a further layer of protection for the eastern Mount Lofty Ranges. Within the Development Plan and particularly the Rural Zone, wind farms are not envisaged within the Preservation District and are non-complying forms of development.

The Palmer Wind Farm is outside of the Protection District, which ensures that an area of the eastern face of the Mount Lofty Ranges continues to achieve the protection sought by the policies of the Marne Watercourse Policy Area and Hills Policy Area.

PDC 1 Development should not be undertaken unless it is consistent with the desired character for the policy area.

PDC 5 No buildings should be developed on the eastern face of the ranges as defined in Marne Watercourse Policy Area Figures HF(MWPA)/1 to 5.

The character of the wind farm development site and the locality, including the Marne River corridor is broadly outlined in previous sections of this report, but is further addressed under the heading of Visual Amenity (Section 6.3).

In summary, wind farms are envisaged land uses within the Rural Zone. Given the minimal reduction in productive farming area, the proposal will not adversely impact on the ongoing sustainability of primary production within the locality, and is unlikely to have an adverse impact on the principle function of the zone.

The visible nature of the wind farm is anticipated within the zone and therefore the proposal does not offend the objectives and Desired Character Statement relating to this aspect. Furthermore, the site of the wind farm is outside of the Barossa Valley Character Preservation District. The development is considered to satisfy the Rural Zone provisions in relation to land use.

6.2 Efficient Energy Generation

Within the General Section of the Development Plan, there are a number of provisions under the heading of 'Renewable Energy', including Objective 96 and 97 that support renewable energy projects including wind farms to harness natural resources and generate electricity that would benefit the community and the state.

Renewable Energy

Objective 96: Development of renewable energy facilities that benefit the environment, the community and the state.



Objective 97: The development of renewable energy facilities, such as wind farms and ancillary development, in areas that provide opportunity to harvest natural resources for the efficient generation of electricity.

Trustpower have determined through feasibility analysis that the Palmer wind farm provides an opportunity to harvest the natural wind resources of the region for efficient generation of electricity. Trustpower has determined the subject land as an appropriate location for a wind farm, based on a variety of factors (wind speed, cut-in wind speed, capacity factor) along with the location and capacity to connect to the electricity grid.

The wind farm has a potential total generation capacity of 1,300 Gigawatt hours (Gwh) of electricity per annum. This equates to three percent of the 2020 national Large-scale Renewable Energy Target (LRET) of 41,000 GWh expanded RET established by the Federal Government. An economic analysis undertaken by Hudson Howell, that at a *“conservative carbon price of \$20 per tonne (conservative relative to international trading schemes and Australia’s carbon tax of \$23 per tonne), the value of carbon emission savings associated with the Palmer Wind Farm is estimated to be \$21 million per annum or a net present value of \$223 million over a 20 year period (discount rate of 7%)”*

Furthermore, the Hudson Howells Economic Impact Assessment Report, which forms part of the application documents, provides an estimate that the Palmer Wind Farm project would generate \$407 million of value to the State, as quoted below:

“Modelling for this scenario indicates that the project will generate \$407 million of value added (contribution to Gross State Product) in the State over the period of construction and that this would happen over three years (allowing for lagged flow through effects). 3,550 person years of employment would be supported – or again an average of over 1,180 jobs sustained per year over three years. Once operational the project is estimated to support annually \$19 million of value added, and support directly and indirectly of the order of 180 jobs per year.

From a regional perspective⁷, the modelling indicates that the project will generate \$107 million of value added (contribution to Gross Regional Product) in the region over the period of construction and, again allowing for lagged flow through effects, this would happen over three years. 970 person years of employment would be supported, or again an average of 320 jobs sustained per year over three years. Once operational the project is estimated to support annually \$7 million of value added in the region, and support directly and indirectly (including the multiplier impact) approximately 60 jobs per year.”

⁷ 1 Hudson Howells Palmer Wind Farm – Economic Impact Assessment defines Regional in this context as the Adelaide Hills Region of South Australia and predominantly the Eastern Adelaide Hills Region.



It is evident that the Palmer Wind Farm would have economic benefits to the local community and the state in general, in accordance with the Renewable Energy Objectives of the Development Plan.

6.3 Visual Amenity

The Development Plan recognises that due to the large scale of wind farms (in terms of both height and spread of components) that mitigating visual impacts are difficult. As stated in the Desired Character Statement of the Rural Zone, *“these visual impacts are to be accepted in pursuit of benefits derived from increased generation of renewable energy”*. The Renewable Energy section of the Development Plan contains specific provisions relating to managing visual impacts of wind farms, particularly PDC 397.

Wind Farms and Ancillary Developments

PDC 397. The visual impacts of wind farms and ancillary development (such as substations, maintenance sheds, access roads and wind monitoring masts) should be managed through:

- (a) **wind turbine generators being:**
 - (i) **setback at least 1000 metres from non-associated (non-stakeholder) dwellings and tourist accommodation;**
 - (ii) **setback at least 2000 metres from defined and zoned township, settlement or urban areas (including deferred urban areas);**
 - (iii) **regularly spaced;**
 - (iv) **uniform in colour, size and shape and blade rotation direction;**
 - (v) **mounted on tubular towers (as opposed to lattice towers);**
- (b) **provision of vegetated buffers around substations, maintenance sheds and other ancillary structures**

With reference to PDC 397 above, the Palmer Wind Farm proposes to manage the visual impacts in the following manner:

- Satisfy the minimum setback of 1,000 metres from all non-stakeholder dwellings. It is noted that the nearest non-stakeholder dwelling (R096) is approximately 1,015 metres from the nearest turbine in the proposed indicative layout. However, more than half of non-stakeholder dwellings within 3.0 kilometres of the nearest turbine have a separation of in excess of 2.0 kilometres from the nearest wind turbine generator.
- Satisfy the minimum setback of 1,000 metres from the four known tourist accommodation facilities within the locality of the wind farm including:
 - the Palmer Hotel within the township of Palmer, which is approximately 2.3 kilometres from the nearest WTG;
 - Stonybank Cottages, Stonybanks Road, Sanderston, which is approximately 1.2 kilometres from the nearest WTG;
 - Saunders Gorge Sanctuary, Chain Road, Sanderston with the nearest WTG estimated to be 3.2 kilometres from the nearest WTG; and



- Rabbiter's Hut Bed and Breakfast at Pebbly Range Road, Tungkillo, which is approximately 3.6 kilometres from the nearest WTG.
- Wind turbine generators setback of greater than 2,000 metres from the defined settlements of Sanderston, Milendella, Palmer and Tungkillo.
- The wind turbine generators are to be constructed of tubular towers, all of which are proposed to be a uniform colour, size and shape. Design of the wind farm ensures that the blade rotation is also uniform.
- Sufficient area is available within the boundaries of the substation, operations and maintenance facilities for screen landscaping.

The Rural Living (Sanderston) Zone is within the locality of the proposed wind farm, particularly adjacent Area A. The site of the development immediately adjoins the Rural Living Zone north of Sanderston. This Rural Living Zone is an elongated shape which extends from Sanderston in a northerly direction along the foothills of the escarpment of the Eastern Mount Lofty Ranges. The Development Plan describes this part of the zone as follows:

Rural Living Zone – Desired Character - Sanderston

The Sanderston part of the zone follows the old stock routes and extends from the settlement of Sanderston to the boundary township of Cambrai.

The zone is at the interface of the Hills Face and Murray River and being only lightly treed. Visual issues associated with new development are of critical importance. These can be addressed by appropriate siting of development, minimising changes in land form and promoting extensive tree plantings. There are few large allotments, well above the medium size, which can be divided to a minimum size of 10 hectares.

The largest concentration of dwellings within the zone, adjacent to the proposed wind farm is within the area around Pohl Road and Burton Road. Wind farm infrastructure proposed in the vicinity of this cluster of rural living allotments including a temporary laydown area and 33 kv transmission lines. The nearest wind turbine generator is WTG A17, which is between 1,359 metres and 2,374 metres to the west of this cluster of dwellings.

During the construction period of the wind farm, the proposal includes some temporary laydown/storage and construction facilities within close proximity to the Rural Living (Sanderston) Zone. The location of these facilities would mean increased traffic around the area on local roads and potential for noise and dust associated with these activities. During construction there may be some adverse impact on the amenity of the locality, however these impacts would be minimised by, the short period of time in which they would be used, approximately two years and suitable management of these facilities in accordance with EPA legislation and the Construction Environmental Management Plans.



It is not a typical rural living zone, as it is not immediately contiguous with a settlement or urban area. The allotment size specified for Sanderston, at 10 hectares, is significantly larger than from any other rural living zoned area. Allotment sizes in other areas range from 2,000 square metres to 4.0 hectares. The unique characteristics of this zone should be noted in determining any non-compliance with PDC 397.

In addition to its unique physical characteristics, the Rural Living Zone (Sanderston) comprises some rural living dwellings, whilst large areas of this zone are utilised for primary production purposes, generally in conjunction with other larger land holdings in the area.

The Development Plan places a high value upon the scenic qualities of rural landscapes in the Rural Zone, including the eastern Mount Lofty Ranges. The preservation of the rural landscape must be balanced against the recognition with the Rural Zone that wind farm will be visible, and that this impact is acceptable in the pursuit of renewable energy facilities. Through the investigative process a number of turbines were removed from Area A in order to accommodate the noise limits for this zone.

Rural Zone – Desired Character Statement

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 that part of the zone outside of the Barossa Valley Character Preservation district (as defined by Character Preservation legislation) and constitute a component of the desired character of this part of the zone.

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 preservation of scenic qualities of the primary production area is outlined in the Desired Character Statements of the Rural Zone and the Marne Watercourse and Hills Policy Areas. The value of the rural landscape character is also stated in numerous Objectives and Principles of Development Control quoted below.

Rural Zone

Vegetation and Landscape Character



Objective 5: Retention and maintenance of wetlands and existing native vegetation for its conservation, biodiversity, and habitat value and environmental management function.

Objective 6: Maintenance and enhancement of the landscape character.

Built Form and Design

Objective 21: Buildings and structures compatible with the environmental qualities, built form and character of the surrounding area and landscape.

Form of Development

PDC 1 Development should not be undertaken unless it is consistent with the desired character and acceptable forms of development for the zone and the relevant policy area.

Landscape

PDC 4. Development should be designed and sited to respect and maintain the landscape character of an area which is of:

- (a) historical (including archaeological) significance;
- (b) scientific interest;
- (c) scenic value or natural beauty;
- (d) other heritage significance; or
- (e) conservation significance.

Building Development

PDC 22. Wind farms and ancillary development should be located in areas outside of the Barossa Valley Character Preservation District as defined by Character Preservation legislation which provide opportunity for harvesting of wind and efficient generation of electricity and may therefore be sited:

- (a) in visually prominent locations;
- (b) closer to roads than envisaged by generic setback policy.

Policy Area Number 13 – Marne Watercourse

Objective 1: The character, aesthetic appearance, scenic beauty and amenity of the River Marne and River Somme and its environs are preserved and enhanced in order to:

- (a) undertake sustainable primary production;
- (b) protect water systems;
- (c) provide recreation areas, particularly passive recreation areas;
- (d) provide for native flora and fauna habitats; and
- (e) protect areas of scientific, archaeological or cultural significance.

Objective 4: Protection of the open rural character of the hills face of gorge.

PDC 1. Development should not be undertaken unless it is consistent with the desired character for the policy area.



Policy Area Number 14 – Hills Policy Area

Objective 1: Retention of the open rural character as derived from large land holdings used for primary production and dispersed isolated built form.

Objective 2: No building development on the eastern face of the Mount Lofty Ranges.

PDC 1. Development should not be undertaken unless it is consistent with the desired character for the policy area.

PDC 3. Dwellings and non-rural buildings shall not be located where they are prominently visible from a public road without extensive screening first established.

As outlined in previous sections of this report, a detailed visual assessment was undertaken by WAX Design. The report methodology notes that *“a total of 10 viewpoints were selected for a detailed visual assessment and photomontages have been produced to illustrate the anticipated visual change that will be experienced in the surrounding landscape character units ...”*

WAX state that *“The viewpoints identified represent a range of locations and landscape characters around the proposed development. Each viewpoint has been selected to illustrate locations that are publicly accessible, represent typical views of landscape character units and where a large number of wind turbines will be visible in the landscape. In this regard, each viewpoint represents the greatest probable degree of visual change that will be experienced as a result of the proposed development within the existing landscape. The 10 viewpoints were assessed using the GrimKe matrix. The matrix has been used to quantify the visual effect of the development from a number of locations.”*

The following table provides an extract of the findings of the Landscape Assessment for each of the viewpoints.

Viewpoint Number	Viewpoint Location	Description Of Locality	Visual Effect
1	Summit of Mount Pleasant (west – sub-regional)	Viewpoint 1 is located adjacent to the summit of Mount Pleasant. This viewpoint is located at approximately 8.0 kilometres from the nearest turbine and demonstrates the probable visual effect that will be experienced from elevated locations within the Barossa, Adelaide Hills and Mount Crawford Forest landscape areas to the west of the proposed wind farm. The landscape surrounding the viewpoint is typical of the undulating wooded landscape character to the Mount Pleasant and Eden Valley Ridgeline and from locations across the Barossa and Adelaide Hills.	The visual effect of the proposed development from this viewpoint is described as moderate. The landscape character of this area provides increased levels of amenity and sensitivity to change. While the natural and vegetated qualities of the landscape increase the potential for visual effect the increased levels of vegetation, topographic form and distance to the proposed development enhance the landscapes capacity to absorb the development limiting the degree of visual change.



		<p>The viewpoint and surrounding locality has a high degree of scenic value as a result of the extensive vegetation cover, undulating relief and the numerous water bodies that exist within the landscape.</p>	
2	Eden Valley Lookout (north-west – regional)	<p>This viewpoint represents an important community location with panoramic views across Keynes Gap and Eden Valley with views extending through almost 270 degrees towards the Barossa Valley and Adelaide Hills. The panoramic qualities of the viewpoint provide numerous opportunities from which to see a diverse range of landscapes ranging from well-vegetated areas of remnant vegetation, across vineyards, grazed pastures and distant ridgelines. The landscape is punctuated by settlements, church spires and buildings. This combination of elements creates an attractive landscape amenity which reinforces the significance of the viewpoint.</p>	<p>The visual effect of the proposed development from this viewpoint is described as moderate. The landscape character of this character area provides amenity due to the panoramic view across varying landscape typologies. The scenic qualities of the landscape increase the visual sensitivity of the landscape. However, due to the distance of the visual effect the scale of the turbines are offset by the horizontal and existing vertical scale of the landscape. Given the elevated viewpoint, there is only moderate absorption screening due to the panoramic scenic quality. However the scale of the landscape and distance of effect provide sufficient capacity to reduce the degree of visual change.</p>
3	Gerschwitz Road, Cambrai (north – sub-regional)	<p>Viewpoint 3 is located on Gerschwitz Road. The viewpoint is typical of the visual effect that will be experienced from sub-regional locations to the northeast of the proposed wind farm at a distance of 5.5 kilometres. Located outside the township of Cambrai, the viewpoint provides an indication of the potential visual effect that will occur in and around the township and from properties on the western edge of the town. From the viewpoint the landscape character is defined by the lower-lying topography of the Murray Plain that transitions from the foothills of the escarpment to the inclined landform of the Eastern Mount Lofty Ranges.</p>	<p>The visual effect of the proposed development from this viewpoint is described as moderate. Due to the distance of the visual effect and prominent vertical scale of the turbines on the dominant escarpment, the proposed development will produce an increase degree of visual change on the underlying landscape character. However, the low landscape amenity value of the eastern escarpment which is denuded of vegetation results in the development producing a moderate effect on landscape amenity.</p>



4	Angas Valley Road and Ridley Road Intersection (east – sub-regional)	<p>Viewpoint 4 at the intersection of Angas Valley Road and Ridley Road represents a major tourist and community road corridor and provides panoramic views of the proposed development site across the Murray Plain towards the Eastern Mount Lofty Ranges escarpment.</p> <p>The viewpoint represents the typical landscape character experienced across the Murray Plains with open views across a flat landscape punctuated with localised undulations which create a degree of screening.</p>	<p>The visual effect of the proposed development from this viewpoint is described as moderate. Due to the distance of the visual effect and prominent vertical scale of the turbines on the dominant escarpment, the proposed development will not alter the underlying landscape character. Due to the existing infrastructure elements and built form within the field of view and limited natural vegetation the sensitivity of the landscape to visual change is limited and the low scenic quality implies that the development will have only moderate visual effect on landscape amenity.</p>
5	Adelaide to Mannum Road Intersection (south-east – regional)	<p>The viewpoint is located at a busy intersection on the main D1 and B36 Mount Pleasant Road to Mannum transport corridor.</p> <p>The landscape character surrounding the viewpoint is typical of the Murray Plains area with a low lying topographic undulation creating local screening and small scale landform variations.</p> <p>The topographic prominence of the Eastern Mount Lofty Ranges escarpment is visible as a backdrop to the viewpoint which increases in visual prominence to the north, while decreasing to the south to form a low lying elevated plateau that continues towards Nairne and Lobethal.</p>	<p>The visual effect of the proposed development from this viewpoint is described as moderate. Due to the distance of the visual effect and moderate landscape absorption capacity the development is seen as an integrated development form rather than imposing on the underlying character. On the other hand the vertical scale of the turbines on the visually dominant escarpment, will increase the visual presence of the development from the Murray Plain Landscape Character Unit.</p>
6	Outskirts of Palmer on Randell Road (east – sub-regional)	<p>Viewpoint 8 is located on the outskirts of Palmer and represents an elevated location from which the surrounding topography, landscape character of Palmer and adjacent escarpment is visible. The viewpoint is typical of the foothills of the Murray Plains with expansive views of an agricultural landscape character to the east and the rising visual envelop of the Eastern Mount Lofty Ranges escarpment to the west.</p> <p>The presence of the Adelaide-Mannum pipeline and large grain silos creates a defined visual effect that contrasts the open agricultural character of the underlying landscape.</p>	<p>The visual effect of the proposed development from this viewpoint is described as moderate. Due to the low level of existing landscape amenity partially due to the existing degree of built form and infrastructure within the field of view, the proposed development will have only a moderate visual effect on the existing character which has a low sensitivity to visual change and effect.</p>



7	Tungkillo Township (west – local)	<p>The viewpoint represents the potential visual effect that will be experienced within the township of Tungkillo and the associated transitional landscape between the tablelands to the east and the edge landscape of the Adelaide Hills and Barossa Valley area. The existing landscape character is defined by undulating ridgelines that produce a visual envelope to the viewpoint and surrounding landscape. Existing vegetation is scattered across the landscape in the form of isolated trees within grazed paddocks between.</p> <p>The ridgeline directly to the east provides a rocky escarpment that creates a degree of visual character to the area and highlights the characteristics of the tablelands further to the east.</p>	<p>The visual effect of the proposed development from this viewpoint is described as moderate. Due to the localised variance in topography, vegetation and contained views which screen a proportion of the development, there will be a limited horizontal and vertical degree of visual influence. In addition the scenic quality and landscape amenity is already impacted by existing infrastructure and built form associated to the water pipeline and township of Tungkillo. The proposed development will have only a moderate visual affect on the existing character.</p>
8	Brinkworth Road (west – local)	<p>Viewpoint 8 is located on the Brinkworth Road approximately 4.0 kilometres south of Tungkillo. The viewpoint is representative of the landscape character and potential visual effect that will be experienced across the tablelands to the southwest of proposed Palmer Wind Farm. The existing landscape character is defined by undulating hills that extend throughout the area with localised valleys and trees punctuating the landscape. The land cover is grazed with a few isolated remanent trees as well as occasional belts of vegetation associated with creek lines.</p>	<p>The visual effect of the proposed development from this viewpoint is described as substantial. Due to the close proximity and vertical scale of the turbines, the landscape provides limited capacity to absorb the turbines, the wind turbines will be seen as large pieces of infrastructure. This coupled with a degree of existing landscape character amenity means the proposed development will produce a partial change in the character of the landscape form this localised aspect.</p>
9	North of Church Road and Strachan Road Intersection (northwest – sub-regional)	<p>Viewpoint 9 is located on Church Road west of the proposed wind farm. The viewpoint is typical of the interface between the tablelands and the eastern edge of the Adelaide Hills and Barossa. The landscape character is defined by undulating landforms that extend across the landscape creating a variety of local low ridgelines and valleys.</p>	<p>The visual effect of the proposed development from this viewpoint is described as moderate. Due to the close proximity and vertical scale of the turbines, the landscape provides limited capacity to absorb the turbines and they will be seen as large pieces of infrastructure. Given the viewpoint is on an elevated ridgeline the visual effect surrounding this viewpoint will be reduced within the lower lying agricultural paddocks due to the local topographic ridgelines screening the development.</p>



		<p>The interrelationship of ridgelines and valleys creates a complex visual character with views screened from within valleys contrasted by more open and elevated views from the high points within the landscape.</p>	
10	<p>North of Church Road and Strachan Road intersection (northwest – sub-regional)</p>	<p>Viewpoint 10 represents the potential visual affect that will be experienced in the locality of Harrison Gorge and around Mine Road to the south of Palmer. The view point and general locality is important as it represents a pocket of highly valued natural landscape character.</p> <p>The vegetation cover and rocky outcrops provide a high degree of visual amenity in relation to natural features within the local area.</p> <p>While the viewpoint is located within the wider agricultural landscape the secluded visual qualities of the valley enhance the visual qualities and experience of the landscape character. The combination of visual enclosure and the prominence of natural elements increase the visual amenity of the area.</p>	<p>The visual effect of the proposed development from this viewpoint is described as substantial. Due to the close proximity and vertical scale of the turbines, the landscape provides limited capacity to absorb the turbines and they will be seen as large pieces of infrastructure. The natural character of Harrison Gorge with its incised valley form and vegetation elevates the visual amenity and scenic qualities of this defined local area. The sensitivity to visual change is increased and the potential for adverse visual effect increases.</p> <p>The proposed development will be seen to alter the character of this area but will ultimately only be perceived form a defined locality along the elevated ridgelines surrounding the gorge. From within the gorge itself the development will have less of an impact as the turbines will be proportionally or completely screened from view. Hence this viewpoint is not considered to be reflective of the views experienced within the Gorge but from the approach along Mine Road.</p>

In addition to the assessment of visual impact of the wind turbine generators, WAX Design makes the following observations with respect to the substation/operations and maintenance facilities, access tracks and transmission lines:

- “the sub-station /switching yard will be located in the south western half of the site in the vicinity of turbine B10. The sub-station has been located in the design process to limit the potential visual effect and capitalises on local landscape forms to provide screening and mitigation of the visual effect.*
- Where visible, the substation will create a visual contrast to the rural character of the landscape reinforcing the perceived land use changes that will occur with the introduction of the wind farm across the wider landscape.*



- *While the visual effect of the substation in relation to the overall effect of the wind farm is minimal, from local viewpoints around Randell Road and Borthwick Brae Road, the degree of visual change within the rural landscape will increase and the substation will be a noticeable development form.*
- *The tracks developed across private land areas will typically be 10 m during the construction period and reduced 5 m after implementation. Public road access track will be limited to 5-6 m width. The access tracks correspond with the alignment of the turbines and are located on the local profile of the ridges that form the Eastern Mount Lofty Ranges Tablelands and the edge of the escarpment.*
- *The proposed incline of the access tracks will be between 2 and 6%, increasing to 14% (1 in 7) in a few isolated locations. The slope profile closely follows the existing topography of the Ranges and would require limited cut and fill, which in turn will limit the extent of visual impact associated with access tracks.*
- *Wherever possible the proposal will utilise existing access track and road connections. In addition, the form, materiality and colour of the new tracks will be in keeping with other tracks and roads in the area. While the proposed tracks will appear as new development post construction, they do not appear out of character with the wider rural landscape. The track surface will be crushed rock sourced either on site or from a local supplier. Overtime, the track material is likely to dull and weather naturally which will reduce the associated visual effect.*
- *Finally, the visibility of the tracks needs to be assessed relative to the other development forms associated with the wind farm proposal. The proportional effect of the tracks will always be a secondary or partial visual element when considered against the degree of visual change produced by wind turbines. In this regard, the visual effect of the track is described as negligible and will progressively diminish over time.*
- *The proposed 33kV line will be located to the base of the Eastern Mount Lofty Ranges escarpment, along Three Chain Road for 1.6km and Milendella Road for 2.4km before travelling west across the escarpment to the proposed substation north of Borthwick Brae Road.*
- *The introduction of a 25 m high transmission line across the landscape will produce a series of localised visual effects as a result of the development form and the adjacent locality of the transmission line. An assessment of the proposed development corridor indicates the transmission line will be visible and will produce a defined degree of visual change that is limited to 2km from the transmission line corridor. While the poles produce individual visual effects, the uniformity and repetitive pattern of the entire development ensures that the transmission line is seen within the context of the wider agricultural landscape. As a result, the proposed transmission will be seen as 'another piece' of infrastructure, no more significant than the existing stobie poles, farm buildings and pipelines within the landscape.*



- *To the northern extent of the 33kV transmission line runs to the base of the Eastern Mount Lofty Ranges escarpment across the existing rural landscape. The rising topography of the escarpment provides a significant backdrop to the transmission line, reducing the visual effect and prominence of the poles in the landscape. Along Three Chain Road the visibility of the transmission line is more fragmented due the amount of vegetation that exists along the road corridor and around Saunders Gorge. This fragmented visual quality allows the transmission line to be seen as a secondary or recessive landscape element, particularly when viewed within the wider context of the surrounding rural landscape.*
- *At the intersection of transmission line with Walker Flat Mount Pleasant Road, the alignment of the connection follows Milendella Road. As the road corridor already contains an electrical transmission line, the proposed 33kV line will represent an increase in the existing visual effect rather than a new piece of infrastructure.*
- *It is only from locations adjacent to the proposed transmission line and over relatively short distances (less than 300 to 400m) that the visual effect increases. As the distance between the viewing point and the transmission line increases beyond 2 to 3kms, the resulting visual effect decreases significantly and at the same time the visual effect produced by the wind farm will increase, reducing further the notability of the transmission line.*
- *The 275kV transmission line will create an infrastructure corridor that connects the wind farm substation with the Tungkillio substation. The proposed transmission line will be supported by either a spun concrete pole or lattice. In both cases, the development of lattice towers up to 46m high or steel or spun concrete monopoles up to 32m high will produce a fragmented visual effect across the existing rural landscape.*
- *The presence of an existing transmission line that runs to the western edge of the proposed wind farm site produces a context for the degree of visual effect that is likely to result from the towers or poles. At an offset distance of between the 500m and 800m to the east of the existing transmission line, the proposed overhead connection will produce a proportional increase in the visual effect, rather than a new development form with the existing rural landscape. Only from locations long Ayres Road and Brinkworth Road will the visual effect become more prominent. However, as previously stated, when the distance between the viewing point and the transmission line increases beyond 2 to 3kms, the degree of visual change decreases as a direct result of increased degree of visual change associated with the proposed wind farm."*

In conclusion, WAX Design state there is a variety of visual effects that would be experienced across the local, sub-regional and regional landscape. *"It is noted that the visual effects will occur within a highly modified pastoral landscape. Overall there is only a moderate variation in the degree of visual change experienced to the northwest and southwest with a slightly greater degree of visual effect to the west.*



This reflects the uniformity in the existing landscape character in terms of land use, vegetation and topography". In the summary of the visual assessment, the following is noted:

- *"The areas and regions surrounding the proposed wind farm that will experience differing levels of visual effect.*
- *local landforms and vegetation which may provide partial or complete screening of the wind farm*
- *The assessment of the visual effect demonstrates that the degree of visibility with reference to ZTVI will be experienced as moderate increasing to significant across the majority of the local, sub-regional and regional landscape to the north east and west. The degree of visual change decreases to the south, particularly in relation to the wooded and topographically varied landscape character associated with the Adelaide Hills region.*
- *Although there is a uniform degree of visual change across the sub-regional and regional landscape, some areas may experience increased levels of visual effect due to existing landscape's sensitivity to visual change. This is particularly relevant to Harrison Gorge and the surrounding landscape areas which are defined by the Baker Creek and Reedy Creek corridors. The scenic and community values associated with the area, as assessed by WAX Design, BGLA and as indicated by members of the community during the consultation sessions, have increased the potential visual effect from moderate to substantial across the local and sub-regional landscape to the south resulting in the potential for a specific area of adverse visual effect.*
- *The localised areas of significant visual effect will be experienced from elevated viewpoint looking towards Harrison Gorge which represents specific areas of high scenic value and will be impacted by the turbines associated with Group C. From locations within the Gorge there will be less visual effect as the proposed development will become partially screened by the incised topography of the Gorges. Consequently the experience of being within Harrison Gorge and Barker Creek will have a reduced visual effect.*
- *A similar increase in visual effect may occur around Sanderston Gorge and Marne River, where a natural landscape character is impacted more significantly by the development of the proposed wind farm due to the level of sensitivity that the landscape has to visual change. By contrast, the topographic screening and potential visual absorption of the landscape around Tungkillo and Palmer reduce the degree of visual change.*
- *In summary, the proposed wind farm will produce a moderate degree of visual change across a highly modified rural landscape. This degree of visual change results from visibility of the wind turbines located on the elevated profile of the Eastern Mount Lofty Ranges. While the elevated location increase the visual prominence of the wind farm the interaction of ridgelines, local topography and vegetation limits the number and extent of wind turbines that are visible in the landscape.*



- *This coupled with the lower sensitivity to visual change that results from the highly modified rural landscape and the presence of existing utility and transport infrastructure limits the degree of visual change and the potential for adverse visual effect.”*

The findings of the visual assessment report acknowledge that there will be visual change in the region of the wind farm, as anticipated in the provisions of the Development Plan, including the Desired Character Statement of the Rural Zone, which identifies that wind farm elements will be visible due to their spread and scale. The Desired Character Statement also notes that wind farm facilities may need to be located in valuable scenic and environmental areas and be visible from scenic routes.

Rural Zone – Desired Character Statement

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.**

Within the Rural Zone, the Marne Watercourse and Hills Policy Areas, along with the Hills Face all describe the scenic qualities of the Eastern Mount Lofty Ranges and natural features including the River Marne, River Somme the hills and the gorge. Objective 1 of the Marne Watercourse Policy area seeks to preserve and enhance the character, scenic beauty and amenity of the River Marne for various reasons, as quoted below.

Policy Area Number 13 – Marne Watercourse

Objective 1: The character, aesthetic appearance, scenic beauty and amenity of the River Marne and River Somme and its environs are preserved and enhanced in order to:

- (a) **undertake sustainable primary production;**
- (b) **protect water systems;**
- (c) **provide recreation areas, particularly passive recreation areas;**
- (d) **provide for native flora and fauna habitats; and**
- (e) **protect areas of scientific, archaeological or cultural significance.**

The proposed wind farm would not unreasonably affect sustainable primary production; does not involve building works or construction techniques that would unreasonably impact on the water systems or native flora and fauna habitats; does not alter access or the capacity of the community to utilise the River Marne for recreational purposes; and does not unreasonably intrude into areas of archaeological or cultural significance.



Whilst the setback of the proposed wind turbine generators to the River Marne is estimated to be a moderate 400 metres, as noted by WAX Design *“the existing landscape character within the river corridor is maintained with a moderate degree of visual effect occurring to the south edge. In addition, the incised topography of the river corridor across the eastern escarpment of the Mount Lofty Ranges provides localised visual envelopes that reinforce the natural and scenic values of the river while limiting the potential visual impact of individual wind turbines from certain locations in the river corridor”*.

Although the visual landscape in the locality of the river corridor would be altered by the wind turbines, the scenic beauty of the area can still be appreciated, without impacts on (a) to (e) of Objective 1 of the Marne Watercourse Policy Area.

Both the Marne Watercourse and Hills Policy Areas seek to protect the character and amenity of the hills by minimising building within these areas. Neither Policy Area lists wind farms as unacceptable forms of development in the Desired Character Statements. As previously identified, it is apparent that the provisions of the Policy Areas that state that buildings should not be developed on the eastern face of the ranges and are inconsistent with the underlying intent of the Rural Zone, which acknowledges that wind farms are anticipated within visually prominent locations.

Marne Watercourse Policy Area

Desired Character Statement

The following forms of development are unacceptable in that part of the Marne Watercourse Policy Area that comprises the hills face and gorge as defined in Figs HF(MWPA)/1 to 5 (additional to unacceptable use for the Rural Zone):

- **horticulture, particularly viticulture and olive production;**
- **forestry;**
- **buildings on allotments less than 200ha in size.**

PDC 5. No buildings should be developed on the eastern face of the ranges as defined in Marne Watercourse Policy Area Figures HF(MWPA)/1 to 5.

PDC 11. Buildings should not be sited on prominent ridgelines or in locations that would detract from views obtained from any primary or secondary arterial roads or scenic routes, or in locations requiring unnecessary removal of natural vegetation or excessive amounts of excavation.

Hills Policy Area

Desired Character Statement

The following forms of development are unacceptable in that part of the Hills Policy Area defined in Figures HF(HPA)/1 to 5 (additional to unacceptable uses for the Rural Zone):

- **horticulture, particularly viticulture and olive production;**
- **forestry;**



- **buildings on allotments less than 200ha in size.**

Objective 2: No building development on the eastern face of the Mount Lofty Ranges.

PDC 3. Dwellings and non-rural buildings shall not be located where they are prominently visible from a public road without extensive screening first established.

As discussed in Section 6.1 of this report within the land use discussion, there is an additional level of protection for the Eastern Mount Lofty Ranges as a result of the Barossa Valley Character Preservation District. This Preservation District immediately abuts the site of the wind farm development and ensures that wind farms are not developed further west or within the area of the Barossa Council.

Therefore, a significant area of the Eastern Mount Lofty Ranges is protected from building and development, including the development of wind farms.

Wind farms by their nature and form will be visually dominant in a locality as acknowledged in the provisions of the Development Plan. The visual impact of the proposal is considered acceptable and not fatal to the proposed development, for the following reasons:

- The landscape of the locality has been modified.
- The underlying rural landscape is retained and can be readily viewed.
- The approved but yet to be constructed Keyneton Wind Farm proposed to the north of the Palmer Wind Farm illustrates that this form of development is seen to be an appropriate form of development. This proposal would not introduce a new form of infrastructure or visual intrusion into the landscape.
- The locality contains a variety of natural landforms that provides ridges and valleys that assist in minimising the views of the proposed wind farm and transmission line. The wind turbines and transmission lines will come into and out of view depending on the location.
- The proposal is not expected to result in significant visual impact for the residents of the townships and settlements in the locality.
- The proposal results in only localised significant visual impact on areas of defined landscape value such as Harrison Gorge and the River Marne.
- The natural landforms within the locality have a variety of elevations, which limit the extent of potential cumulative effects of the turbines within the wider landscape.
- The access tracks are unlikely to be visually out of character or a dominant element in the wider rural landscape.



- Transmission lines are likely to be viewed as an additional visual element in the landscape rather than a new element given the existence of both 11kV and 275kV electricity infrastructure in the locality.
- The substation will be appropriately screened and is also an additional element in the locality rather than a new element, as the proposed wind farm will feed into the existing Tungkillio substation.
- Operation and maintenance facilities are sited in a manner to be viewed as additional infrastructure in a localised manner and appropriately screened.

6.4 Noise and Infrasound

Numerous provisions of the Development Plan establish that development of any form should not detrimentally affect the amenity of a locality or cause unreasonable interference through a variety of potential impacts, including noise (Interface Between Land Uses PDCs 87, 92 and 93). Protection of sensitive users and minimising acoustic interference is sought by Objective 16 and Principle of Development Control 12 of the Rural Zone. In addition, the wind farm is required to satisfy the current Environment Protection (Noise) Policy.

In addition to the general provisions of the plan protecting amenity from potential interference, there are specific provisions in the Development Plan relating to wind farms. The Renewable Energy Facilities provisions require that excessive noise from wind farms should be avoided or minimised, as stated in PDC 398(b).

Interface Between Land Uses

PDC 87. Development should not detrimentally affect the amenity of the locality or cause unreasonable interference through any of the following: ...

(b) noise;...

PDC 88. Development should be designed and sited to minimise negative impact on existing and potential future land uses considered appropriate in the locality.

Noise

PDC 92. Development should be designed, constructed and sited to minimise negative impacts of noise and to avoid unreasonable interference.

PDC 93. Development should be consistent with the relevant provisions in the current Environment Protection (Noise) Policy.

Renewable Energy

Objective 98: Location, siting, design and operation of renewable energy facilities to avoid or minimise adverse impacts on the natural environment and other land uses.



Wind Farms and Ancillary Developments

PDC 398. Wind farms and ancillary development should avoid or minimise the following impacts on nearby property owners/occupiers, road users and wildlife: ...

(b) excessive noise; ...

Rural Zone

Noise Pollution

Objective 16: Protection of sensitive uses from external noise.

PDC 12. Development designed to minimise adverse acoustic impacts on adjoining uses which would be sensitive to acoustic interference.

A detailed acoustic assessment of the proposed wind farm has been undertaken by Sonus and is included in the application documents. This assessment has been undertaken in accordance with the 2009 South Australian Wind Farms Environmental Noise Guidelines (SA Guidelines).

As noted in the Sonus report, the SA Guidelines were established to ensure a wind farm project did not unreasonably interfere with the acoustic amenity of the surrounding community and therefore to provide an objective assessment method for the purposes of comparison with the relevant Development Plan provisions.

Predictions of the noise from the wind farm have been made by Sonus for dwellings within the locality in the Rural Zone and also in the Rural Living Zone, which adjoins Area A and B (Rural Living – Sanderston). Table 3.1 in the Sonus report quoted below, summarises the applicable noise criteria for the locality of the wind farm.

Landowners	Zone	Noise Criteria
Without commercial agreement	Rural Living (Sanderston) Rural Living (Palmer)	35 dB(A), or background noise (LA90,10) plus 5 dB(A), whichever is greater.
	Rural Service Centre (Palmer)	40 dB(A), or background noise (LA90,10) plus 5 dB(A), whichever is greater.
With commercial agreement	Any	45 dB(A), or background noise (LA90,10) plus 5 dB(A), whichever is greater.

In assessing the potential impacts of the Palmer Wind Farm, the most pertinent considerations are:

- Does the wind farm create excessive noise?
- Does the wind farm avoid or minimise noise to nearby property owners and/or occupiers?



- Will the wind farm comply with the current Environment Protection (Noise) Policy?
- Is the health and amenity of the community adequately protected?

In assessing these matters, I note and consider:

- The developer has a general environmental duty pursuant to the *Environment Protection Act 1993*.
- The current Environment Protection (Noise) Policy specifically refers the assessment of wind farms to the SA EPA Wind Farm Guidelines as the relevant standard.
- 'Excessive noise' is a term utilised in the Development Plan particularly within the Renewable Energy Facilities PDC 398(b) and the SA EPA Wind Farm Guidelines, although it is not defined by either of these documents. 'Excessive noise' has been interpreted here to mean noise that exceeds the criteria established by the SA EPA Wind Farm Guidelines.
- The use of the terms 'avoid or minimise' is to be read as a disjunctive and that 'avoid' does not impose a higher standard than that of a containment to the acceptable level, in accordance with the discussion on this matter in *Paltridge & Ors v District Council of Grant & Anor* (2011) SAERDC 23 (17 June 2011) at paragraphs 39 to 41.
- The wind farm is located within a Rural Zone; however a number of dwellings within the locality are within a Rural Living Zone. The Environmental Noise Assessment undertaken by Sonus utilises the relevant criteria for assessment against the SA EPA Wind Farm Guidelines, which contains the following definitions:

"locality means an area to which a Development Plan applies (whether described in the Plan as a locality, or as a zone or a precinct or otherwise) that is—

- (a) made subject to a set of land use rules by provisions of the Plan; and*
- (b) not itself further divided by the Plan into areas that are made subject to separate sets of land use rules.*

Rural living: A 'rural living' zone is a rural–residential 'lifestyle' area intended to have a relatively quiet amenity. The area should not be used for primary production other than to produce food, crops or keep animals for the occupiers' own use, consumption and/or enjoyment. The noise amenity should be quieter than in an urban–residential area."

- The Rural Living Zone in the locality is elongated in shape and immediately adjoins the Rural Zone to both the east and west. The zone appears to contain both rural living and primary production land uses.



In answer to the first three considerations, I defer to the Sonus Environmental Noise Assessment Report. Utilising the criteria in Table 3.1 of their report, an assessment was undertaken by Sonus of the noise at all dwellings within 3.0 kilometres of the wind turbine generators and proposed substation.

It is noted that the nearest non-stakeholder dwelling (R096) within the locality is approximately 1,015 metres away from its closest turbine. This dwelling is within the Rural Zone and noise from the wind farm is not predicted to exceed the noise criteria.

Sonus concludes that *"Based on the assessment, the predicted noise levels achieve the requirements of the SA Guidelines at all relevant locations. Based on above, it is considered that the proposed wind farm will meet the relevant noise provisions of the Mid Murray Council Development Plan"*.

Given the technical nature of an acoustic assessment, I defer to the Sonus report and conclude that the proposed Palmer Wind Farm would satisfy the relevant provisions of the Mid Murray Council Development Plan regarding noise. I further note that the Environment Protection Authority is a formal referral agency for a wind farm development application and the technical nature of the acoustic assessment undertaken by Sonus will be reviewed by that agency as part of the application process.

The fourth assessment matter is the protection of the health and amenity of the community. Concerns regarding the health impacts on humans living in the locality of wind farms have been widely canvassed over recent years. Objective 26 of the Interface Between Land Uses provisions of the Development Plan seeks to *"protect community health and amenity"*. Concerns raised on the impacts of wind farms on residents' health often relate to infrasound.

Interface Between Land Uses

Objective 26: Protect community health and amenity and support the operation of all desired land uses.

Infrasound is *"low frequency noise below the audible frequency range that manifests as a rattle in lightweight materials such as glass"* (South Australian EPA Wind Farm Guidelines). Infrasound is not regulated either in the Development Plan or by the Guidelines. I note that the SA EPA Wind Farm Guidelines state:

"Infrasound was a characteristic of some wind turbine models that has been attributed to early designs in which turbine blades were downwind of the main tower. The effect was generated as the blades cut through the turbulence generated around the downwind side of the tower.

Modern designs generally have the blades upwind of the tower. Wind conditions around the blades and improved blade design minimise the generation of the effect. The EPA has consulted the working group and completed an extensive literature search but is not aware of infrasound being present at any modern wind farm site."



In relation to health impacts from wind farms, I note that this matter was extensively reviewed in the Environment Resources and Development Court matter of *Paltridge & Ors v District Council of Grant & Anor (2011) SAERDC 23*.

In general terms, the appellants in this matter argued that even at noise levels which otherwise meet the levels sought in the SA EPA Guidelines for Wind Farms, there still may be detrimental health effects. Evidence of health impacts of wind farms was provided by Dr Laurie and Professor Wittert and the Court preferred the conclusions of Professor Wittert who concluded that:

"There is no credible evidence of a causal link, between the physical outputs of a turbine (or sets of turbines), at the levels that are described in the statement of Mr C Turnbull⁸ and adverse effects on health" (paragraph 120 SAERDC 23).

Furthermore, in the *Paltridge & Ors v District Council of Grant & Anor (2011) SAERDC 23* matter, the appellants sought to invoke the 'precautionary principle'. This principle dictates that measures to prevent or forestall damage (in this case to human health) should not be postponed, merely because of the lack of full scientific certainty as to the need for such measures. The ERD Court were referred by Professor Wittert to *Wind Turbines and Health - A Rapid Review of Evidence - National Health and Medical Research Council - July 2010*, which concluded that *"there are no direct pathological effects from wind farms and any potential impact on humans can be minimised by following existing planning guidelines"*. At that time, the ERD Court accepted this as being the most up-to-date and reliable research on this issue and accordingly considered there was no basis to invoke the precautionary principle.

Since 2011, the potential health impacts of wind farms has been further considered in numerous forums, including the Victorian Civil and Administrative Tribunal (VCAT), the NSW Planning Assessment Commission, through studies undertaken by the South Australian Environment Protection Authority⁹ (EPA), a report by the Victorian Department of Health entitled "Wind farms, sound and health", and studies by the National Health and Medical Research Council.

The recent EPA study included the following conclusion:

"This study concludes that the level of infrasound at houses near the wind turbines assessed is no greater than that experienced in other urban and rural environments, and that the contribution of wind turbines to the measured infrasound levels is insignificant in comparison with the background level of infrasound in the environment."

⁸ Mr Turnbull of Sonus Acoustics provided evidence on noise and infrasound to the ERD Court on behalf of the applicant in this matter.

⁹ Infrasound levels near wind farms and in other environments – SA EPA – January 2013.



The Victorian Department of Health report concludes (at p. 19):

"There is no evidence that sound which is at inaudible levels can have a physiological affect on the human body. This is the case for sound at any frequency including infrasound."

The VCAT decision on the Cherry Tree Wind Farm Pty Ltd (VCAT Reference No P2910/2012) was adjourned to await the completion of the South Australian Environment Protection Authority study regarding the effects of wind turbines at Waterloo wind farm in South Australia, which is the EPA study referenced above. Following review of the findings of the SA EPA study, VCAT concluded the following in relation to the potential deleterious health effects caused by noise or infrasound:

"43 In relation to a causal link the evidence points to an association, but does not establish causation. On the contrary the additional material submitted after the interim decision, being the views of NSW Health as reported in the Bodangora determination and the Victorian Department of Health publication, expressly state that there is no scientific evidence to link wind turbines with adverse health effects. These are the views of State authorities charged by statute with the protection of public health. These views must be respected.

44 There is certainly no compelling evidence, and indeed no expert evidence at all that was capable of being tested, that would justify the Tribunal adopting a view that is opposed to the clearly stated opinions of the public health authorities. Those opinions are underscored by the currently stated position of the NHMRC."

On the 24 February 2014, the National Health and Medical Research Council (NHMRC) released a draft Information Paper regarding evidence on the potential effects of wind farms on human health. The draft Information Paper is based on the findings of an independent literature review commissioned by the NHMRC, which used rigorous, internationally recognised methods to select and analyse all available evidence. The draft Information Paper provides a summary of the available scientific evidence. Based on the evidence, the paper concludes that:

"there is no reliable or consistent evidence that wind farms directly cause adverse health effects in humans."

On the basis of all information available through the SA ERD Court, VCAT, the SA EPA and the NHMRC, there is no scientific evidence that the proposed wind farm would adversely affect the health and amenity of the community. The proposed development is considered to protect community health and satisfies the provisions of the Development Plan.



6.5 Shadow Flicker, Reflection and Blade Glint

Renewable Energy Principle of Development Control 398 requires that wind farms should avoid or minimise shadowing, flickering, reflection or glint on nearby property owners and/or occupiers, road users and wildlife.

Renewable Energy

PDC 398. Wind farms and ancillary development should avoid or minimise the following impacts on nearby property owners/occupiers, road users and wildlife:

(a) shadowing, flickering, reflection or glint;

Shadow flicker is the modulation of light levels resulting from the periodic passage of a rotating wind turbine blade between the sun and an observer. The duration of shadow flicker experienced at a specific location can be determined using geometric analysis. A geometric analysis has been undertaken on the Palmer Wind Farm by GL Garrad Hassan. A copy of the Shadow Flicker and Blade Glint Assessment forms part of the application documents.

Impact of shadow flicker has been assessed for the dwellings within the vicinity of the wind farm, utilising a limit of theoretical shadow flicker of 30 hours per year, and a limit on the actual shadow flicker duration of 10 hours per year. The current Planning SA Planning Bulletin for Wind Farms does not provide a limit or methodology to be used to assess the impacts of shadow flicker. GL Garrad Hassan have utilised the Victorian Planning Guidelines and the Environment Protection and Heritage Council (EPHC) Draft National Wind Farm Development Guidelines.

The shadow flicker assessment report notes that shadow flicker is likely to cause annoyance within 1,260 metres of the turbine, which equates to 10 rotor dimensions. In utilising the EPHC guidelines, GL Garrad Hassan notes that:

"The model also makes the following assumptions and simplifications:

- *there are clear skies every day of the year*
- *the turbines are always rotating*
- *the blades of the turbines are always perpendicular to the direction of the line of sight from the location of interest to the sun.*

These simplifications mean that the results generated by the model are likely to be conservative."

The results of the shadow flicker assessment identified four dwellings (R012, R013, R056 and R096) as being predicted to experience some level of theoretical shadow flicker within 50 metres of the dwelling. None of these dwellings are predicted to experience theoretical shadow flicker durations in excess of the 30 hour limit recommended by the Draft National Guidelines.



A further two host landowner dwellings were predicted to receive theoretical shadow flicker, R137 and R139. It is understood that dwelling noted as R137 related to a proposed dwelling which previously obtained Development Plan Consent, but this has since lapsed. Furthermore, the landowner of R139 has landowner agreement precluding habitation should the house experience exceedance of the shadow flicker guideline limits unless an agreement is reached with this landowner on a reasonable level of shadow flicker above the guidelines. As such these two dwelling were not included in the overall analysis.

A calculation of actual shadow flicker takes account of factors such as cloud cover and variation in turbine orientation. *"It does not take account of any reduction due to low wind speed, vegetation or other shielding around each house in calculating the number of shadow flicker hours. Therefore the values may still be regarded as conservative"* (page 1 of GL Garrad Hassan report).

GL Garrad Hassan concludes that *"after reductions due to turbine orientation and cloud cover are taken into account, no dwellings are predicted to experience actual shadow flicker duration above the limit of 10 hours, as recommended in the Draft National Guidelines¹⁰".* Furthermore, the assessment does not take into consideration existing vegetation or other potential screening and there may be opportunities for further minimisation of shadow flicker. Nonetheless, Trustpower has committed to ensure the final constructed layout will not result in any actual shadow flicker at a non-stakeholder dwelling beyond the recommended 10 hours.

It is noted that the National Health and Medical Research Council (NHMRC) draft Information Paper¹¹ concludes that:

"There is insufficient direct evidence to draw any conclusions on an association between shadow flicker produced by wind turbines and health outcomes. Flashing lights can trigger seizures among people with a rare form of epilepsy called photosensitive epilepsy. The risk of shadow flicker from wind turbines triggering a seizure among people with this condition is estimated to be very low"

Renewable Energy PDC 389(a) seeks to minimise impact of shadow flicker and glint on road users. Impact on road users is discussed in the GL Garrad Hassan report, which concludes that *"there is negligible risk associated with distraction of vehicle drivers who experience shadow flicker"*.

¹⁰ GL Garrad Hassan – page 8 – Shadow Flicker and Blade Glint Assessment.

¹¹ National Health and Medical Research Council (NHMRC) draft Information Paper: Evidence on Wind Farms and Human Health, for consultation February 2014.



Based on the conclusions of the shadow flicker assessment and the findings of the draft NHMRC, it is considered that shadow flicker is suitably minimised and unlikely to result in unreasonable adverse impacts on the amenity of the locality. On this basis, it is considered that PDC 398(a) is satisfied for property owners/occupiers in the locality.

Blade glint refers to the regular reflection of the sun off one or more rotating turbine blades. PDC 398(a) seeks to ensure that glint is avoided or minimised. GL Garrad Hassan note that *"blade glint is not generally a problem for modern turbines provided non-reflective coatings are used for the surface of the blades"* (page 2). Given Trustpower is committed to utilising non-reflective coating on the turbine blades, blade glint is minimised in accordance with the requirements of PDC 398(a).

6.6 Interface Between Land Uses

The Palmer Wind Farm is contained wholly within the Rural Zone, although some areas of the site of the development do adjoin the Rural Living (Sanderston) Zone and the Barossa Valley Character Preservation District.

General provisions of the Development Plan under the heading of Interface Between Land Uses seek to ensure development is appropriately located and designed to prevent adverse impacts and conflicts between land uses, as stated in Objective 25 and Principles of Development Control 87 and 88. In addition, the general provisions of the Development Plan contain numerous provisions regarding the design, siting and appearance of buildings to minimise adverse impacts on adjoining land uses and owners and occupiers of land.

Renewable Energy provisions of the Development Plan provide further criteria which need to be satisfactorily addressed as part of any development assessment of a wind farm. Some of the specific criteria, such as noise, electrical interference, glare, flora and fauna and traffic impacts are dealt with in detail in other sections of this assessment report. Other potential impacts are discussed below.

Interface Between Land Uses

Objective 25: Development located and designed to prevent adverse impact and conflict between land uses.

Principles of Development Control

PDC 87. Development should not detrimentally affect the amenity of the locality or cause unreasonable interference through any of the following:

- (a) the emission of effluent, odour, smoke, fumes, dust or other airborne pollutants;
- (b) noise;
- (c) vibration;
- (d) electrical interference;
- (e) light spill;
- (f) glare;
- (g) hours of operation; or
- (h) traffic impacts.



PDC 88. Development should be designed and sited to minimise negative impact on existing and potential future land uses considered appropriate in the locality.

Renewable Energy Facilities

Objective 98: Location, siting, design and operation of renewable energy facilities to avoid or minimise adverse impacts on the natural environment and other land uses.

PDC 396. Renewable energy facilities, including wind farms and ancillary development, should be:

- (a) located in areas that maximize efficient generation and supply of electricity; and**
- (b) designed and sited so as not to impact on the safety of water or air transport and the operation of ports, airfields and designated landing strips.**

PDC 398. Wind farms and ancillary development should avoid or minimise the following impacts on nearby property owners/occupiers, road users and wildlife:

- (a) shadowing, flickering, reflection or glint;**
- (b) excessive noise;**
- (c) interference with television and radio signals and geographic positioning systems;**
- (d) interference with low altitude aircraft movements associated with agriculture;**
- (e) modification of vegetation, soils and habitats;**
- (f) striking of birds and bats.**

PDC 399. Wind turbine generators should be setback from dwellings, tourist accommodation and frequently visited public places (such as viewing platforms) a distance that will ensure that failure does not present an unacceptable risk to safety.

6.6.1 Aviation and Aerial Agriculture

A detailed assessment of aviation activities in the location of the proposed wind farm has been undertaken by The Ambidji Group¹². Renewable Energy Principle of Development Control 396(b) requires that a wind farm be designed and sited so as not to impact on the safety of air transport and the operation of ports, airfields and designated landing strips. Furthermore, Renewable Energy PDC 398(d) states that wind farms should avoid or minimise interference with low altitude aircraft associated with agriculture.

The findings of the aviation assessment report by The Ambidji Group note the wind farm:

- will not be of operational significance to aircraft safety;

¹² Palmer Wind Farm Aeronautical Impact Assessment Aviation Impact Statement Qualitative Risk Assessment and Obstacle Lighting Review by The Ambidji Group.



- will not require obstacle lighting;
- will not impact on aviation communications, navigation and surveillance equipment;
- may have a minimal impact on some low level military flying training; and
- will not impact on defense communications equipment.

Given the extensive investigations undertaken in the aviation assessment and its conclusions, the wind farm is unlikely to impact on air safety of air transport. Furthermore, lighting of the turbines is not required for obstacle limitation purposes and therefore lighting from this component of the turbine would not impact on the amenity of the locality.

Principle 398(d) of the Renewable Energy Facility provisions of the Development Plan seeks to ensure that interference with low altitude aircraft movements associated with agriculture are avoided or minimised. In relation to the aerial agricultural application, the aviation assessment notes that the principal aerial agriculture operator in the South Australia has indicated that they do not undertake extensive aerial application in the locality of the proposed wind farm. This comment is considered consistent with the pattern of land use within the locality, which is principally grazing activities, particularly in the area west of the Murray Plains.

It is anticipated that aerial agriculture may be utilised on the Murray Plains were cropping activities are undertaken. The location of wind turbines, which are generally on elevated land along or adjacent the ridgelines are therefore unlikely to adversely impact on aerial application on the cropping and grazing land to the east. Areas further west of the wind farm site and particularly those used for more intensive agriculture and horticulture within the Barossa Council area may also periodically utilise aerial agriculture applications. It is considered that the separation distance from these land uses and the wind farm would limit any potential interference.

Fixed wing aerial agriculture aircraft are utilised in aerial bushfire fighting throughout the state and were recently utilised in the locality of the wind farm, namely the area to the west around Eden Valley. Concerns are sometimes raised that installation of wind turbines limit the capacity of aerial fire fighting. The CFS have a fact sheet on the aerial fire fighting¹³, which discusses conditions and limitations to aerial fire fighting, of which only one is wind turbines as an obstruction. The fact sheet notes that in some circumstance aircraft will not be utilised because risks caused by vertical obstructions exceed safe operating conditions. The fact sheet notes that "*deployment of aircraft to any fire is made after consideration of many variable, risks, aircraft suitability and aircraft availability*" and is undertaken on a dynamic risk assessment basis.

¹³ South Australian CFS Fact Sheet – Understanding Aerial Firefighting.



It is noted that the provisions of the Development Plan do not specifically require aerial firefighting to be assessed. However, it is understood that Trustpower has undertaken consultation with the CFS in relation to the proposed wind farm. Trustpower have committed to prepare a bushfire management plan as part of the operational procedures during the construction and operational phases of the wind farm.

On balance, given the land use pattern of the locality, the minimal use of aerial agriculture in the area and/or suitable separation from land uses that may use aerial agriculture application, it is unlikely the wind farm would adversely impact on aerial application for agriculture purposes. The impact of any wind farm on future use of fixed wing aircraft for aerial fire fighting is a matter for dynamic risk assessment at the time by the CFS.

6.6.2 Hours of Operation

There are two elements of the wind farm to consider in assessing the impact of the hours of operation on adjoining land uses and the amenity of owners and occupiers of land, firstly the construction phase and secondly the operational phase.

The construction phase of the project would occur over an 18 month to two year period. During this time there would be considerable activity throughout the development site, involving extensive vehicle movements, construction of the turbines, operation and maintenance facilities, temporary laydown/storage facilities, temporary concrete batching plants, access tracks and upgrading of public roads. This construction phase would be undertaken in accordance with relevant legislation, particularly the *Environment Protection Act 1993* to manage a range of potential environmental impacts, including noise, vibration and dust.

A draft Construction Environmental Management Plan (CEMP) is incorporated in the application documents, which contains a range of management practices in relation to the construction phase of the project. The draft CEMP indicates that operating hours of the plant during the construction phase would be limited to 7:00am-7:00pm Monday to Saturday with no work to occur on Sundays or Public Holidays without prior approval from the EPA/Council (subject to qualifications in the approved CEMP). Post construction and during the operational phase of the wind farm, the turbines would operate 24 hours per day, seven days per week when wind conditions are conducive to the generation of electricity within the parameters of the selected WTG. Other than the visibility of the WTG's, the potential impacts of continuous operation of the WTG on the locality are considered to be noise and lighting. As discussed previously, there is no need for obstacle limitation lighting on the turbines. Furthermore, the acoustic assessment concludes that the noise levels from the wind farm will be compliant and therefore the hours of operation are not a significant impediment to the ongoing use of adjoining land.



6.6.3 Rural Living Zone

The Rural Living Zone (Sanderston) adjoins the northern part of the wind farm. The proposed wind farm does not utilise any rural living zoned land as part of the development site, other than land within the road reserve over which the 33kV transmission lines would in part be located. It is noted that there are a number of vacant allotments within the Rural Living Zone, which pursuant to the provisions of the Development Plan would have the potential to be developed for rural residential purposes with allotments of not less than 10 hectares. Rural Living Zone

Objective 1: A zone for detached dwellings on large allotments and associated compatible rural activities of a minor nature.

Land Division

PDC 28 Allotments proposed by land division should be in accordance with the following standards:...
Sanderston 10 hectares

The potential impacts of the wind farm on the future development of the rural living zone are generally those associated with noise. Appendix F of the Environmental Noise Assessment report illustrates the predicted noise levels for the wind farm. In relation to the Rural Living Zone (Sanderston) adjacent Area A of the wind farm, the predicted noise levels at the boundary of the Rural Living Zone, and dwellings within the Rural Living Zone are shown to be compliant with the noise criteria. Location of the wind turbines to the west of the Rural Living (Sanderston) Zone does not restrict the achievement of the envisaged land use within that zone due to impacts of noise.

During the construction period of the wind farm, the proposal includes some temporary laydown/storage and construction facilities within close proximity to the Rural Living (Sanderston) Zone. The location of these facilities would mean increased traffic around the area on local roads and potential for noise and dust associated with these activities. Over a short period of time there may be some adverse impact on the amenity of the locality, however these impacts would be minimised by, the short period of time in which they would be used, approximately two years and suitable management of these facilities in accordance with EPA legislation and the Construction Management Plans.

A temporary construction facility is proposed adjacent vacant land within the Rural Living (Sanderston) Zone and south west of Dwelling R003. Whilst the vacant land adjoining the site of the development is not part of the land within the project boundary, it is in the ownership of an involved landowner. Any development of this land for rural residential purposes would therefore be undertaken with knowledge of the proposed operation and maintenance facility.

It is noted that the temporary construction facility could incorporate a temporary concrete batching plant during the construction phase. Suitable separation distances are provided (a minimum of 200 metres for noise, in accordance with the EPA Guidelines for Separation Distances December 2007) between the batching plant and the Rural Living Zone boundary.



The separation distance between this potential temporary batching plant and the nearest residence (R003) is approximately 680 metres. Should the concrete batching plant proceed in this location, the impacts on the adjoining dwelling and properties within the locality would be managed by a final Construction Environmental Management Plan and in accordance with EPA legislation and license conditions.

Development of 33kV transmission lines adjacent to, or within the road reserves, adjoining the Rural Living Zone are likely to be viewed as an additional visual element in the landscape rather than a new element. Given the new overhead transmission lines would be viewed against the background of the hills and that this form of electricity infrastructure is common place in the wider locality, it is not considered this infrastructure would unreasonably affect the amenity of people living within the Rural Living Zone.

It is acknowledged that there may be some short term impact on the amenity of the Rural Living (Sanderston) Zone during the construction phase of the wind farm. However, the development of the wind farm does not preclude the envisaged land use of dwellings for rural residential lifestyle being developed on vacant land in the future. In this regard, the development satisfies the intent of Objective 25 Interface Between Land Uses and Objective 98 Renewable Energy facilities.

6.6.4 Mining

Immediately adjoining the Palmer Wind Farm site, is a private mine, which is currently not operational. It is understood that this mine, known as Kitticoola mine (private mine 53), is a former copper-gold mine, which a mining exploration company has recently entered into an agreement to explore. The Development Plan contains specific provisions relating to the protection of mineral reserves.

Whilst the extent and nature of the mining exploration proposed at Kitticoola mine is unknown at this time, it is considered unlikely that the wind farm would have adverse impacts on this exploration. It is estimated that the nearest wind turbine (WTG C23) is approximately 800 metres from the boundary of the mine property. Development of wind turbines on land adjacent to the mine is not a sensitive land use that would be affected by way of noise, vehicle movements, visual, dust or other similar impacts. It is considered that exploration at the mine and any future mining activities could co-exist on adjoining properties, as they are not considered incompatible, thereby addressing the intent of Objective 33.

Objective 33 Continued availability of metallic, industrial and construction minerals.

Protection of mineral reserves will be assisted by limiting development likely to inhibit their exploitation.

Mineral resources within the economic distance of usage points should be delineated and evaluated against alternative sources and other potential uses of the land. The most suitable sites, consistent with environmental constraints and expected future demand, should be kept free of development likely to inhibit the exploitation of the resource. The major deposits in the Council area are identified on Structure Plan Map MiMu/1 (Overlay 2).

Sufficient land should be available to provide reserves for continued production and for the establishment of buffer areas between the mineral deposit and adjoining development.



PDC 122 Development other than that associated with mining and quarrying should not be undertaken in the vicinity of known mineral deposits:

- (a) until the full extent and significance of such deposits has been determined;**
- (b) if such development would be incompatible with mining operations; or**
- (c) if it would add to the cost of extracting the resource.**

Principle of Development Control 122 seeks to protect mining operations from incompatible uses by limiting development within the vicinity. The appropriate planning principle to apply would be one that considers the nature of both developments and whether they are considered incompatible. The development of a wind farm in the locality of the mine is not considered to be incompatible and there is suitable separation between the nearest wind turbine and the boundary of the mine site. On this basis, it is considered inappropriate to determine the wind farm development should be delayed whilst mineral exploration is undertaken.

6.6.5 Tourism Development

There are four known tourist accommodation facilities within the locality of the proposed wind farm. PDC 399 requires that wind turbine generators should be setback from tourist accommodation. A separation distance is stated as 1,000 metres in PDC 397(a), to minimise visual impact. Wind turbine generators near each of the four tourist accommodation facilities in the locality achieve the minimum setback. Achieving the minimum separation distance of 1,000 metres from tourist accommodation is also considered to be an appropriate separation to minimise unacceptable risk, as sought by PDC 399.

PDC 397. The visual impacts of wind farms and ancillary development (such as substations, maintenance sheds, access roads and wind monitoring masts) should be managed through:

- (a) wind turbine generators being:**
 - (i) setback at least 1000 metres from non-associated (non-stakeholder) dwellings and tourist accommodation;...**

PDC 399. Wind turbine generators should be setback from dwellings, tourist accommodation and frequently visited public places (such as viewing platforms) a distance that will ensure that failure does not present an unacceptable risk to safety.

6.6.6 The Barossa Valley Character Preservation District

The Barossa Valley Character Preservation District immediately abuts the site of the development. There are no elements of the proposed Palmer Wind Farm within the Barossa Valley Character Preservation District. Consequently, the proximity of the Barossa Valley Character Preservation District is not directly relevant to the assessment of the Palmer Wind Farm development site application.



The "district" referred to as the Barossa Valley Character Preservation District is defined by the *Character Preservation (Barossa Valley) Act 2012* as "the area defined as the Barossa Valley district by the plan deposited in the General Registry Office at Adelaide and numbered GP 4 of 2012 (being the plan as it exists on 26 June 2012)".

The provisions of the *Character Preservation (Barossa Valley) Act 2012* are in addition to the provisions of any other Act, including the *Development Act 1993*. For the purposes of the *Development Act 1993*, the *Character Preservation (Barossa Valley) Act 2012* "is a character preservation law" (Part 4 (2) of that Act). There is a requirement that the Planning Strategy developed pursuant to the *Development Act 1993* will take account the objects under a character preservation law.

Currently the Planning Strategy applicable to the Mid Murray Council Area is the Murray and Mallee Region Plan (Addendum dated December 2013 and gazetted on 13 February 2014¹⁴). This Planning Strategy references the Character Preservation legislation, and recognises that the legislation provides that the special character of the Barossa Valley "is recognised, protected and enhanced while providing for economic, physical and social wellbeing of the communities within the districts". The Murray and Mallee Region Plan has no legislative function in the formal assessment of the development application for the Palmer Wind Farm.

In future reviews of its Development Plan, the Mid Murray Council must consider and review its land use policy to reflect the area of special character. This review process has no role to play in the assessment of this development application for the Palmer Wind Farm. It should however be recognised that the Character Preservation district abuts, but does not include any area of the site for the Palmer wind farm.

The objects of the *Character Preservation (Barossa Valley) Act 2012* include the recognition, protection and enhancement of the "special character of the district" (Part 6 – Objects 1(a)). As previously stated, the site of the development for the Palmer Wind Farm is not within the defined "district" and there is no legal requirement for the proposed development to further the objects of the *Character Preservation (Barossa Valley) Act 2012*.

Whilst there is no requirement within the Mid Murray Development Plan to address the Barossa Valley Character Preservation District, it is acknowledged that the wind farm would be visible from within the Preservation District. On the basis of this visual interface with the Preservation District, the following commentary is provided against the five character values established in the Barossa Valley Character Preservation District legislation, which are:

¹⁴ Murray and Mallee Region Plan – A volume of the South Australian Planning Strategy – January 2011; and Addendum to Murray and Mallee Region Plan – Barossa Valley and McLaren Vale Character Preservation December 2013.



- *“the rural and natural landscape and visual amenity of the district*
- *the heritage attributes of the district*
- *the built form of the townships as they relate to the district*
- *the viticultural, agricultural and associated industries of the district*
- *the scenic and tourism attributes of the district.”*

In considering the character values identified in the legislation:

- the Palmer Wind Farm does not adversely impact upon the principal land use of the development site or the locality. The site of the development is retained for primary production and the introduction of wind turbine generators and ancillary infrastructure does not impact upon the agricultural or viticultural land uses and associated industries within the locality, including those areas within the Barossa Council area and within the Preservation District;
- there is no impact on the built form of townships within the Mid Murray Council area within the general locality of the wind farm, nor on the towns within the Preservation District;
- the heritage attributes within the site of the development, including European and Indigenous heritage are protected and managed as part of the wind farm proposal. The wind farm does not directly affect any heritage places within the Preservation District and is well separated from the townships that are often described as being the heritage attributes of the area;
- similar to the heritage attributes of the area, the proposed wind farm does not directly affect any tourist destinations or places within the Preservation District. It is acknowledged that the wind farm would be visible from some scenic areas in the locality, some of which are within the Preservation District; and
- in relation to the visual amenity of the District, it is acknowledged that the wind turbine generators would be visible from within the Preservation Districts and the extent of this impact is illustrated by the viewpoint analysis contained within the WAX Design visual assessment report. When any boundary is established, there will always be potential impacts (real or perceived) on the adjoining area. Interface between land uses and character and amenity of areas can be widely contentious in any planning assessment. In relation to the facts of this proposed development, the wind farm is outside of the Preservation District, within a Rural Zone which anticipates wind farm development and acknowledges that this form of development can be located on visually prominent locations and visible from scenically important areas.

The Barossa Valley Character Preservation District does not directly apply to the development site and there is no legal requirement for the proposed development to further the objects of The Barossa Valley Character Preservation District legislation.



As previously stated, it is acknowledged that the wind farm would be visible from the Barossa Valley Preservation District area. The visibility of the wind farm from this Preservation District is not considered fatal to the proposed development when assessed against the relevant provisions of the Mid Murray Development Plan.

Furthermore, the Barossa Valley Preservation District establishes a buffer in which further wind farms could not be developed within the Mid Murray Council area, as they would be deemed to be a non-complying form of development.

6.7 Interference with Telecommunications and Electromagnetic Radiation

The potential for telecommunications interference associated with the development has been assessed by GHD in the report entitled Electromagnetic Interference Assessment, which forms part of the application documents. Principle of Development Control 87 - Interface Between Land Uses seeks to ensure that development does not detrimentally affect the amenity of the locality through electrical interference. PDC 398 (c) – Renewable Energy specifically relates to wind farms and requires that they should avoid or minimise interference with television and radio signals and geographic positioning systems on nearby property owners/occupiers and road users.

Renewable Energy

PDC 398. Wind farms and ancillary development should avoid or minimise the following impacts on nearby property owners/occupiers, road users and wildlife:

- (c) **interference with television and radio signals and geographic positioning systems; ...**

Interface Between Land Uses

PDC 87. Development should not detrimentally affect the amenity of the locality or cause unreasonable interference through any of the following: ...

- (d) **electrical interference;...**

The Electromagnetic Interference Assessment identifies the following potential impacts and mitigation measures:

- *“Fixed Point-to-Point Microwave – potential for some links to intrude within the second Fresnel Zone within Area C of the wind farm*

Continue investigations and negotiations with service operators during design phase of project, i.e. ElectraNet, Mid Murray Council and SA Water. Take care if micro-siting affected turbines to avoid further link intrusion.
- *Land Mobile Radio Systems – the wind farm could potentially block line of site along the route of the Mannum-Adelaide pipeline*



- *Digital Television Broadcast - Digital TV is not susceptible to visible "ghosting" degradation as was experienced with analogue broadcasts; any impact of reflections from the turbines would be a minor reduction of coverage at the limit of the service area. The impact on the wind farm on digital TV services can be quantified by performing and recording pre and post installation signal level measurements in and around the wind farm areas.*

Use of primarily non-metallic turbine blades. Use (wherever practical) of equipment complying with the Electromagnetic Emission Standard, AS/NZS 61000.6.4:2012.

Proponent may monitor TV signal reception within vicinity of proposed wind farm before and after turbine installations. Options available to the Proponent include re-orientation of antennas to alternative transmitter sites to achieve higher signal level, upgrade of affected television user infrastructure to include a combination of high performance antennas and signal amplifiers, or offer satellite television alternative (if available)

- *Meteorological Radar – no expected interference given distance from the Bureau of Meteorology site in the region*
- *FM Narrowcast and Broadcast - There is a minor chance of signal degradation for services broadcast from Crafers in the immediate vicinity of the wind farm.*
- *Cellular Mobile Telephone Systems - Interference to cellular phone coverage by the proposed Palmer Wind Farm is anticipated to be minimal except for those users operating in close proximity to the proposed wind farm such as maintenance staff.*

Continue investigations and negotiations with service operators during design phase of project, i.e. Telstra

- *50Hz Radiation - the main sources of electromagnetic (EM) fields associated with wind farms are the substations and transmission lines. Designing to the standards utilised by ElectraNet (275kV) and SA Power Networks (33kV) will ensure safe levels of EM radiation are achieved."*

Mapping incorporated in the development application illustrates the EMI exclusion areas. WTG C21 is currently within the EMI Exclusion Area. The infringement of the exclusion zone is a matter of metres in relation to the blade tips of this turbine. Following selection of the final layout and turbine model, all turbines will be sited outside of the EMI Exclusion Areas.

It is noted that the National Health and Medical Research Council (NHMRC) draft Information Paper¹⁵ has investigated the health impacts electromagnetic radiation from wind farms and concludes that:

¹⁵ National Health and Medical Research Council (NHMRC) draft Information Paper: Evidence on Wind Farms and Human Health, for consultation February 2014.



- *"There is no direct evidence on whether there is an association between electromagnetic radiation produced by wind farms and health outcomes.*
- *Extremely low-frequency electromagnetic radiation is the only potentially important electromagnetic emission from wind turbines.*
- *Limited evidence suggests that the level of extremely low-frequency electromagnetic radiation close to wind farms is less than average levels measured inside and outside Australian suburban homes.*
- *There is no consistent evidence of human health effects from exposure to extremely low-frequency electromagnetic radiation at much higher levels than is present near wind farms."*

On the basis of information available, it is considered that the wind farm would have minimal adverse impact on telecommunications within the locality and there is no evidence that electromagnetic radiation adversely impacts on human health.

6.8 Impact on Flora and Fauna

The Renewable Energy Facilities section of the Development Plan seeks the development of renewable energy facilities in appropriate locations, with those facilities sited, designed and operated in such a manner as to avoid or minimise adverse impacts on native vegetation, conservation, the natural environment, geological or natural heritage significance and wildlife (Objectives 98 and Principle of Development Control 398).

Renewable Energy

Objective 98: **Location, siting, design and operation of renewable energy facilities to avoid or minimise adverse impacts on the natural environment and other land uses.**

PDC 398. **Wind farms and ancillary development should avoid or minimise the following impacts on nearby property owners/occupiers, road users and wildlife:**

...

- (e) modification of vegetation, soils and habitats;**
- (f) striking of birds and bats.**

In addition to the Renewable Energy provisions, there are provisions within the Rural Zone, including the Desired Character Statement and Objective 5 and 6 and PDC 4 seeking to protect native vegetation and landscape character.



Rural Zone

Desired Character Statement

The Zone encompasses the eastern face of the Mount Lofty Ranges which contributes significantly to the district's visual qualities. The location and design of development on the hills face is therefore a matter of importance, as is the retention of remnant bushland and native vegetation for aesthetic and conservation purposes.

Vegetation and Landscape Character

Objective 5: Retention and maintenance of wetlands and existing native vegetation for its conservation, biodiversity, and habitat value and environmental management function.

Objective 6: Maintenance and enhancement of the landscape character.

Landscape

PDC 4. Development should be designed and sited to respect and maintain the landscape character of an area which is of:

- (a) historical (including archaeological) significance;**
- (b) scientific interest;**
- (c) scenic value or natural beauty;**
- (d) other heritage significance; or**
- (e) conservation significance.**

The Development Plan contains extensive provisions (not all of which are quoted below) under the headings of Natural Resources, Conservation, Biodiversity and Native Vegetation which relate to the retention, maintenance, preservation and protection of flora and fauna.

Natural Resources

Objective 51: Native flora, fauna and ecosystems protected, retained, conserved and restored.

Conservation

Objective 55: Preservation and replanting of roadside vegetation.

Objective 56: Preservation of natural vegetation of historic, local or particular visual significance.

Objective 58: Retention of environmentally-significant areas of native vegetation.

Retention of native vegetation where clearance is likely to lead to problems of: soil erosion; slip and salinisation; flooding; or a deterioration in the quality of surface waters is of particular importance.

Buildings and other structures and use of land undertaken in a manner which minimises the requirement to clear or remove native vegetation.

Fragmentation of homogenous areas of native vegetation through use of land or establishment of buildings should not occur.



Land division, including boundary re-arrangement, should not fragment native vegetation.

Retention and reinstatement of native vegetation including roadside vegetation for amenity purposes, for livestock shade and shelter and for the movement of native wildlife.

PDC 163. Development liable to create significant adverse effects on natural features, areas of significant native vegetation, drainage systems, water catchments and storage areas, the River Murray or any associated water bodies, fragile land, scenic routes or scenically attractive areas, or areas of environmental significance, should not be undertaken. Development which produces strong organic, chemicals or other intractable waste should not be established in water catchment areas.

PDC 164. The natural character of rivers and creeks should be preserved.

PDC 165. Important natural resources including watercourses and water catchment areas, scenic areas and significant flora and fauna should be conserved and protected from development which would affect them adversely.

Biodiversity and Native Vegetation

Principles of Development Control

PDC 168. Development should retain existing areas of native vegetation and where possible contribute to revegetation using locally indigenous plant species.

PDC 169. Development should be designed and sited to minimise the loss and disturbance of native flora and fauna.

PDC 170. The provision of services, including power, water, effluent and waste disposal, access roads and tracks should be sited on areas already cleared of native vegetation.

PDC 171. Native vegetation should be conserved and its conservation value and function not compromised by development if the native vegetation does any of the following:

- (a) provides an important habitat for wildlife or shade and shelter for livestock;**
- (b) has a high plant species diversity or includes rare, vulnerable or endangered plant species or plant associations and communities;**
- (c) provides an important seed bank for locally indigenous vegetation;**
- (d) has high amenity value and/or significantly contributes to the landscape quality of an area, including the screening of buildings and unsightly views;**
- (e) has high value as a remnant of vegetation associations characteristic of a district or region prior to extensive clearance for agriculture;**
- (f) is growing in, or is characteristically associated with a wetland environment.**

PDC 172. Native vegetation should not be cleared if such clearing is likely to lead to, cause or exacerbate any of the following:

- (a) erosion or sediment within water catchments;**
- (b) decreased soil stability;**



- (c) soil or land slip;
- (d) deterioration in the quality of water in a watercourse or surface water runoff;
- (e) a local or regional salinity problem;
- (f) the occurrence or intensity of local or regional flooding.

PDC 173. Development that proposes the clearance of native vegetation should address or consider the implications that removing the native vegetation will have on the following:

- (a) provision for linkages and wildlife corridors between significant areas of native vegetation;
- (b) erosion along watercourses and the filtering of suspended solids and nutrients from run-off;
- (c) the amenity of the locality;
- (d) bushfire safety;

PDC 174. Where native vegetation is to be removed, it should be replaced in a suitable location on the site with locally indigenous vegetation to ensure that there is not a net loss of native vegetation and biodiversity.

PDC 175. Development should be located and occur in a manner which:

- (a) does not increase the potential for, or result in, the spread of pest plants, or the spread of any non-indigenous plants into areas of native vegetation or a conservation zone;
- (b) avoids the degradation of remnant native vegetation by any other means including as a result of spray drift, compaction of soil, modification of surface water flows, pollution to groundwater or surface water or change to groundwater levels;
- (c) incorporates a separation distance and/or buffer area to protect wildlife habitats and other features of nature conservation significance.

PDC 177. No change of land use should occur in or near areas of native vegetation which is likely to adversely impact on the vegetation.

PDC 178. The provision of services, including power, water, effluent and waste disposal, access road and tracks should be effected over areas already cleared of native vegetation or, if this is not possible, cause the minimum interference or disturbance to native vegetation.

PDC 181. Trees and other vegetation, including native flora and bushland remnants which are of:

- (a) special visual, historical, cultural or scientific significance or interest or heritage value;
- (b) existing or possible future value in the screening of a building or unsightly views;
- (c) existing or possible future value in the provision of shade or as a windbreak;
- (d) existing or possible future value in the prevention of soil erosion;
- (e) value as a habitat or feeding area for native fauna;

should be conserved and their value and function not compromised by development.



In discussing the impacts of the wind farm on the locality, I note the following from the EBS Ecology Flora and Fauna Survey:

“Trustpower made a number of revisions to the turbine and infrastructure layout in response to recommendations by EBS Ecology. An exclusion zone has been adopted around:

- *Heritage Agreements.*
- *known Wedge-tailed Eagle nests - 500 m buffer applied between turbines.*
- *known Peregrine Falcons nesting sites - 1000 m buffer applied between turbines.*
- *Lomandra exclusion zones (EPBC category B) - nationally threatened ecological community. It is recommended that avoidance of all EPBC sites occur, however if this is not possible, and if there is a potential impact, this will be assessed within an EPBC Referral ;*
- *Lomandra exclusion zones (Potential category B) - potential threatened ecological community. It is recommended that avoidance of all EPBC sites occur, however if this is not possible, and if there is a potential impact, this will be assessed within an EPBC Referral.*

EBS Ecology recommends that the following sensitive areas should be avoided where possible:

- *threatened flora and fauna records*
- *native vegetation of good to excellent condition (with an SEB score of 7:1 - 10:1)*
- *woodland habitats*
- *significant roadside sites*
- *native vegetation along narrow public roads*
- *scattered trees (including dead trees)*
- *creeklines*
- *preferred fauna habitat including riparian habitats and rocky outcrops.*

Where possible, avoidance of native vegetation has been embedded into the wind farm design. Where complete avoidance of native vegetation is not possible, Trustpower will endeavour to minimise the level of impact on native vegetation through micro-sighting of infrastructure. Trustpower is committed to utilising existing access tracks and will avoid clearing individual trees, where possible. EBS Ecology has proposed several alternative access track routes in areas B and C to minimise the impact on sensitive vegetation.



Trustpower has committed to considering these alternatives as part of the detailed design phase and undertaking additional survey if required to confirm the status of potentially affected vegetation.

In addition to the above, EBS Ecology recommends Trustpower should adopt the following measures: as conditions of development approval:

- *submit an EPBC Act referral for impacts areas of Lomandra Grassland*
- *confirm the SEB offset required once the infrastructure design is finalised and submit a clearance application to the Native Vegetation Council*
- *protect native vegetation and fauna habitat and implement recommended buffers*
- *consider recommended alternatives for proposed infrastructure locations to reduce ecological impacts*
- *develop appropriate environmental management practices and procedures for the construction and operation of the wind farm*
- *undertake ongoing weed/soil pathogen management and monitoring, pre, during and post construction of the wind farm (to be addressed in a separate Weed Management Plan)*
- *undertake suitable site management measures including traffic management and access restrictions to prevent disturbance to flora and fauna (to be addressed in separate Construction Environmental Management Plan)*
- *undertake further survey should the project area and extent of proposed impact change*
- *undertake further survey to confirm the condition of Lomandra Grassland patches*
- *Where construction activities are planned within 500 and 1,000 m of known Wedge-tailed Eagle and Peregrine Falcon nests respectively during their peak breeding seasons, nest checks should be employed to determine their breeding status and if necessary buffers put in place or specific management strategies implemented to minimise any potential impact on the breeding success of these birds.*
- *implement a monitoring program for bird-strike, commencing prior to construction."*

The provisions of the Development Plan seek impacts on flora, fauna and native vegetation, watercourses and the natural environment generally are minimised. As outlined in the EBS report, the design and siting of elements of the wind farm has addressed a number of the environmental constraints of the site. Having reviewed the EBS Flora and Fauna Survey report, it is considered that the proposal suitably minimises impacts on the natural environment, in the manner discussed below.



6.8.1 Native Vegetation

The provisions of the Development Plan seek to protect native vegetation from clearance. However, there is recognition that if native vegetation must be cleared, it should be replaced in suitable locations on the site with locally indigenous vegetation, to ensure there is no net loss of native vegetation and biodiversity. A detailed analysis of native vegetation has been undertaken by EBS Ecology. Based on this analysis, it is considered that the necessary clearance of native vegetation is undertaken in a manner that minimises its impact on biodiversity, for the following reasons:

- The majority of WTGs are located in degraded areas of grassland.
- Intact native vegetation has been avoided in the layout of the wind farm.
- Only seven of the proposed 114 WTG are located within vegetation associations that have a vegetation condition of 5:1 or 6:1 (moderate condition). There are no WTG proposed in areas of vegetation condition greater than 6:1 (good or excellent condition).
- During construction some clearance of vegetation will be required, the majority of which is associated with access tracks. Total vegetation clearance is estimated to be approximately 81 hectares, which is a relatively small percentage (0.68 percent) of the site of the development (12,000 hectares).
- The majority of the vegetation required to be cleared for access tracks is in very poor condition, that is, approximately 66.7 hectares of the estimated 81 hectares (82 percent). Only 0.5 hectares of vegetation clearance for access tracks is in a good condition.

The following table estimates the vegetation to be cleared for access tracks, based on Table 52 in the EBS Flora and Fauna Survey report.

Vegetation Condition	Estimated Hectares
1:1 Very Poor	60
2:1 Very Poor	6.7
3:1 Poor	2.4
4:1 Poor	9.8
5:1 Moderate	0.4
6:1 Moderate	1.2



7:1 Good	0.3
8:1 Good	0.2

- Areas of native vegetation clearance that would be required for construction amenities is estimated to be 12.39 hectares of vegetation in very poor (12.28 hectares) or poor condition (0.11 hectares).
- The overhead 275kV transmission line is located through predominantly grazing land and total vegetation clearance is estimated to be 0.36 hectares.
- The overhead 33kV transmission line over private land is estimated to require clearance of 0.2 hectares of vegetation in poor condition and 0.02 hectares in moderate condition and 0.002 hectares of good condition.

Trustpower are aware of their responsibilities under the *Native Vegetation Act 1991* to provide offsets for cleared vegetation. A number of areas within the development site and locality have been identified as potential offset areas to achieve significant environmental benefit (SEB). The extent and location of offsets will be confirmed as part of the Native Vegetation Clearance application and approval. As identified by EBS Ecology, the potential SEB offset areas include:

- *“areas containing Eucalyptus odorata (Peppermint Box) woodland, particularly in Area C to allow the woodland to rehabilitate to an EPBC community Peppermint Box (Eucalyptus odorata) grassy woodland of South Australia*
- *major creeklines such as Reedy Creek or Marne River to enhance the biodiversity in the region*
- *areas containing Lomandra Grasslands on east facing hills within Areas A and B to allow the grassland to rehabilitate to an EPBC community Iron-grass natural temperate grassland of South Australia*
- *high SEB condition remnant vegetation within Area A*
- *significant roadside vegetation sites (e.g. rabbit control along Three Chain Road).”*

6.8.2 Flora and Fauna

Conservation of flora and fauna is promoted in numerous provisions of the Development Plan. The design and siting of the wind farm seeks to minimise impacts on flora and fauna by retaining habitat and establishing exclusion or buffer areas for various species.



There is extensive discussion in the EBS Ecology report in relation to specific flora and fauna, with the following noted:

- Impact on three State listed flora species: *Eucalyptus fasciculosa* (Pink Gum), *Mentha diemenica* (Slender Mint) and *Ptilotus erubescens* (Hairy-tails) would be low if vegetation, including scattered trees are retained.
- Woodland areas and scattered trees are important for the survival of many mammals, birds, reptiles and invertebrates.
- Most of the bat species likely to occur within the development site at the site forage within and around woodland vegetation. Interaction between such bat species and turbines can be reduced by implementing a buffer between turbines and wooded habitats.
- A minimum 1,000 metre buffer is incorporated between turbines and Peregrine Falcon nest sites to minimise the likelihood of disturbance to nest sites and to individual birds.
- A minimum 500 metre buffer is incorporated between turbines and Wedge-tailed Eagles nest sites to minimise the likelihood of disturbance to nest sites and to individual birds.
- *"The overall level of risk for bird all species was determined as low. The likelihood of collision causing mortality was determined as unlikely (D) for six raptor species (including the Peregrine Falcon) and five threatened bird species. The likelihood of collision causing mortality was determined as rare (E) for the two bird species that were determined as "likely to occur on site".*
- *"The consequence of mortality at a species/population level was determined as minor (4) for four species: the Peregrine Falcon, Hooded Robin, Elegant Parrot and Diamond Firetail. The consequence of mortality may impact on the local population for these four species, however will not impact on the overall species. Consequence was determined as insignificant (1) for nine species; individuals may be affected, but the viability of local populations will not be impacted upon."*

On the basis of the conclusions reached by EBS Ecology, it is considered that the proposal satisfactorily addresses the provisions of the Development Plan which seek to retain habitat and incorporate buffers to protect habitats.

6.8.3 Pest Plant Management

Provisions of the Development Plan state that development should not increase the potential for, or result in, the spread of pest plants. Management of weed species during construction and in the operational phase is incorporated in the Draft Construction Environmental Management Plan, which forms part of the application documents.



6.8.4 Flora and Fauna Summary

The proposed wind farm (including the transmission line) would require some clearance of native vegetation; however the majority of this clearance is of vegetation of poor quality. Potential opportunities have already been identified in the application documents for revegetation to achieve a significant environmental benefit to the development site and on this basis, the clearance of some native vegetation is not considered fatal to the proposal. Furthermore, suitable buffers have been included around nesting sites of Wedge-tailed Eagles and Peregrine Falcons to minimise disturbance to these species. Trustpower has incorporated a range of commitments in the development application which relate to managing and minimising impacts on the natural environment, particularly in the process of final design and placement of infrastructure and during the construction phase.

On balance, it is considered that the proposal adequately addresses the extensive provisions in the Development Plan in relation to conservation of the natural environment.

6.9 Water Resources, Water Quality and Soil Erosion

There are a number of watercourses within the wind farm development site, predominantly fed by rainfall and the majority are ephemeral. These watercourses are part of the River Murray tributaries. As previously noted, the site of the development is within the Marne Watercourse Policy Area. Both the Rural Zone and Marne Watercourse Policy Area provisions of the Development Plan require development to protect water systems.

Rural Zone

Objective 3: Maintenance of natural hydrological systems and environmental flows.

Objective 4: Surface run-off designed to protect property and life and environmental quality.

PDC 2. No adverse impact on natural hydrological systems and environmental flows.

Policy Area Number 13 – Marne Watercourse

Objective 1: The character, aesthetic appearance, scenic beauty and amenity of the River Marne and River Somme and its environs are preserved and enhanced in order to:

- (a) undertake sustainable primary production;**
- (b) protect water systems;**
- (c) provide recreation areas, particularly passive recreation areas;**
- (d) provide for native flora and fauna habitats; and**
- (e) protect areas of scientific, archaeological or cultural significance.**

Objective 2: Sustainable use of the River Marne's and River Somme's groundwater aquifer and catchments as sources of water for primary production.

PDC 6. Development should not be undertaken if the establishment, operation or management of such development is likely to result in:



- (a) **pollution of the Rivers' systems;**
- (b) **unnecessary loss or damage to native vegetation;**
- (c) **erosion;**
- (d) **the introduction of or an increase in the number of pest plants or vermin;**
- (e) **reduction in capacity of the river channel;**
- (f) **landfill or landslide; or**
- (g) **damage to Aboriginal sites, objects or remains as defined under the Aboriginal Heritage Act 1988.**

The WAX Design visual assessment report describes the landscape characteristics of a number of watercourses in the locality of the wind farm, including the Marne River, Harrison Creek/Gorge and Sanderston Creek/Gorge.

An assessment of the hydrology of the development site has been undertaken by GHD in the report entitled Palmer Wind Farm Civil, Geology, Geotechnical and Hydrology Assessment, which forms part of the application documents. This report focuses on construction of the development and discusses groundwater conditions rather than the watercourses in the area of the development.

The proposed development does not incorporate any wind turbine generators within the Marne River or other watercourses and maintains suitable setback between the turbines and the gorges and watercourses. Due to the topography of the site, it is likely that some access tracks and electricity infrastructure may cross watercourses. As part of the design, crossing of watercourses has been minimised, given difficulties created for manoeuvring of large vehicles and/or the desire to minimise additional physical infrastructure. Any crossing of a watercourse required to implement the project will be addressed in the final CEMP.

As stated in PDC 6 of the Marne Watercourse Policy Area, development should not be undertaken if it is likely to pollute the Rivers' systems or reduce its capacity, cause erosion or landslip.

There are also an extensive number of provisions in the general section of the Development Plan which relate to water quality, soil erosion, sloping land, water sensitive design and stormwater management, some of which are quoted below.

Rural Zone

Objective 7: Protection and maintenance of:

- (a) **the physical, chemical and biological quality of soil resources;**
- (b) **the quantity of soil resources;**
- (c) **the natural processes of sediment transfer.**

PDC 3. Stormwater from buildings and ground areas managed in a manner which minimises impact on natural drainage systems by:

- (a) **preventing soil erosion or siltation;**
- (b) **minimising the entry of pollutants; and**
- (c) **mitigating peak flows.**



- PDC 5.** Development should not have an adverse impact on the natural, physical, chemical or biological quality and characteristics of soil resources.
- PDC 6.** Development should minimise the loss of soil from a site through soil erosion or siltation both:
- (a) during the construction phase; and
 - (b) following commencement of an activity.
- PDC 7.** Development should not result in alterations to the landform or drainage patterns which will impede natural processes of sediment transfer.

Water Resources

- Objective 60:** Protection of the quality and quantity of South Australia's surface waters, including inland and underground waters.
- Objective 61:** The ecologically sustainable use of natural resources including water resources, including ground water, surface water and watercourses.
- Objective 63:** Development consistent with the principles of water sensitive design.
- Objective 64:** Development sited and designed to:
- (a) protect natural ecological systems;
 - (b) achieve the sustainable use of water;
 - (c) protect water quality, including receiving waters;
 - (d) reduce runoff and peak flows and prevent the risk of downstream flooding;
 - (e) minimise demand on reticulated water supplies;
 - (f) maximise the harvest and use of stormwater; and
 - (g) protect stormwater from pollution sources.
- Objective 66:** Water resources protected from excessive usage and pollution.
- PDC 190.** Development should be undertaken with minimum impact on the natural environment, including air and water quality, land, soil, biodiversity, and scenically attractive areas.
- PDC 192.** Development should not significantly obstruct or adversely affect sensitive ecological areas such as creeks and wetlands.

Water Sensitive Design

- PDC 194.** Development should be designed to maximise conservation, minimise consumption and encourage re-use of water resources.
- PDC 196.** Development should be sited and designed to:
- (a) capture and re-use stormwater, where practical;
 - (b) minimise surface water runoff;
 - (c) prevent soil erosion and water pollution;
 - (d) protect and enhance natural water flows required to meet the needs of the natural environment;
 - (e) protect water quality by providing adequate separation distances from watercourses and other water bodies;
 - (f) not contribute to an increase in salinity levels;



- (g) **avoid the water logging of soil or the release of toxic elements; and**
- (h) **maintain natural hydrological systems and not adversely affect:**
 - (i) **the quantity and quality of groundwater;**
 - (ii) **the depth and directional flow of groundwater; or**
 - (iii) **the quality and function of natural springs.**

PDC 202. Stormwater management systems should preserve natural drainage systems, including the associated environmental flows.

Water Catchment Areas

PDC 206. Development should ensure watercourses and their beds, banks, wetlands and floodplains are not damaged or modified and are retained in their natural state, except where modification is required for essential access or maintenance purposes.

PDC 209. Along watercourses, areas of remnant native vegetation, or areas prone to erosion, that are capable of natural regeneration should be fenced off to limit stock access.

PDC 215. Development liable to cause soil erosion or contribute to the silting of any watercourse should not be undertaken.

PDC 216. Development should take place in a manner which will not interfere with the utilisation, conservation or quality of water resources and protects the natural systems that contribute to natural improvements in water quality.

Once operational, the wind farm is unlikely to have adverse impacts on the watercourses within or downstream of the site of the development. The nature of the development does not require extraction of water, nor create waste in a manner that would adversely affect the natural systems of the watercourses.

The exclusion to this is the operation and maintenance facilities that would require collection, use and disposal of wastewater. The plans which accompany the development application show an indicative layout of the operations and maintenance facilities, which includes on-site stormwater disposal. It is anticipated that these facilities would be self-sufficient and not generate off-site impacts. The final design and layout, including on-site water collection and disposal would be subject to further design and provided to the planning authority as part of the Building Rules Consent process. Detailed design of these facilities would be undertaken in accordance with the principles of water sensitive design and in accordance with the Construction Environmental Management Plan, a draft of which forms part of the application documents.

The construction of the wind farm has the potential to create impacts on watercourses and groundwater, by erosion and landslip, through the earthworks associated with constructing or upgrading of access tracks, footings for the turbines, and site development for both temporary and permanent operation and maintenance facilities. In addition, the temporary concrete batching plants with the construction facilities would require disposal of wastewater.



Water utilised during the construction phase may be sourced from the aquifer; however this would be subject to approval through other legislation. The option also exists to obtain water from an external source and transport and store it within the construction facilities.

In order to protect watercourses, groundwater and the landform during the construction phase, the draft Construction Environmental Management Plan incorporates a number of practices, which include:

- utilising existing access tracks wherever practical;
- minimising vegetation clearance;
- retention of all contaminated stormwater and process wastewater on-site;
- locate stockpiles away from drainage lines and in areas least susceptible to wind erosion;
- effectively control surface runoff entering and leaving the site;
- truck and wheel wash facilities to be provided at exit points;
- all equipment wash down to be undertaken within an identified wash down area and contained within that area;
- the refuelling of vehicles or equipment shall not be conducted within 30 metres of a water body, water course or drainage channel; and
- all construction activities to be undertaken in accordance with the EPA Stormwater Pollution Prevention – Code of Practice for the Building and Construction Industry.

It is considered that there would be a low risk of impact on water quality during construction, provided that work complies with a Construction Environment Management Plan (CEMP) incorporating a Soil Erosion and Drainage Management Plan for each element of the development. Potential impacts on natural features due to erosion and landslip can be minimised through appropriate management, utilising techniques already outlined in the draft CEMP.

6.10 Sloping Land

The site of the development contains numerous ridgelines and valleys. To construct the wind farm a number of these ridgelines will be accessed by new or upgraded existing access tracks. Objective 93 of the Development Plan requires development on sloping land to minimise environmental and visual impact and protect soil stability and water quality. As discussed above, addressing soil erosion and maintaining water quality are matters to be addressed during construction and can be adequately managed by practices outlined in the CEMP.



As outlined in the CEMP and discussed in the civil engineering report accompanying the application, access tracks would utilise existing tracks wherever possible, minimise the clearance of native vegetation and avoid areas of higher native vegetation, control stormwater discharge, be constructed of gravelled surfaces and be reduced in width from 10 metres to 5.0-6.0 metres post construction.

The WAX Design report incorporates the impact of access tracks in the visual assessment of the proposed wind farm and notes that *"while the proposed tracks will appear as new development post construction, they do not appear out of character with the wider rural landscape. The track surface will be crushed rock sourced either on site or from a local supplier. Overtime, the track material is likely to dull and weather naturally which will reduce the associated visual effect"*.

Earthworks are a significant component of the construction of the wind farm, both in terms of access tracks and turbine construction. It is acknowledged that during the construction of the wind farm appropriate management would need to be in place to minimise the impact on sloping land. These practices, in draft form, are contained in the CEMP that accompanies the application documents and address the intent of the provisions of the Development Plan to minimise environmental harm.

Sloping Land

Objective 93: **Development on sloping land designed to minimise environmental and visual impacts and protect soil stability and water quality.**

Landslip

Principles of Development Control

PDC 377. **Land that is at risk from landslip should not be developed.**

PDC 378. **Development in areas susceptible to landslip should:**

- (a) **incorporate split level designs to minimise cutting into the slope;**
- (b) **ensure that cut and fill and heights of faces are minimised;**
- (c) **ensure cut and fill is supported with engineered retaining walls or are battered to appropriate grades;**
- (d) **control any erosion that will increase the gradient of the slope and decrease stability;**
- (e) **ensure the siting and operation of an effluent drainage field does not contribute to landslip;**
- (f) **provide drainage measures to ensure surface stability is not compromised; and**
- (g) **ensure natural drainage lines are not obstructed.**

PDC 383. **Driveways and access tracks across sloping land should be accessible and have a safe, all-weather trafficable surface.**

PDC 387. **The cutting and/or filling of land outside townships and urban areas should:**

- (a) **be kept to a minimum and be limited to a maximum depth or height no greater than 1.5 metres so as to preserve the natural form of the land and the native vegetation;**



- (b) **only be undertaken in order to reduce the visual impact of buildings, including structures, or in order to construct water storage facilities for use on the allotment;**
- (c) **only be undertaken if the resultant slope can be stabilised to prevent erosion; and**
- (d) **result in stable scree slopes which are covered with top soil and landscaped so as to preserve and enhance the natural character or assist in the re-establishment of the natural character of the area.**

6.11 Air Quality

The potential impacts on air quality are generally those associated with the construction phase of the project, particularly movement of vehicles and earthworks required in constructing access tracks, trenching and preparing each wind turbine site, which is likely to create a risk of causing a dust nuisance. Minimisation of dust during the construction phase is addressed in the Draft Construction Environmental Management Plan (CEMP) and the need to undertake the development pursuant to the developers' duty of care under the *Environment Protection Act 1993* and relevant EPA policies and guidelines.

In addition, a Construction Traffic Management Plan will be prepared prior to construction to identify the route for vehicles and any specific mitigation required i.e. management of potential fugitive material during transportation, operation of equipment to control exhaust emissions and a procedure for complaints. Mitigation methods identified to date include: identification of routes to avoid (wherever possible) residential land uses; all vehicles and equipment will be operated and maintained to comply with regulatory standards for exhaust emissions; construction site roads watered down; spray down with water pavement materials and aggregates before transporting; and covering any loads of dust generating or odorous materials entering or leaving site.

These practices are considered to be satisfactory in meeting the intent of the Development Plan in relation to minimising nuisance in relation to air quality.

Rural Zone

Objective 15: Prevention of environmental nuisance or harm resulting from odour and other airborne particles.

PDC 14. Landscaping includes bushfire protection features to minimise risk of damage to buildings and property and assist in preventing or slowing spread of fire.

PDC 15. Development should have regard to the possible impacts in terms of air quality both in terms of odour and air borne particles (eg dust) on:

- (a) **horticulture and viticulture;**
- (b) **residential and tourist accommodation; and**
- (c) **sensitive industries.**

PDC 16. Development likely to result in the emission of odour, or other airborne particles, should minimise environmental nuisance or harm external to the site as a result of that emission.



6.12 Road Traffic and Access

As outlined in the relevant provisions of the Development Plan, there are numerous considerations in relation to traffic and access, including the provision of safe and efficient movement from public roads, minimising visual impacts of internal access tracks, ensuring that the wind farm does not interfere with airfields, that the landform is not altered significantly and any potential impacts on flora and fauna. Matters of landform, visual amenity and impacts on flora and fauna have been discussed in previous sections of this report.

The key issue with regard to traffic and transport relate to the impacts likely to arise from the additional vehicles accessing the proposed wind farm site both during its construction and operation.

It is acknowledged that the proposed wind farm construction period would have an effect on the daily activities of the local community due to potentially increased traffic delays and noise. This will primarily be on the adjacent landowners and the centres of Palmer, Sedan, Cambrai, Tungillo and Sanderston.

A detailed traffic impact assessment has been undertaken by GHD and is included in the development application documents. This assessment report gives particular consideration to the transportation of the proposed wind farm components (including nacelles, hubs, blades, modularised tower sections and substation transformers) on account of the size and weight of these components during the 18 to 24 month construction period. The report notes that whilst *"this study has given consideration to feasible road transport routes, the final choice of route is dependent upon the final delivery location of the wind turbine equipment, the transport contractor selected, the availability and type of vehicles at the contractor's disposal and the route that is acceptable to authorities"*.

"GHD states that "the primary impact, in terms of road network performance and safety, will be during the 18 to 24 month construction period where a large number of vehicle movements will be generated over a short period of time. The total one-way vehicle trips estimated for the construction phase of the proposed wind farm are shown to be reasonably significant, comprising of approximately:

- *2 554 over mass and over dimensional trips;*
- *49 293 truck trips; and*
- *105 600 car trips.*

The above listed trips however, will occur over a minimum 18 month period. When broken down to average trips per month and per day the impacts on the road network are shown to be more reasonable. The average daily trips are:

- *6 over mass and over dimensional trips.*
- *124 truck trips*



- 267 car trips

The above estimated worst case increase in daily traffic volumes will be approximately 365 additional vehicles per day (vpd) on the key roads surrounding the proposed wind farm site. The key issue to be addressed is that over 25% of vehicle movements associated with the construction of the proposed wind farm will be heavy vehicle movements. This will be managed through the development of a detailed Traffic Management Plan (TMP). It should be noted that these figures are conservative and are representative of the "worst case scenario". The trips are able to be reduced if measures are in place such as sourcing locally produced quarried materials.

During the operations phase the proposed wind farm is designed for stand-alone remote operation. Generally the proposed wind farm will operate unattended for most of its operational life and accordingly the traffic associated with the long-term operation of the wind farm will be minimal.

In conclusion, taking into account the current road usage near the proposed Palmer Wind Farm site and the expected increase in traffic, particularly during the construction phase, the impacts from traffic and traffic related activities are not considered to be significant. Where impacts are identified these can be mitigated with good management and the implementation of a detailed Traffic Management Plan and Environmental Management Plan during construction."

In assessing the impacts of the proposed development against the provisions of the Development Plan, the two phases of the development must be considered. As stated by GHD, there would be impacts on the road network during the construction phase (a two year period), however during the operational phase, which is expected to be 25 to 30 years, there is very little ongoing impact anticipated.

There are a number of provisions of the Development Plan which seek to ensure safe and convenient movement of people and goods, including the Rural Zone PDC 20 and Movement of People and Goods Objectives 14 and 16 and a range of Principles of Development Control, as quoted below.

Rural Zone

PDC 20. Sites should be provided with a safe and convenient means of access which:

- (a) avoids unreasonable interference with the flow of traffic on adjoining roads;**
- (b) accommodates all types and the volume of traffic likely to be generated by the development or land use; and**
- (c) is located and designed to minimise any adverse impact on the occupants of visitors to neighbouring properties.**



Movement of People and Goods

Objective 14: Safe and efficient movement of people and goods by road.

The primary and secondary road network serving local and district traffic is shown on Map MiMu/1 (Overlay 1).

Objective 16: Free flow of traffic on roads by minimising interference from adjoining development.

Principles of Development Control

PDC 34. Development liable to generate traffic volumes which cannot safely and conveniently be accommodated on the existing or proposed road system should not be undertaken.

PDC 37. Development should include an appropriate provision on the site to enable the parking, loading, unloading, turning and fuelling of vehicles and pedestrian or cycle movement in a safe and convenient manner. Shared parking areas or sites located elsewhere other than on site should only be provided where such an arrangement is to be benefit of the community.

PDC 38. The construction of access ways onto public roads should:

- (a) not interfere with or restrict drainage channels or watercourses; and
- (b) be located in a safe and convenient location.

PDC 39. Driveways, access tracks and parking areas should:

- (a) follow the natural contours of the land;
- (b) follow the geometric pattern of plantings;
- (c) be designed and constructed with a minimum amount of excavation and/or fill;
- (d) be designed and constructed to minimise the potential for erosion from run-off; and
- (e) not involve the removal of existing vegetation.

PDC 40. Development should not be undertaken if the design and location of access points will create unsafe conditions or cause interference with the free flow of traffic on any adjoining road.

Although final routes for vehicle movements during the construction phase of the project require further consultation, agreement and relevant approvals by the Department of Planning, Transport and Infrastructure and Council, the following practices have already been identified to minimise the impact of the additional traffic movement in the locality:

- Distribution of vehicle trips associated with the construction phase across three key transport routes.
- Utilisation of major highways/road from Adelaide and/or Melbourne including Dukes Highway, Princes Highway, South Eastern Freeway and/or Sturt Highway, that are currently designated as heavy vehicle transport.



- Minimise noise associated with a significant number of slow moving vehicles around towns and settlements in consultation with the residents as part of the Traffic Management Plan (TMP).
- Avoid town centres as a direct access route, as much as practical.
- Minimise heavy vehicle access along the school bus route(s) during the scheduled bus operating hours.
- Upgrading of a number of roads along the primary routes to meet required standards, including:
 - sealing of shoulders at various intersections;
 - upgrading or introduction of appropriate directional and warning signage to warn of heavy vehicle movements;
 - upgrading of guard rails, culverts and similar infrastructure on some specific local roads; and
 - surface treatment and widening of some specific local roads, should they be selected as part of the delivery route of wind farm components.
- Designated delivery periods, delivery routes and access points to the site for all materials and equipment supplied for different locations around the site.
- Designated speed limits and load limits specified for heavy vehicle routes.
- Designated reserve areas on the construction site for parking, turning, loading and unloading.
- Appropriate traffic controls and management on-site to ensure that vehicles use the designated site access tracks and do not travel off these tracks.
- Appropriate traffic controls and management on site to ensure that vehicles use the designated wash down areas if applicable.
- An inspection and maintenance program for the selected access routes and site tracks, to ensure these are kept in an adequate and safe condition.
- Controls and management measures to ensure farm stock (sheep and cattle) are not able to escape from the site through access points during construction operations.

As stated previously, during the construction phase of the wind farm there is potential for impacts on the safe and convenient movement of people and goods in the region. This construction period is estimated to be up to two years. During this phase of the development it is important that the potential impacts are minimised.



It is considered that the routes (and alternatives) along with the practices already identified in the Traffic Assessment Report and briefly outlined above; along with the preparation of a detailed Traffic Management Plan prior to construction commencing, would satisfy the intent of the Development Plan in providing safe and convenient movement of goods and people in the locality of the development.

Post construction and during the operational phase of the wind farm, it is unlikely that the proposal would adversely impact on the road network or the safe and convenient movement of people and goods.

The need for appropriate management of traffic movements is acknowledged and these would be addressed further as part of a Traffic Management Plan to be authorised by Council and the Department of Planning, Transport and Infrastructure. On this basis, it is considered that the proposal adequately addresses the requirements of the Development Plan regarding road traffic and transportation.

6.13 Heritage

The Development Plan contains numerous provisions relating to protection of places of heritage significance, both Aboriginal and European, as stated in the Rural Zone Objective 4, Marne Watercourse Policy Area 13 and Objective 3 of the Hills Policy Area. Conservation Objective 57 states that:

“The region contains buildings and sites of European historic and cultural interest, and Aboriginal burial grounds and camp sites important to the study of archaeology and anthropology. The area north of the Marne River contains examples of Aboriginal and early European settlement, and the eastern escarpment of the Mount Lofty Ranges, north of Palmer, contains sites of early settlement, historic relics and unusual granite tors. These and other geological sites should be protected for education and research purposes and to provide historic links with the past.”

Structure Plan Map MiMd/1 (Overlay 2) illustrates a range of Aboriginal historic sites around the Palmer and Tungkillo area.

Rural Zone

PDC 4. Development should be designed and sited to respect and maintain the landscape character of an area which is of:

- (a) **historical (including archaeological) significance;**
- (b) **scientific interest;**
- (c) **scenic value or natural beauty;**
- (d) **other heritage significance; or**
- (e) **conservation significance.**

Policy Area Number 13 – Marne Watercourse

PDC 6. Development should not be undertaken if the establishment, operation or management of such development is likely to result in:

- (a) **pollution of the Rivers' systems;**



- (b) unnecessary loss or damage to native vegetation;
- (c) erosion;
- (d) the introduction of or an increase in the number of pest plants or vermin;
- (e) reduction in capacity of the river channel;
- (f) landfill or landslide; or
- (g) damage to Aboriginal sites, objects or remains as defined under the *Aboriginal Heritage Act 1988*.

Policy Area Number 14 – Hills Policy Area

Objective 3: Conservation and enhancement of the importance of the area for Aboriginal heritage.

Conservation

Objective 56: Preservation of natural vegetation of historic, local or particular visual significance.

Objective 57: Conservation of land, buildings, structures and other items of significant historical, social and architectural or other Aboriginal or European heritage significance.

The region contains buildings and sites of European historic and cultural interest, and Aboriginal burial grounds and camp sites important to the study of archaeology and anthropology. The area north of the Marne River contains examples of Aboriginal and early European settlement, and the eastern escarpment of the Mount Lofty Ranges, north of Palmer, contains sites of early settlement, historic relics and unusual granite tors. These and other geological sites should be protected for education and research purposes and to provide historic links with the past.

With the Murray River Valley are areas of outstanding importance for the conservation of wildlife and their habitats, wilderness areas and other areas of natural vegetation. They include sites of scientific, cultural, educational or historic importance, sites of former Aboriginal occupation, and land necessary to preserve the scenic attractiveness of the Murray Valley.

PDC 167. The nature, features and the character of areas and items, other than building development and vegetation, should be conserved which are of special:

- (a) historical (including archaeological and cultural) significance or heritage value;
- (b) scientific interest; or
- (c) scenic value or natural beauty.

PDC 187. Development liable to impair the character or nature of buildings, relics and sites of heritage, archaeological, scientific or agricultural importance should not be undertaken.

PDC 188. Development adjacent to, or near, buildings of heritage, cultural, scientific or visual significance, should not be undertaken if it would significantly detract from the appearance of the building or the character of the locality.

PDC 189. Individual buildings or groups of buildings should be conserved and, where possible, restored which are of special:

- (a) architectural merit, significance or interest;



- (b) visual interest;
- (c) historical significance or heritage value; or
- (d) scientific interest.

PDC 230. Development adjoining buildings, structures or sites of heritage significance should be visually compatible with that building, structure or site.

There are numerous recorded sites of Aboriginal or European heritage within the site of the development and the wider locality. The site of the development includes traditional lands of the Peramangk Aboriginal group. The Mannum Aboriginal Community Association Incorporated (MACAI) represents the heritage interests of the Peramangk people. Australian Cultural Heritage Management (ACHM) on behalf of Trustpower is continuing consultation with MACAI as part of the application process and to satisfy the requirements of the *Aboriginal Heritage Act 1988*.

Further details of local cultural and heritage sites are provided in the Trustpower Palmer Wind Farm Cultural Heritage Assessment Study prepared by Australian Cultural Heritage Management and which is included in the application documents.

ACHM note that *"...previous research indicates that various Aboriginal site types, such as campsites, burials, culturally modified trees, rock shelters and rock art sites, are most likely to be found in the vicinity of a watercourse, and that watercourses are often culturally significant in and of themselves. Many such sites have been previously identified within the Mt Lofty Ranges, and it is possible that more could be encountered within the proposed Palmer Wind Farm area"*.

The ACHM report notes that *"there are 88 recorded sites of Aboriginal or historical heritage within close proximity of the Trustpower Palmer Wind Farm Project Area. It is the opinion of ACHM that there is moderate to high potential for the Project Area to contain Aboriginal heritage sites and a low potential for it to contain historical heritage sites"*. MACAI has requested that the details of culturally sensitive areas are not made available in the public domain.

Further survey work is proposed to be undertaken with MACAI. In the interim, the following recommendations have been made by ACHM to protect aboriginal heritage within the site of the development:

- *"Ensure where necessary all areas of infrastructure in the final layout have been surveyed prior to construction and compliance with impact mitigation measured agreed with the traditional owners (MACAI), such as construction monitoring where requested.;*
- *Avoid impacting on or disturbing any registered or newly identified aboriginal sites in accordance with the Aboriginal Heritage Act and agreement with MACAI*
- *Work with the MACAI to agree and subsequently manage potential issues during the construction phase;*



- *Comply with the Aboriginal site discovery procedure provided in the Heritage Assessment report if Aboriginal sites, objects or remains are discovered during works in the Project Area.*
- *Prior to work commencing, construction workers on the project will be given appropriate cultural heritage awareness training in consultation with MACAI.*
- *All on site workers should remain within the project footprint at all times and avoid going into nearby gullies and rocky outcrops as these are likely to contain Aboriginal heritage sites.*
- *Utilise as much as possible existing access tracks and avoid any disturbance or development in the gullies between hills. Wherever possible, access tracks should keep to the crest or upper slopes of the hills within the project area."*

In addition to Aboriginal heritage within the locality of the proposed wind farm, there is one State Heritage Place within the development site and others within the immediate locality, as identified in Section 3.5.2 of this report. There are no places of local heritage significance identified in the Mid Murray Council Development Plan.

The "Granite Boulders Area Geological Site (State Heritage ID 13197)" on Allotment 110, Filed Plan 169859 in Certificate of Title Volume 5705 Folio 899 is a State Heritage place. The Heritage Places Database illustrates this place as being located immediately north of Randell Road. The extent of listing does not include the whole of the Certificate of Title. This distinction is important as Allotment 110 is an involved landowner and a small portion of land immediately adjacent the northern boundary is within the corridor of the wind turbine generators and is proposed to accommodate a meteorological mast. The separation between the corridors around the WTG and the area designated as a State Heritage Place is estimated to be in the vicinity of 500 metres. Given the significance of this State Heritage place is geological, the potential impact on this place is considered to be visual.

As previously discussed in detail in this report, the wind farm will have a visual impact on the landscape, however this impact is anticipated by the provisions of the Development Plan.

In addition to this place of State Heritage significance within the site of the development, the other State Heritage places within the locality of the wind farm are not affected by any wind farm infrastructure, but like the Granite Boulders, the landscape in which they are located may be altered visually by the introduction of wind turbine generators.

It is noted in the ACHM report and on maps which accompany the development application, a number of dry stone walls within the site of the development. It is understood that these dry stone walls are considered to be of social and historical importance to the local community and are visually identifiable in the locality. The walls are not however listed as places of heritage significance. At this time, some access tracks to service the wind farm may need to cross these dry stone walls. Trustpower is aware of the local importance of these walls and during detailed planning of the wind farm would seek to minimise impact on these walls.



ACHM has recommended to Trustpower that during the detailed planning process and prior to construction; that consultation be undertaken directly with the Dry Stone Wall Association, to determine appropriate management practices for any work required.

This approach to the protection of the dry stone walls is considered to be an appropriate approach to minimise the impact of the development.

On the basis of information available, it is considered that the proposal is unlikely to significantly detract from the heritage and cultural significance of the locality and thereby generally complies with the provisions of the Development Plan.

6.14 Bushfire

The Mid Murray Council Development Plan contains Bushfire Protection Area (BPA) maps of bushfire risk. The site of the development is partly within the Medium Bushfire Risk area, and also partly within the General Bushfire Risk area. The proposed wind farm does not involve construction of dwellings, tourist accommodation and other forms of habitable buildings in a High Bushfire Risk Area of a Bushfire Protection Area, which is sought to be avoided by the provisions of the Development Plan.

As discussed in Section 6.6.1 development of wind farms often results in concerns being raised about the impacts on fixed wing aircraft for aerial bushfire fighting. It is understood that wind turbines are treated as a vertical obstruction in a similar manner to overhead electricity infrastructure and the decision as to whether to fight a fire aurally is determined on a dynamic risk assessment basis by the CFS and the aerial operator. It is understood that Trustpower have been informed by the CFS Manager State Aviation Operations that:

"Wind farms are really just another piece of infrastructure in the environment that we need to manage on a risk basis when we're fighting fires. Aircraft are only used on a relative minority of fires throughout the fire season and their prime objective is to support fire trucks on the ground.

Any obstacle in the airspace where we're running aircraft is a problem for aircraft obviously. But we would treat the wind farms exactly the same way as we treat any other tall objects or structures."

Wind farm access roads provide increased access on-site (in often previously inaccessible areas), create natural fire breaks and staging areas for firefighting."

There are no provisions in the Development Plan against which aerial fire fighting should be assessed.



Trustpower are aware of their duty of care in relation to bushfire management and have commenced the preparation of a Fire Management Plan in consultation with the CFS. This Fire Management Plan includes:

- emergency response procedures;
- consideration of the construction activities and schedule considering fire risks;
- vegetation management on-site;
- access requirements for equipment, vehicles and machinery;
- induction and training of on-site personnel;
- provision of adequate fire fighting equipment at construction sites and at the operating wind farm;
- shutting down of turbines if the components reach critical temperatures or if directed by the CFS in the case of a nearby wildfire; and
- ongoing liaison, co-operation and consultation with the CFS and other key emergency stakeholders.

It is considered that these measures form a suitable approach to fire fighting on the subject land, satisfying the intent of the Development Plan.

Objective 94: Development should minimise the threat and impact of bushfires on life and property while protecting the natural and rural character.

Objective 95: Buildings and the intensification of non-rural land uses directed away from areas of high bushfire risk.

Principles of Development Control

PDC 388. Buildings and structures should be located away from areas that pose an unacceptable bushfire risk as a result of one or more of the following:

- (a) vegetation cover comprising trees and/or shrubs;
- (b) poor access;
- (c) rugged terrain;
- (d) inability to provide an adequate building protection zone; or
- (e) inability to provide an adequate supply of water for fire-fighting purposes.

PDC 391. Buildings and structures should be designed and configured to reduce the impact of bushfire through using simple designs that reduce the potential for trapping burning debris against the building or structure, or between the ground and building floor level in the case of transportable buildings.



PDC 395. Development in a Bushfire Protection Area should be in accordance with those provisions of the Minister's Code: Undertaking development in Bushfire Protection Areas that are designated as mandatory for Development Plan Consent purposes.

6.15 Summary of Development Plan Assessment

In summary, the proposed wind farm and ancillary components has substantial planning merit when assessed against the relevant provisions of the Development Plan. The planning merits are:

- a wind farm and ancillary development is an envisaged land use within the Rural Zone;
- the site of the development is outside of the Barossa Valley Character Preservation District;
- neither the Marne Watercourse or Hills Policy Areas specifically list a wind farm as an unacceptable land use;
- 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 proposal does not adversely impact on the attainment of the objectives of the adjacent Rural Living Zone for development of existing vacant rural living allotments;
- 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 adequately minimises the impact on the natural environment;
- 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 is satisfied;
- the minimum setback of 1,000 metres to all known tourist accommodation facilities is satisfied;
- wind turbine generators are located in excess of 2,000 metres from surrounding townships and settlements;
- 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 dwellings within 1.26 kilometres of any turbine;
- 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 and managing impacts on Aboriginal heritage places; and
- the proposal contains suitable methodology for managing bushfire risks.

7.0 CONCLUSION

Following an assessment of the proposed development against the whole of the Mid Murray Development Plan, it is considered that the proposed development is not significantly at variance with the Development Plan.

A wind farm and ancillary infrastructure is an envisaged land use within the Rural Zone. A wind farm is not listed as an “unacceptable” land use within either the Marne Watercourse Policy Area or the Hills Policy Area. The Rural Zone acknowledges that a wind farm would be located in visually prominent locations and visible from scenic routes and valuable scenic and environmental areas. The wind farm is consistent with the intent of the zone and not in conflict with the provisions of the policy areas.

The proposed Palmer Wind Farm adequately and appropriately addresses potential impacts, particularly those associated with noise, protection of flora and fauna, European and Aboriginal heritage and traffic movements in a manner sought by the Development Plan.

On balance, the proposed Palmer Wind Farm is a suitable form of development within the Rural Zone that suitably addresses potential impacts and thereby warrants the granting of Development Plan Consent.

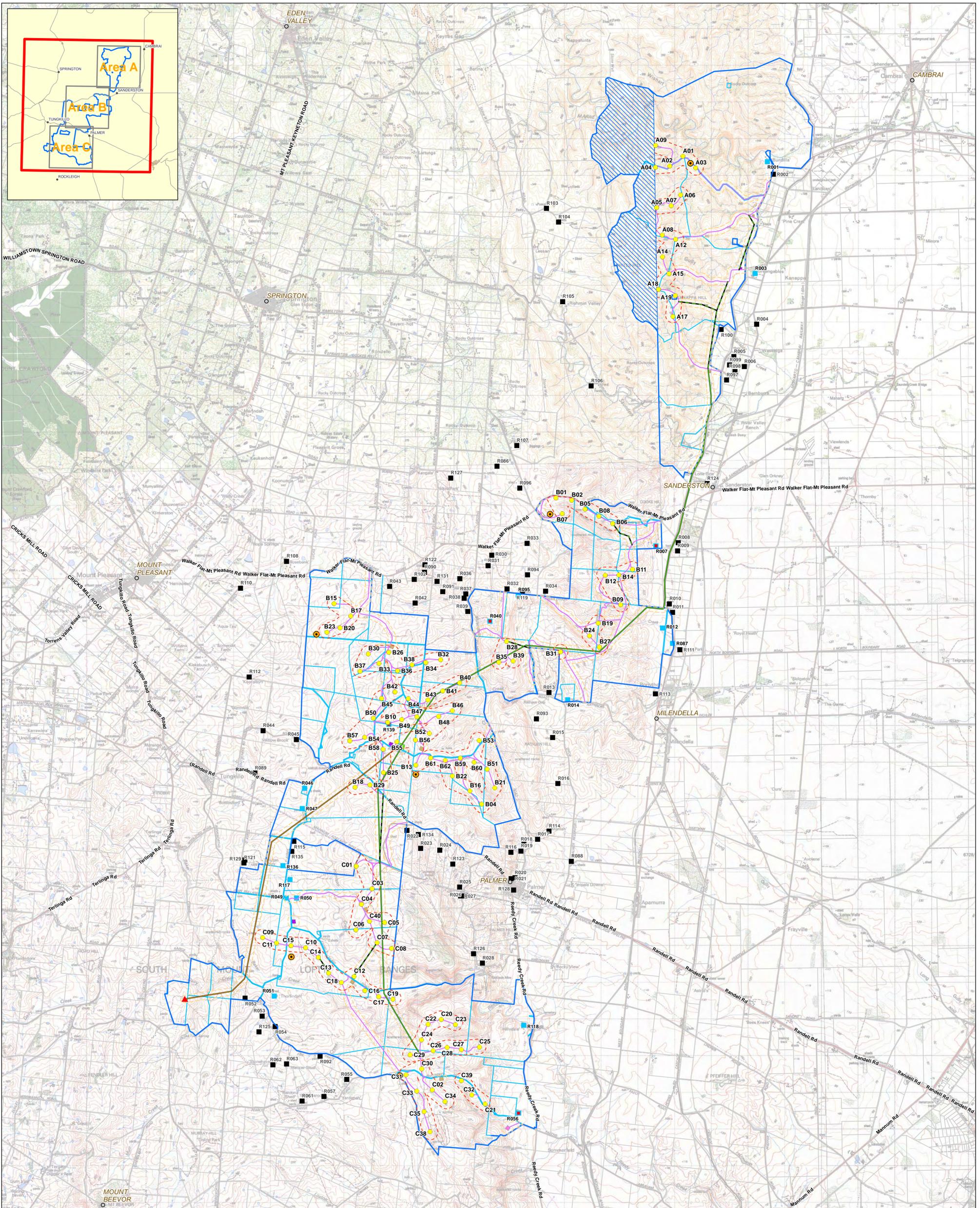
Julie Jansen MPIA, CPP
BA, BA(Hons), GDURP

15 August 2014

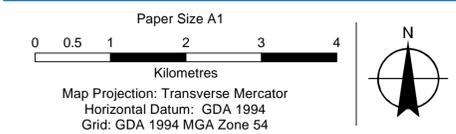


Attachment 1

Plans

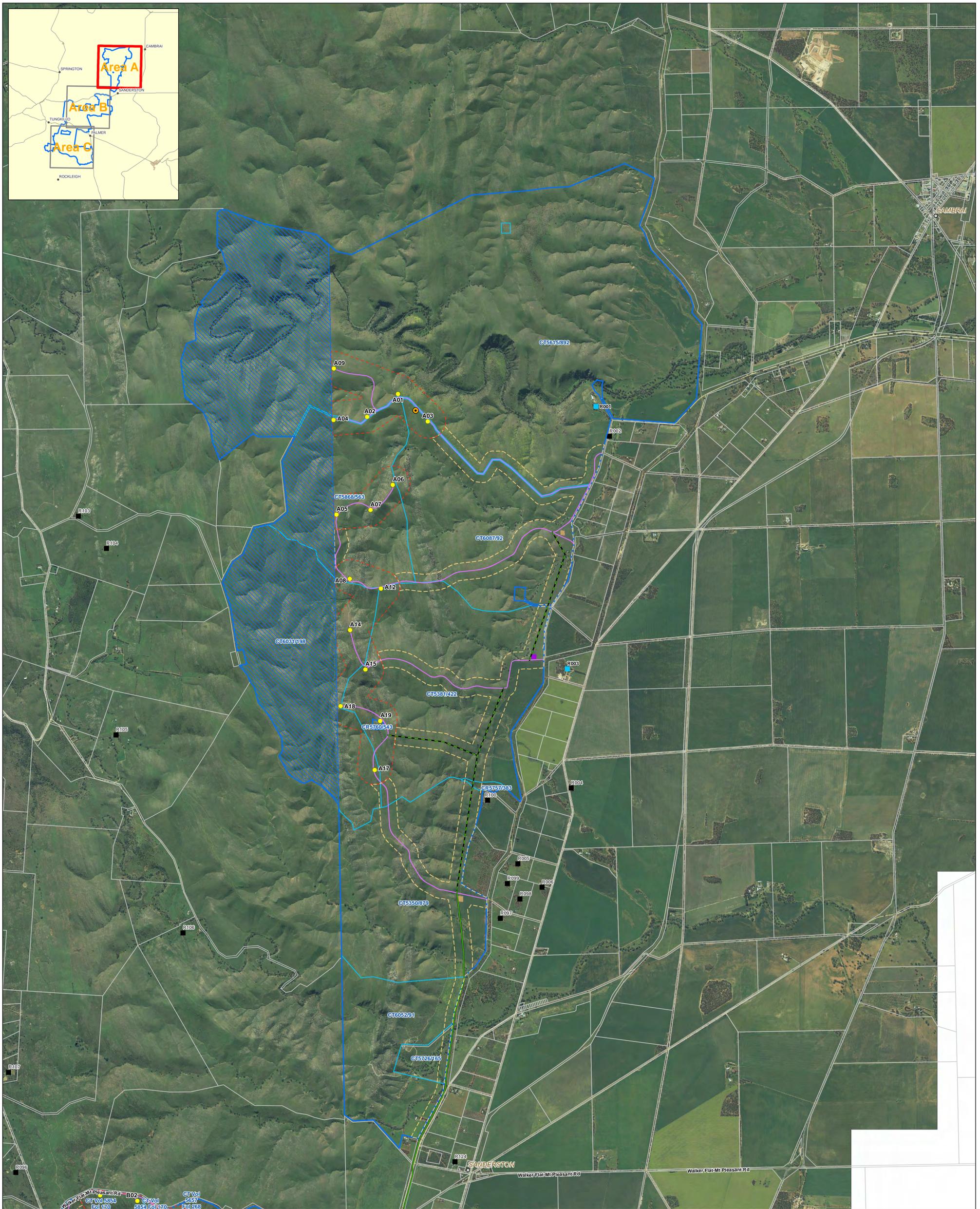
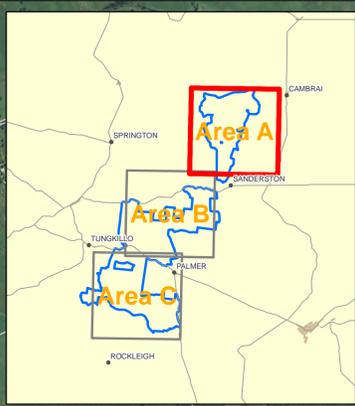


- Legend**
- Indicative Turbine Location
 - ▲ Tungkillo Substation
 - Turbine Corridor
 - 33kV Transmission Lines
 - 275kV Transmission Line
 - Underground Cable not within Proposed Access Track
 - Proposed Access Tracks
 - Project Boundary
 - Not within site of development
 - Corridor around other infrastructure
 - Titles inside Project Boundary
 - Dwelling within 1km
 - Host Dwelling
 - Occupied Dwelling
 - Construction Amenities
 - Batch Plant/Construction Amenities
 - Laydown Area/Construction Amenities
 - Laydown Area
 - Substation and Operations & Maintenance Compound
 - Meteorological Mast



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 Palmer Wind Farm Technical Studies
 Palmer Wind Farm Layout
 Indicative Project Layout

Job Number | 33-17234
 Revision | 0
 Date | 15 Aug 2014



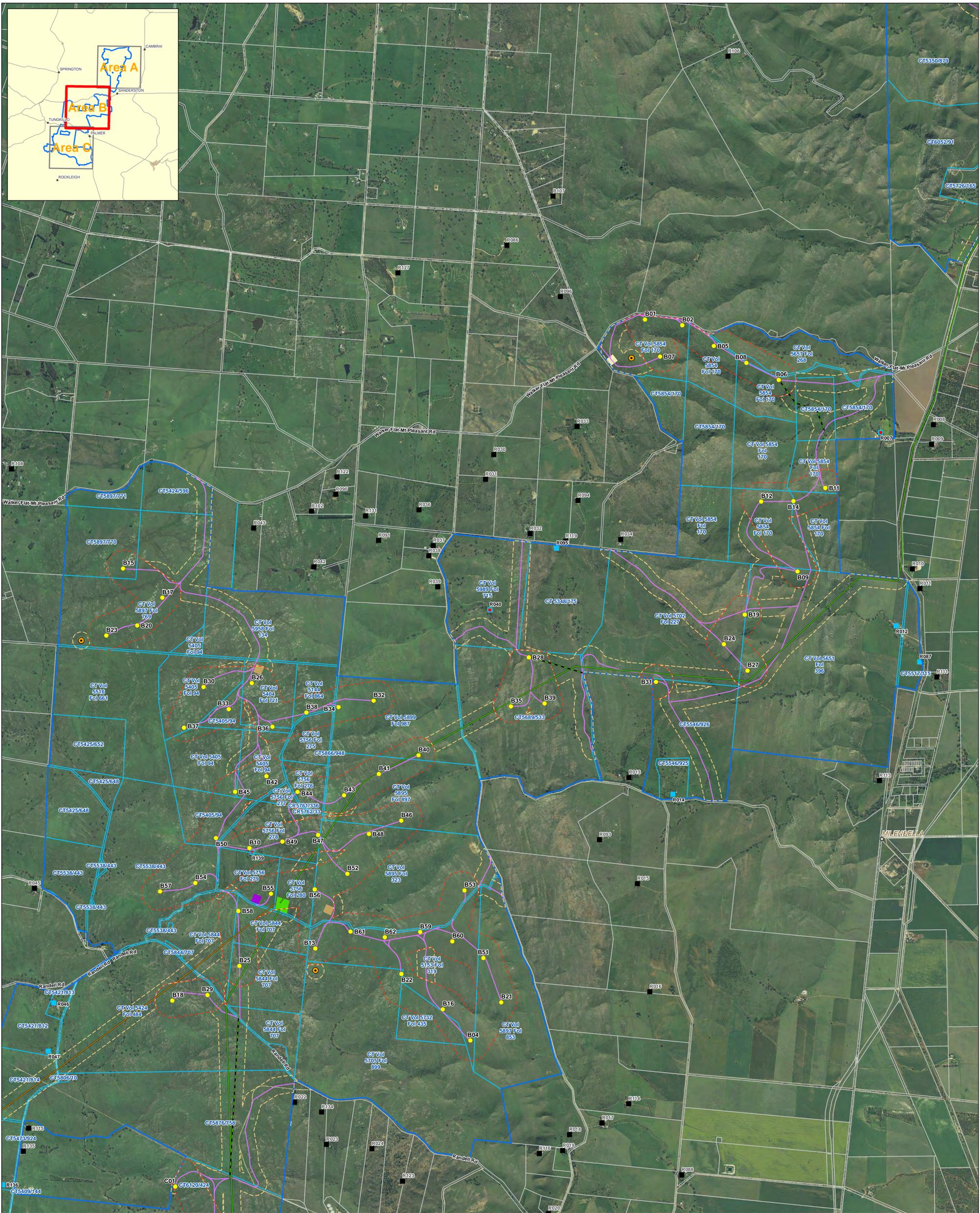
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- Indicative Turbine Location
 - ▲ Tungkillo Substation
 - Turbine Corridor
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 - Batch Plant/Construction Amenities
 - Laydown Area/Construction Amenities
 - Laydown Area
 - Substation and Operations & Maintenance Compound
 - Meteorological Mast



TrustPower Australia Holdings Pty Ltd
 Palmer Wind Farm Technical Studies
 Palmer Wind Farm Layout
 Area A Indicative Project Layout

Job Number | 33-17234
 Revision | D
 Date | 14 Aug 2014

Map of Area A



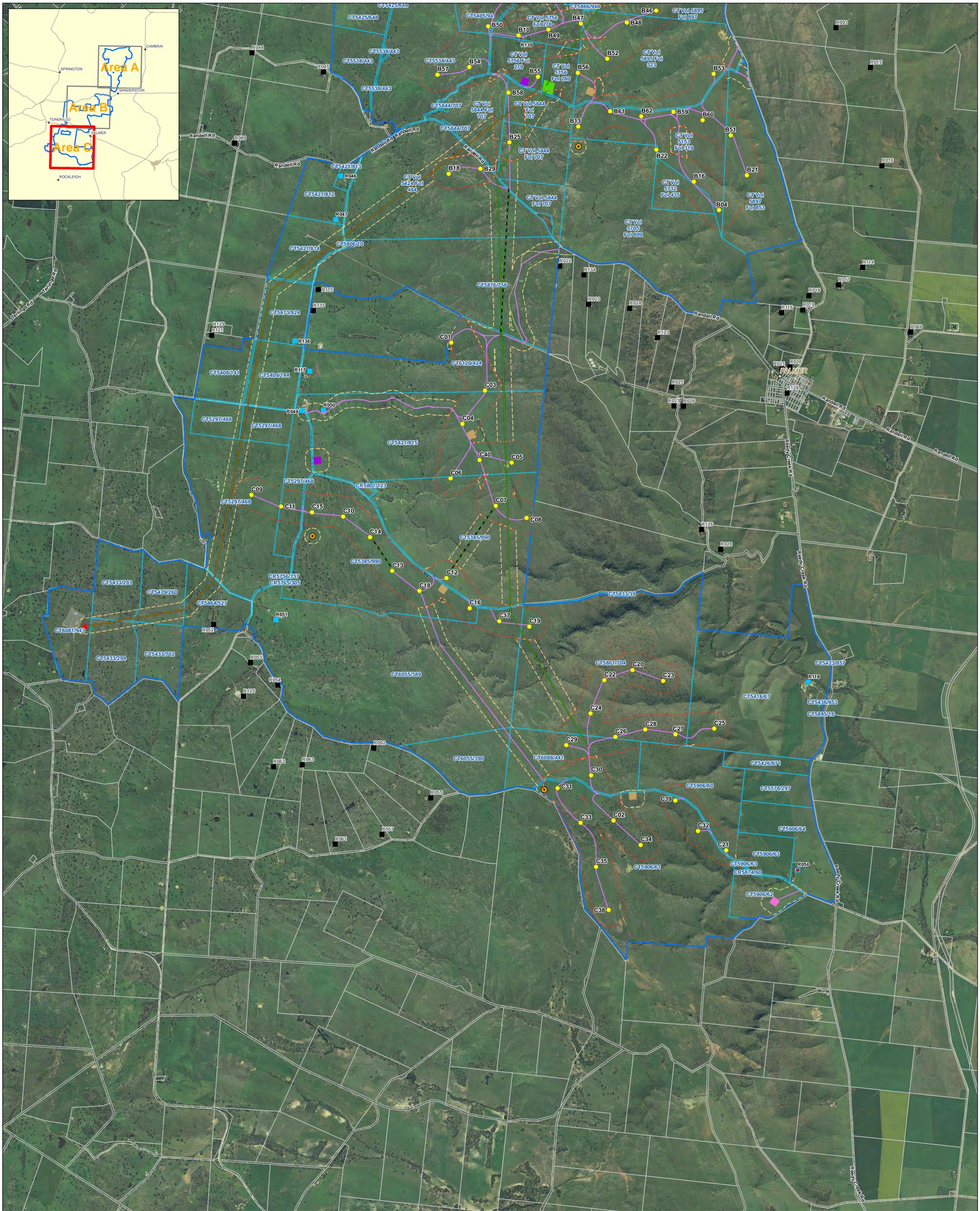
- Legend**
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 - ▲ Tungkillo Substation
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 - Construction Amenities
 - Batch Plant/Construction Amenities
 - Laydown Area/Construction Amenities
 - Laydown Area
 - Substation and Operations & Maintenance Compound
 - Meteorological Mast



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 Palmer Wind Farm Technical Studies
 Palmer Wind Farm Layout
 Area B Indicative Project Layout

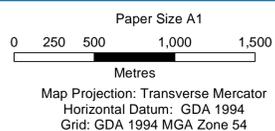
Job Number | 33-17234
 Revision | D
 Date | 14 Aug 2014

Map of Area B



Legend

- Indicative Turbine Location
- ▲ Tungkillo Substation
- Turbine Corridor
- 33kV Transmission Lines
- 275kV Transmission Line
- Underground Cable not within Proposed Access Track
- Proposed Access Tracks
- Titles inside Project Boundary
- Project Boundary
- Not within site of development
- Corridor around other infrastructure
- Dwellings within 1km
- Host Dwelling
- Occupied Dwelling
- Construction Amenities
- Batch Plant/Construction Amenities
- Laydown Area/Construction Amenities
- Laydown Area
- Substation and Operations & Maintenance Compound
- Meteorological Mast



TrustPower Australia Holdings Pty Ltd
 Palmer Wind Farm Technical Studies
 Palmer Wind Farm Layout
 Area C Indicative Project Layout

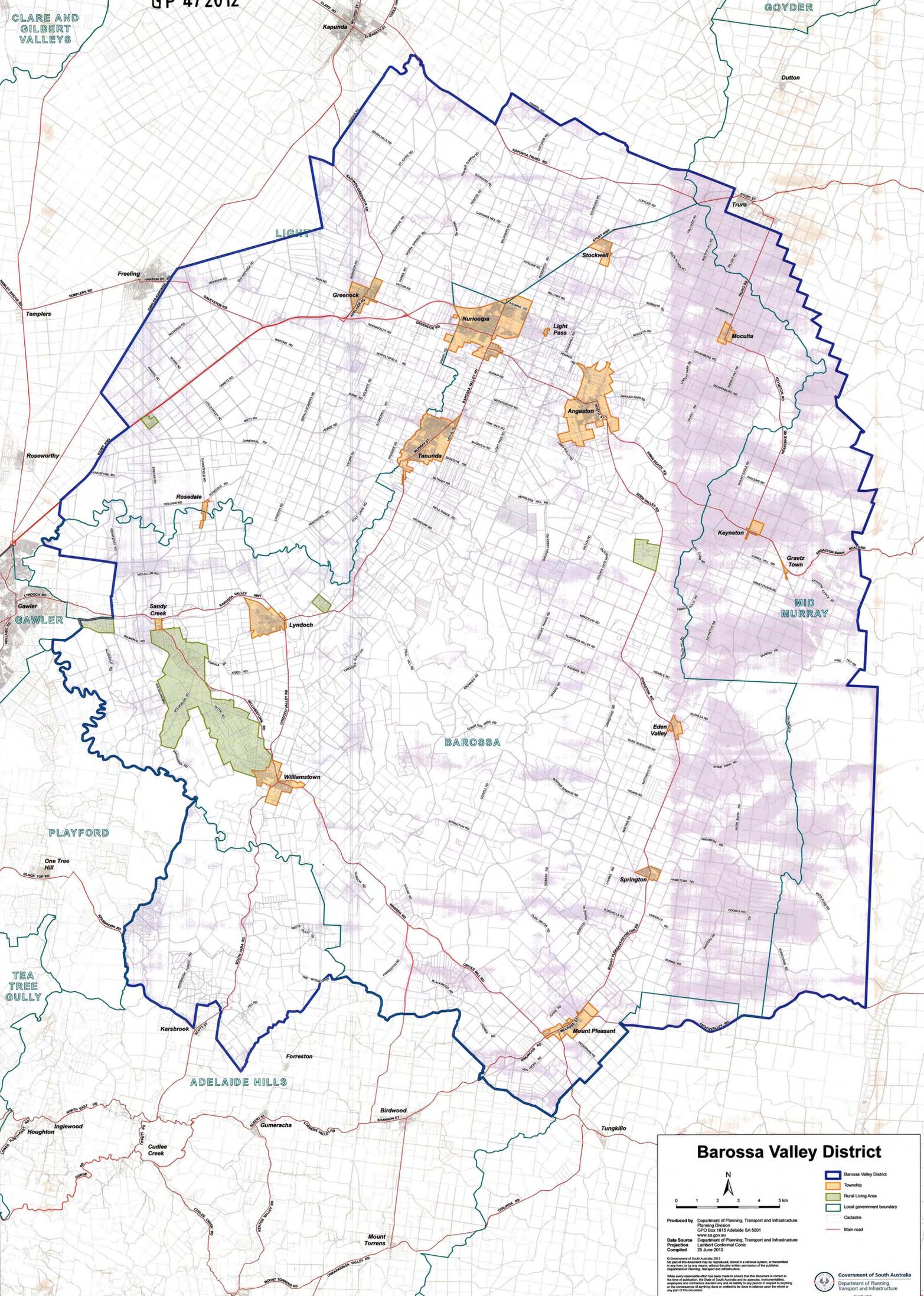
Job Number | 33-17234
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 Date | 14 Aug 2014

Map of Area C



Attachment 2

Plan – Barossa Valley Character Preservation District



Barossa Valley District

0 1 2 3 4 5 km

- Barossa Valley District
- Township
- Rural Living Area
- Local government boundary
- Cadastre
- Main road

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 Department of Planning,
 Transport and Infrastructure
 P.L.C. 2012



Attachment 3 – Land within the Site of the Development

Area A

Title Reference	Parcel ID
CT5615/892 (part of)	D3806 A8
CT6031/198 (part of)	F170020 Q272
CR5760/543	H170100 S55
CT5350/879	F170016 A267
CT5381/422	F170025 A276
CT6087/92	F170029 A280
CT5868/563 (part of)	F170028 Q279
CR5757/383	H170100 S530
CT5726/165	H170100 S529
CT6052/91	D81735 A101

Those parts of the parcels that extend within the Barossa Valley Character Preservation District are not included in the project.

Area B

Title Reference	Parcel ID
CT5517/115	H170300 S52
CT5854/170	H170500 S397
CT5854/170	H170500 S396
CT5705/899	F169859 A110
CT5854/170	H170500 S390
CT5854/170	H170500 S655
CT5854/170	H170500 S395
CT5854/170	H170500 S393
CR5762/33	H171000 S513
CR5761/336	H170500 S344
CT5516/661	F170179 A91
CT5895/323	F169884 A135
CT5854/170	H170500 S394
CT5989/715	F169892 A143
CT5153/319	D20944 A74
CT5546/926	F169887 A138
CT5702/227	F169894 A145
CT5405/94	F204303 A92
CT5844/707	F218333 A21



Title Reference	Parcel ID
CT5844/707	F218333 A17
CT5756/280	F217815 A205
CT5756/278	F217815 A203
CT5732/435	F169873 A124
CT5899/987	F169886 A137
CT5897/769	F170180 A92
CT5348/175	F169893 A144
CT5651/396	F206935 A95
CT5897/853	D20944 A75
CT5756/279	F217815 A204
CT5546/925	F169888 A139
CT5405/94	F204303 A93
CT5404/721	F169891 A142
CT5844/707	F218333 A19
CT5405/94	F204303 Q96
CT5756/276	F217815 A201
CT5756/275	F217815 A200
CT5405/94	F204303 Q95
CT5756/277	F217815 A202
CT5958/134	D68586 A36
CT5657/268	F169896 A147
CT5895/897	D1648 A9
CT5144/864	D26866 A1
CT5854/170	H170500 S391
CT5854/170	H170500 S322
CT5844/707	F218333 A20
CT5405/94	F204303 A91
CT5425/652	H170500 S452
CT5538/443	F170181 Q97
CT5844/707	F218333 A18
CT5897/770	H170500 S437
CT5854/170	H170500 S392
CT5405/94	F204303 A94
CT5424/596	F204033 Q92



Title Reference	Parcel ID
CT5844/707	F218333 A22
CT5689/533	D1648 A5
CT5538/443	F170181 Q98
CT5854/170	H170500 S330
CT5854/170	H170500 S2
CT5897/771	H170500 S438
CR5761/336	H170500 S344
CR5762/33	H171000 S513
CT5425/648	H171000 S173
CT5425/648	H171000 S173
CT5538/443	F170181 Q93
CT5538/443	F170181 Q96
CT5538/443	F170181 Q95
CT5854/170	H170500 S394
CT5866/948	R4658 AA

Area C

Title Reference	Parcel ID
CT5864/527	H171000 S73
CT6055/389	H171000 S483
CT5906/64	F43319 A26
CT5385/990	H171000 S482
CT5906/61	F43319 A21
CT5861/704	F169981 A232
CT5876/758	F169983 A234
CT6088/441	H171000 S488
CT5433/702	H171000 S243
CT5906/60	F43319 A20
CT5385/990	H171000 S481
CT5433/293	H171000 S241
CT5297/468	F157755 A31
CT5426/871	H171000 S357
CT6055/390	H171000 S485
CT5416/67	D16500 A307
CT5297/468	F157755 A32



CT5906/63	F43319 Q24
CT5906/63	F43319 Q25
CT5479/260	H171000 S72
CT6120/424	F169983 A234
CT 5806/10	H213527 A91
CT5578/297	H171000 S358
CR5874/60	F43319 A23
CT5906/62	F43319 A22
CT5408/141	D47145 A62
CT5297/468	F157755 A33
CT5433/294	H171000 S242
CT5297/468	F157755 A30
CT5421/815	H171000 B480
CT5409/144	H171000 S214
CT5421/814	F157574 A39
CT5421/812	F157583 A48
CT5473/924	H171000 S211
CT5421/813	F157582 A47
CT5833/39	R1430 AE
CT6081/943	F157552 A17
CT5424/484	H171000 S477

Paper Road PWF

Position	Title Reference	Parcel ID
Northern Boundary	CT6087/92	F170029 A280
Northern Boundary	CT5868/563	F170028 Q279 Part of this title, up to the point of the Barossa Protection District
Northern Boundary	CT5726/165	H170100 S529
Southern Boundary	CT5657/268	F169896 A147
Southern Boundary	CT5830/562	F169897 A148
Southern Boundary	CT5854/170	H170500 S322
Southern Boundary	CT5854/170	H170500 S330
Eastern Boundary	CT5651/396	F206935 A95
Eastern Boundary	CT5689/533	D1648 A5
Southern Boundary	CT5897/769	F170180 A92
Southern Boundary	CT5405/94	F204303 Q96



Position	Title Reference	Parcel ID
Southern Boundary	CT5958/134	D68586 A36
Eastern Boundary	CT5958/134	D68586 A36
Western Boundary	CT5899/987	F169886 A137
Eastern Boundary	CT5144/864	D26866 A1
Northern & Western Boundary	CT5756/275	F217815 A200
Western & Southern Boundary	CT5756/276	F217815 A201
Western Boundary	CT5761/336	H170500 S344
Western, Southern & Eastern Boundary	CT5762/33	H171000 S513
Northwest Boundary	CT5756/277	F217815 A202
Western Boundary	CT5756/278	F217815 A203
Western Boundary	CT5756/279	F217815 A204
Western Boundary	CT5473/924	H171000 S211
Western Boundary	CT5409/144	H171000 S214
Northwest Boundary	CT5385/990	H171000 S481
Western Boundary	CT5906/61	F43319 A21
Southwest Boundary	CT5906/61	F43319 A21
Southwest Boundary	CT5906/62	F43319 A22



Attachment 4 – Indicative Location of Wind Turbine Generators

WTG Ref Number	Easting (MGA Z54)	Northing (MGA Z54)
A03	336698	6161375
A06	336293	6160637
A01	336353	6161693
A02	335994	6161427
A04	335605	6161391
A07	336033	6160345
A05	335638	6160292
A08	335792	6159545
A12	336154	6159431
A14	335796	6158950
A15	335974	6158492
A18	335687	6158065
A19	336147	6157893
A17	336083	6157324
B01	332895	6152379
B02	333325	6152313
B05	333690	6152072
B06	334442	6151678
B07	333068	6151948
B08	334067	6151876
B09	334658	6149460
B10	328319	6146254
B11	334980	6150426
B12	334238	6150270
B14	334610	6150274
B15	326856	6149493
B17	327311	6149154
B18	332784	6148159
B19	334049	6148960
B20	327021	6148833
B23	326663	6148717
B24	333807	6148617
B26	328346	6148166
B27	334081	6148311
B28	331551	6148465
B29	332416	6148148
B30	327787	6148121
B31	333123	6147940
B32	329755	6147962
B33	328079	6147863
B34	329350	6147887
B35	331343	6147896



WTG Ref Number	Easting (MGA Z54)	Northing (MGA Z54)
B36	328585	6147661
B37	327563	6147649
B38	328978	6147796
B39	331732	6147930
B40	330274	6147331
B41	329816	6147113
B42	328515	6147087
B43	329413	6146867
B44	328875	6146905
B45	328153	6146906
B46	330074	6146572
B47	329114	6146406
B48	329700	6146418
B49	328700	6146329
B50	327931	6146370
B52	329451	6145957
B53	330806	6145764
B54	327692	6145850
B55	328568	6145725
B56	329074	6145776
B57	327285	6145752
B58	328191	6145525.
B59	330294	6145281
B60	330666	6145173
B61	329488	6145286
B62	329885	6145221
B13	329080	6145090
B51	331025	6144980
B25	328203	6144889
B22	330071	6144645
B21	331231	6144468
B16	330555	6144387
B04	330875	6144025
C01	327512	6142437
C03	327891	6141719
C04	327604	6141295
C05	328230	6140799
C06	327453	6140599
C07	328029	6140248
C09	324913	6140387
C10	326082	6140111
C08	328422	6140094
C11	325291	6140241
C13	326709	6139419



WTG Ref Number	Easting (MGA Z54)	Northing (MGA Z54)
C14	326426	6139848.
C15	325685	6140167
C16	327696	6138940
C12	327400	6139327
C18	327055	6139162
C19	328458	6138706
C17	328074	6138775
C20	329773	6138153
C22	329414	6138023
C23	330169	6138015
C24	329236	6137599
C25	330785	6137396
C26	329554	6137298
C27	330330	6137332
C28	329935	6137392
C29	328927	6137194
C30	329243	6136808
C31	328816	6136645
C32	330633	6136105
C33	329109	6136201
C34	329877	6135919
C35	329306	6135639
C38	329468	6135090
A09	335608	6161989
C39	330319	6136487
C02	329529	6136230
C21	330970	6135853
C40	327823	6140832

Location of Key Sites

Site Type	Title Reference
Substation and Operations & Maintenance Facility (refer Fig 3.6)	Pt CT5756/279 & Pt CT5756/278
Construction Facility (refer Fig 3.8-1)	CT5906/62
Construction Facility (refer Fig 3.8-2)	CT5906/61
Construction Facility (refer Fig 3.8-3)	CT5385/990
Construction Facility (refer Fig 3.8-4)	CT5421/815
Construction Facility (refer Fig 3.8-5)	CT5421/815



Construction Facility (refer Fig 3.8-6)	CT5404/721
Construction Facility (refer Fig 3.8-7)	CT5824/170
Construction Facility (refer Fig 3.8-8)	CT5906/879
Construction Facility (refer Fig 3.8-8)	CT5381/422
Construction Facility (refer Fig 3.8-10)	CT6087/92

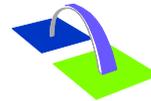
Description of 33kV Route

33kV Transmission Line	Description of Location
Portion of 33kV line located in road reserve.	<p>Enters the road reserve of Three Chain Road from the south-east corner of CT5350/879 (at a point located approximately 1.2km north of the intersection of this road and Glenroy Road). Extends south along the western side of Three Chain Road to the intersection with the Angas Valley Road, then continues south along Milendella Road. Exits the road reserve at the north-eastern boundary of CT5651/396 opposite the intersection with an unnamed road (approximately 1.4km south of Fromm Road).</p>



Attachment 5 – Summary of Host Dwellings

Area	Dwelling Reference	Title Reference	Distance to Nearest WTG
A	001	5615/892	1.96
Not in project boundary	003	5381/406	2.3
Not in project boundary	004	5381/412	2.3
B	007	5854/170	0.9
Not in project boundary	011	5522/869	1.4
B	012	5651/396	1.3
B	014	5546/925	1.3
B	040	5989/715	0.7
C	046	5421/813	1.4
C	047	5421/813	1.6
C	049	5421/815	1.3
C	050	5421/815	1.3
C	051	6055/389	1.4
C	056	5906/64	0.9
B	087	5517/115	1.8
B	095	5348/175	1.3
Not in project boundary	108	5425/654	1.7
C	117	5075/795	1.7
C	118	5416/67	1.3
C	136	5473/924	1.99
B	139	5756/278	0.06



Attachment 6 – Extracts of the Mid Murray Council Development Plan dated 24 October 2013

RELEVANT PROVISIONS OF MID MURRAY COUNCIL DEVELOPMENT PLAN

DEVELOPMENT PLAN DATED 24 OCTOBER 2013

RURAL ZONE

Desired Character

The zone is the location of the majority of dry land agricultural production within the Council area but it also includes irrigated orchards, vegetables, vineyards and pasture where there is access to water supplies for irrigation. The processing of agricultural product is envisaged which, subject to compliance with environmental criteria, could include value-adding enterprises such as packing and processing works and wineries. Other forms of small-scale industry may be appropriate in association with existing residential development, on allotments which are not suited to primary production, or as an adjunct to an existing primary production operation.

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 that part of the zone outside of the Barossa Valley Character Preservation district (as defined by Character Preservation legislation) and constitute a component of the desired character of this part of the zone.

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 Zone adjoins the River Murray and agricultural uses in the vicinity of the River must be managed to ensure that the River's water quality does not further deteriorate through accelerated groundwater inflows, irrigation run-off, chemical over-spray, erosion and siltation and other impacts. Due to the potential for adverse impacts on areas of native vegetation, olive production should be sufficiently separated from environmentally sensitive areas such as the Murray River and Conservation Zones.

The Zone encompasses the eastern face of the Mount Lofty Ranges which contributes significantly to the district's visual qualities. The location and design of development on the hills face is therefore a matter of importance, as is the retention of remnant bushland and native vegetation for aesthetic and conservation purposes.



New landscaping or agro-forestry plantings should not change the bold and exposed character of the Hills Face. The use of local native species should be used in preference to introduced species for these purposes.

The zone's rural and natural character lends itself to tourism activities, such as the interpretation of the natural environment, the sale or sampling of produce and on-farm tourism which will enhance the value of local production and add to the quality and range of experiences available to the visitor in the region. These value-added activities however should not be undertaken in a way which would prejudice the long-term operation of primary production.

Scenic vehicular routes transverse and define the zone. Land adjoining a defined scenic route or which can be viewed from the routes, should only be developed to enhance their function.

Other than where qualified by the provisions for the Policy Areas, the following forms of development are acceptable in the Rural Zone:

- farming and farm buildings;
- horticulture particularly viticulture, vegetable and fruit production and associated storage and processing buildings;
- irrigated pasture;
- residential use providing it is associated with farming, horticulture, viticulture;
- infrastructure to support acceptable uses;
- tourist accommodation associated with existing farm dwellings;
- tourism development associated with the natural environment;
- uses which aid interpretation of natural areas and the region's natural heritage;
- intensive animal keeping providing specified separation distances can be achieved;
- land-based aquaculture providing specified separation distance can be achieved;
- land extensive uses to support urban areas such as waste disposal or waste treatment;
- wind farm and ancillary development outside of the Barossa Valley Character Preservation District; and
- wind monitoring mast and ancillary development outside of the Barossa Valley Character Preservation District.

The following forms of development are unacceptable in the Rural Zone:

- retail apart from the sale of farm produce;
- urban residential;
- industry and commercial not associated with farming, horticulture, or viticulture excluding small scale home industry on an allotment of which its size, existing use and land capability do not support economic primary production;
- outdoor advertising other than information signage, or relative to the sale of produce from the land on which the sign is sited; and
- olive plantation within 1km of the River Murray Zone (apart from the Primary Production Policy Area) and Conservation Zone.



Rural Zone - Objectives

Sustainable Industry

- Objective 1:** Long-term operation and sustainability of rural production and primary industries.
- Objective 2:** Accommodation of wind farms and ancillary development outside of the Barossa Valley Character Preservation District as defined by Character Preservation legislation.

Stormwater

- Objective 3:** Maintenance of natural hydrological systems and environmental flows.
- Objective 4:** Surface run-off designed to protect property and life and environmental quality.

Vegetation and Landscape Character

- Objective 5:** Retention and maintenance of wetlands and existing native vegetation for its conservation, biodiversity, and habitat value and environmental management function.
- Objective 6:** Maintenance and enhancement of the landscape character.

Soil

- Objective 7:** Protection and maintenance of:
- (a) the physical, chemical and biological quality of soil resources;
 - (b) the quantity of soil resources;
 - (c) the natural processes of sediment transfer.

Air Quality

- Objective 15:** Prevention of environmental nuisance or harm resulting from odour and other airborne particles.

Noise Pollution

- Objective 16:** Protection of sensitive uses from external noise.

Hazard Minimisation

- Objective 17:** Prevention of environmental nuisance or harm resulting from a biological, chemical or fire hazard, energy emission or explosion.



Built Form and Design

Objective 20: Rural dwellings or value-adding enterprises which does not preclude horticulture, irrigated pasture, and dairying development.

Objective 21: Buildings and structures compatible with the environmental qualities, built form and character of the surrounding area and landscape.

Infrastructure

Objective 22: Economic provision of infrastructure in an environmentally sensitive manner.

Objective 23: Development provided with an adequate level of appropriate services and infrastructure without excessive cost to the community.

Land Division

Objective 24: Allotments suited to their proposed use.

Principles of Development Control

Form of Development

PDC 1 Development should not be undertaken unless it is consistent with the desired character and acceptable forms of development for the zone and the relevant policy area.

Stormwater

PDC 2. No adverse impact on natural hydrological systems and environmental flows.

Design Techniques (ONE WAY of meeting requirements of the principle of development control)

- 2.1 *Modifications to the landform are not located closer than 50 metres to the bank of a watercourse identified on a current series 1:50 000 SA Government topographic map.*
- 2.2 *The quality of water leaving the site, be of a physical, chemical and biological condition equivalent to or better than pre-development conditions.*
- 2.3 *The rate of discharge from the site shall not exceed the rate of discharge from the site in the pre-development condition for all storm durations up to and including storms having an ARI of 100 years.*

PDC 3. Stormwater from buildings and ground areas managed in a manner which minimises impact on natural drainage systems by:

- (a) preventing soil erosion or siltation;
- (b) minimising the entry of pollutants; and
- (c) mitigating peak flows.

Design Techniques (ONE WAY of meeting requirements of the principle of development control)

- 3.1 *In relation to P3(c) on-site drainage systems shall incorporate a system to the approval of the relevant authority, to detain and treat first flush storm run-off before discharge*



from the site. A detention volume equivalent to the run-off from a 1 year ARI, 2 hour duration storm, discharged gradually over a period of 24 hours is acceptable.

Landscape

PDC 4. Development should be designed and sited to respect and maintain the landscape character of an area which is of:

- (a) historical (including archaeological) significance;
- (b) scientific interest;
- (c) scenic value or natural beauty;
- (d) other heritage significance; or
- (e) conservation significance.

Soil

PDC 5. Development should not have an adverse impact on the natural, physical, chemical or biological quality and characteristics of soil resources.

PDC 6. Development should minimise the loss of soil from a site through soil erosion or siltation both:

- (a) during the construction phase; and
- (b) following commencement of an activity.

Design Techniques (ONE WAY of meeting requirements of the principle of development control)

6.1 *Erosion and sediment control measures such as grade furrows, contour banks, catch/diversion drains, level spreaders, revegetation, hay bale barriers, filter fences, sediment traps and basins are implemented during the construction phase to prevent silt or sediment leaving the subject land.*

PDC 7. Development should not result in alterations to the landform or drainage patterns which will impede natural processes of sediment transfer.

Flooding

PDC 11. Structures (apart from purpose built flood control levels), including fencing and the filling of land should:

- (a) not impede the flow of flood waters or change the pattern of movement of floodwaters; and
- (b) when feasible, mitigate any existing impediments to floodwaters.

Design Techniques (ONE WAY of meeting requirements of the principle of development control)

11.1 *Structures, including fencing (post and wire (strand) fencing), and the filling of land does not take place within the 100 year flood plain of a watercourse.*



Noise Pollution

PDC 12. Development designed to minimise adverse acoustic impacts on adjoining uses which would be sensitive to acoustic interference.

Design Techniques (ONE WAY of meeting requirements of the principle of development control)

12.1 The noise levels associated with the development do not exceed the following guideline noise levels at the nearest noise sensitive receiver:

Type of receiver ⁽⁷⁾	Guideline Noise Level LAeqdB(A) ⁽⁸⁾		Guideline Noise Level LAmaxdB(A) ⁽⁸⁾	
	Day ⁽⁹⁾	Night ⁽⁹⁾	Day ⁽⁹⁾	Night ⁽⁹⁾
Rural Living	45	35	60	50
Rural Living/Primary Industry Interface ⁽¹⁰⁾	50	40	65	55
Primary Industry	55	45	70	60

⁽⁷⁾ Specific criteria must be developed where the type of receiver can not be classified in accordance with the uses in the table

⁽⁸⁾ The LAeq and the LMax are the equivalent and maximum A weighted noise levels respectively as generally defined in Australian Standard AS1055-199720. The LAeq shall be adjusted for noise characteristics. Where meteorological conditions exist that will regularly affect the noise level associated with the proposed development, the LAeq shall take account of this influence.

⁽⁹⁾ The day period is 7am to 10pm. The night period is 10pm to 7am.

⁽¹⁰⁾ Taken to mean where a Rural Zone and a Rural Living Zone (or similar) in which a receiver is located interface. The 'Interface' classification will also apply to a purely residential use located in a Rural Zone.

⁽¹¹⁾ Design Technique 12.2 defines the information that the proponent needs to provide to satisfy the principle where the guideline noise levels will be exceeded. It is expected an acoustic engineer (eligible for membership of both the Australian Acoustical Society and the Institution of Engineers Australia) will be required to provide the information.

12.2 The proposal may exceed Design Technique 12.1 and satisfy principle 12 where the planning authority is of the opinion that all reasonable and practicable steps have been taken by the noise source to prevent any adverse impacts resulting from noise. In determining whether all reasonable and practicable steps have been taken by the noise source, the planning authority may consider, amongst other things⁽¹¹⁾:

- (a) the amount by which the predicted noise level exceeds the criteria under Design Technique 12.1;
- (b) the duration and frequency of occurrence that the noise exceeds the criteria under Design Technique 12.1(12);
- (c) the various types of use in the vicinity of the receiver;
- (d) the primary intention of the zone in which the receiver is located as provided by the relevant Development Plan;
- (e) the primary intention of the zone in which the noise source is located as provided by the relevant Development Plan;
- (f) the presence of ambient noise at the receiver of similar character, duration or frequency of occurrence to the noise exceeding the criteria under Design Technique 12.1(13);
- (g) the presence of alternatives to the process which is generating noise, where those alternatives:



- (i) result in a similar outcome; and
- (ii) result in lower noise levels at the receiver; and
- (iii) are successfully used by a class of persons undertaking activities of a same or similar kind;
- (h) the extent of the area and number of receivers exposed to the noise that exceeds the criteria under Design Technique 12.1;
- (i) the economic benefits and social worth of the activity;
- (j) the financial implications of the noise reduction steps as they relate to class of persons undertaking activities of the same or a similar kind;
- (k) the likelihood of successful application of the noise reduction steps

Air Quality

PDC 14. Landscaping includes bushfire protection features to minimise risk of damage to buildings and property and assist in preventing or slowing spread of fire

PDC 15. Development should have regard to the possible impacts in terms of air quality both in terms of odour and air borne particles (eg dust) on:

- (a) horticulture and viticulture;
- (b) residential and tourist accommodation; and
- (c) sensitive industries.

Design Techniques (ONE WAY of meeting requirements of the principle of development control)

15.1 Control measures include: provision of separation distances; enclosing the source; venting and stack heights; arresters and pavement heights.

PDC 16. Development likely to result in the emission of odour, or other airborne particles, should minimise environmental nuisance or harm external to the site as a result of that emission.

Built Form and Design

PDC 17. Outdoor lighting should not cause nuisance.

PDC 18. Buildings and structures which have:

- (a) a design scale, appearance and site to enhance the positive environmental qualities, built form and character of the locality;
- (b) a site which is unobtrusive and screened from public roads and adjoining properties by:
 - (i) natural landforms;
 - (ii) existing vegetation;
 - (iii) planting of appropriate vegetation;
- (c) a requirement for minimal excavation or filling of land;
- (d) a requirements for minimal removal of existing vegetation; and
- (e) sites which are grouped together.



Design Techniques (ONE WAY of meeting requirements of the principle of development control)

- 18.1 *In relation to P18 (c) excavation and/or filling associated with any building or structure is limited to no greater than 1.5 metres below or above natural ground level.*
- 18.2 *In relation to P18 (b) (iii) landscaping associated with new buildings:*
- (a) comprises random plantings of a variety of indigenous tree and shrub species at spacing of 4-5 metres;*
 - (b) consists of some species with a mature tree height equivalent or greater than the height of proposed buildings and structures;*
 - (c) extends around the proposed buildings and structures for a minimum width of 10 metres; and*
 - (d) does not increase the bushfire hazard by ensuring:*
 - (i) no overhang to buildings; and*
 - (ii) set-back of vegetation from building equivalent to the expected mature height of vegetation.*
- 18.3 *In relation to P18 (e) buildings are not separated by a distance of greater than 15 metres.*

PDC 19 The external appearance and design of buildings and structures visible from a public road or waterway should minimise their visual obtrusiveness by:

- (a) reducing the building's profile;
- (b) reducing the mass of buildings into smaller components by variations in wall and roof lines; and
- (c) using eaves, verandahs and similar techniques to create shadowed areas.

Design Techniques (ONE WAY of meeting requirements of the principle of development control) For Industry:

- 19.1 *Any chain mesh fencing to be plastic coated coloured black and set-back 2.0 metres from the road and residential property boundary.*
- 19.2 *The maximum height of any building or ancillary structure is 12.0 metres.*
- 19.3 *Maximum unarticulated length of building to a street frontage 30 metres (punctuation by windows, canopies, verandahs or walk offsets is considered to be adequate).*
- 19.4 *Maximum unarticulated length of office or administration component is 15 metres.*

PDC 20. Sites should be provided with a safe and convenient means of access which:

- (a) avoids unreasonable interference with the flow of traffic on adjoining roads;
- (b) accommodates all types and the volume of traffic likely to be generated by the development or land use; and
- (c) is located and designed to minimise any adverse impact on the occupants of visitors to neighbouring properties.

Building Development

PDC 22. Wind farms and ancillary development should be located in areas outside of the Barossa Valley Character Preservation District as defined by Character Preservation legislation which provide



opportunity for harvesting of wind and efficient generation of electricity and may therefore be sited:

- (a) in visually prominent locations;
- (b) closer to roads than envisaged by generic setback policy.

PDC 23. Buildings should not be designed and sited so as not to be visually obtrusive.

Design Techniques (ONE WAY of meeting requirements of the principle of development control)

23.1 *Visibility can be measured by mapping sightlines.*

Land Division

PDC 25 Creation of additional allotments should not occur other than to excise a dwelling that existed at 26 June 2003.

Design Techniques (ONE WAY of meeting requirements of the principle of development control)

25.1 *Excising of a dwelling from an existing rural property should have regard to the minimum allotment size for a dwelling in the relevant Policy Area, as well as conditions relative to separation distances to Primary Production.*

PDC 26 Allotments including realignment of existing allotments should be located and be of size and configuration which:

- (a) takes account of environmental features and site constraints;
- (b) provides sufficient space in appropriate locations for the siting of buildings, structures and associated services and infrastructure;
- (c) protects native vegetation;
- (d) is able to satisfactorily accommodate an appropriate use of the land (existing or proposed) consistent with land use policies for the Rural Zone; and
- (e) ensures existing dwellings are on allotments of 36 hectares.

Separation Distance to Primary Production

PDC 27. Siting of dwellings should not limit the use for primary production which requires chemical spraying.

Design Techniques (ONE WAY of meeting requirements of the principle of development control)

27.1 *The separation distance¹ between a detached dwelling and primary production should be:*

open ground: 300m

Advisory Note:

¹ A separation distance is the minimum horizontal distance between the curtilage of the dwelling and the primary production land use on adjoining



land. The balance of the land not used for a dwelling can be included in calculating the separation distance.

Conservation

- 43.** Rural development that does not degrade the conservation value of adjoining Conservation Zones

Complying Development

- 44.** The following kinds of development are complying in the Rural Zone:
- Farming (subject to no removal of native vegetation)

Non-complying Development

- 45.** The following kinds of development are non-complying in the Rural Zone:

Land division except for the purpose of realigning of allotment boundaries without creating an additional allotment or excising a dwelling on an additional allotment where that dwelling existed as at 26 June 2003.

Wind farm and ancillary development such as substations, maintenance sheds, access roads and connecting power lines (including to the National Electricity Grid) located within the Barossa Valley Character Preservation District as defined by Character Preservation legislation.

Wind monitoring mast located within the Barossa Valley Character Preservation District as defined by Character Preservation legislation.

And in addition, within the Marne Watercourse Policy Area 13 and Hills Policy Area 14, all kinds of development other than those listed below are non-complying.

Land division where no additional allotments are created, either partly or wholly, and where the development of the proposed allotments does not result in a greater risk of pollution of surface or underground waters than would the development of the existing allotments, and provided a suitable site for a detached dwelling is available which will comply with the criteria specified in criteria (a) to (g) inclusive specified in Design Technique 10.1

“wind farm and ancillary development such as substations, maintenance sheds, access roads and connecting power lines (including to the National Electricity Grid) located outside of the Barossa Valley Character Preservation District as defined by Character Preservation legislation”

“wind monitoring mast located outside of the Barossa Valley Character Preservation District as defined by Character Preservation legislation”

Public Notification

- PDC 46.** For the purposes of public notification, the following activities are assigned Category 1:

- Farming and farm buildings
- Horticultural and associated processing and storage buildings
- Viticultural and associated processing and storage buildings
- Irrigated pasture
- Dwelling, providing it is associated with farming, horticulture, viticulture



Infrastructure to support acceptable uses
Tourist accommodation associated with existing farm dwellings
Tourism development associated with the natural environment
Uses which aid interpretation of natural areas and the region's natural heritage
Land extensive uses to support urban areas such as waste disposal or waste treatment
Public service installations

PDC 47. For the purposes of public notification, the following activities are assigned Category 2:

Wind farms and ancillary development such as substations, maintenance sheds, access roads and connecting power-lines (including to the National Electricity Grid) located outside of the Barossa Valley Protection District as defined by Character Preservation legislation 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
- (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)

Wind monitoring mast and ancillary development located outside of the Barossa Valley Character Preservation District as defined by Character Preservation legislation.

Rural Zone – Policy Area Number 13 – Marne Watercourse

Background

The Marne Catchment can be defined in four distinct ecological and hydrological units

- (a) The Upper Catchment

Most of the water is collected in the upper catchment in the Mount Lofty Ranges, in the tributaries of the Somme and the high rainfall tributaries of the Marne.

- (b) The Gorge and Hills Face

The main drainage lines join to form a gorge at the start of the descent from the upper catchment. The Marne falls 130 metres over a distance of 12km and has formed a deep gorge through metamorphic rock. The gorge is also representative of the eastern hills face of the ranges.



(c) The Floodplain and River Channel

The Marne forms a floodplain at the base of the gorge to where the river meets the Mallee Plain at Cambrai. The river flows infrequently to the mouth on the Murray. Groundwater is recharged by the Marne's flows in the local Cambrai to Kongolia area.

(d) Marne Mouth or Wongulla Wetland (see River Murray Zone)

Watercourses in the Policy Area have been impacted by agricultural land use including clearing, grazing, dam construction and groundwater use for irrigation. The plant biomass and diversity have reduced the habitat value for fauna. Dam construction in the upper catchment has reduced stream flows considerably and groundwater use near Cambrai has lowered the local watertable. Development policies therefore need to take account of the requirement to make allowance for the environmental needs of the rivers' systems and existing water users.

Desired Character

Apart from the hills face see Figs HF(MWPA)/1 to 5 and associated gorge, the Policy Area is suitable for a range of agricultural and horticultural uses.

The hills face is unsuitable to intensive agricultural uses that would change the existing open and exposed character of the landform. Low intensity uses like grazing of sheep should continue.

Tree plantations on the hills face should be confined to gullies and watercourses and building development should, in addition to meeting design criteria, be limited to very large holdings. Local species should be used such as Sheoaks (*Allocasuarina verticillata*).

Water harvesting and use to support agricultural development is appropriate within sustainable limits.

The following forms of development are unacceptable in that part of the Marne Watercourse Policy Area that comprises the hills face and gorge as defined in Figs HF(MWPA)/1 to 5 (additional to unacceptable use for the Rural Zone):

- horticulture, particularly viticulture and olive production;
- forestry;
- buildings on allotments less than 200ha in size.

Objectives Policy Area Number 13 – Marne Watercourse

Objective 1: The character, aesthetic appearance, scenic beauty and amenity of the River Marne and River Somme and its environs are preserved and enhanced in order to:

- (a) undertake sustainable primary production;
- (b) protect water systems;



- (c) provide recreation areas, particularly passive recreation areas;
- (d) provide for native flora and fauna habitats; and
- (e) protect areas of scientific, archaeological or cultural significance.

Objective 2: Sustainable use of the River Marne's and River Somme's groundwater aquifer and catchments as sources of water for primary production.

Objective 3: Maintenance of the capacity and hydraulic characteristics of the Upper Catchment, Gorge and Floodplain in order to avoid flooding outside the channel.

Objective 4: Protection of the open rural character of the hills face of gorge.

Policy Area Number 13 – Marne Watercourse - Principles of Development Control

PDC 1. Development should not be undertaken unless it is consistent with the desired character for the policy area.

PDC 2. Development should preserve and enhance the character and amenity of the River Marne and River Somme and its environs.

PDC 3. Development should be located and designed so as to minimise damage resulting from floodwaters.

PDC 4. Buildings should be located unobtrusively and should be constructed of materials that blend with the riverine landscape.

PDC 5. No buildings should be developed on the eastern face of the ranges as defined in Marne Watercourse Policy Area Figures HF(MWPA)/1 to 5.

PDC 6. Development should not be undertaken if the establishment, operation or management of such development is likely to result in:

- (a) pollution of the Rivers' systems;
- (b) unnecessary loss or damage to native vegetation;
- (c) erosion;
- (d) the introduction of or an increase in the number of pest plants or vermin;
- (e) reduction in capacity of the river channel;
- (f) landfill or landslide; or
- (g) damage to Aboriginal sites, objects or remains as defined under the *Aboriginal Heritage Act 1988*.

PDC 7. Development should be for primary production purposes which are compatible with the Policy Area's role as a water catchment or recharge area, and should not be undertaken if such development is likely to pollute water resources or lead to a diminution of the water resource.

PDC 8. Activities liable to cause deterioration in water quality should not be established.

PDC 10. Development should maintain and enhance the natural character and beauty of land within the locality.



PDC 11. Buildings should not be sited on prominent ridgelines or in locations that would detract from views obtained from any primary or secondary arterial roads or scenic routes, or in locations requiring unnecessary removal of natural vegetation or excessive amounts of excavation.

PDC 12. Land should not be used for horticultural purposes unless:

- (a) there is no risk of pollution and no further increase in salinity levels to either surface or groundwater supplies;
- (b) the land is capable of sustaining the horticultural activity with reasonable investment and management inputs;
- (c) surface and/or sub-surface water resources, of sufficient quantity, are available to sustain the proposed horticultural use;
- (d) water resources are used at sustainable levels to prevent adverse impacts on dependent ecosystems;
- (e) the land is capable and appropriate for the particular form of horticultural development, and in particular where:
 - (i) irrigation areas are not prone to waterlogging or subject to flood water inundation;
 - (ii) drainage volumes are limited to a maximum of 15 percent of total applied water;
- (f) the horticultural use will be compatible with adjacent uses of land;
- (g) adverse impacts on downstream property owners in terms of water flow and discharge of pollution will be avoided, where:
 - (i) a minimum of 300 metres separation should be maintained between irrigation bores and stock and domestic bores;
 - (ii) diversion or storage dams used for irrigation are located off-stream, with the storage capacity of the dams not exceeding 50 percent of the medium annual run-off from a property;
 - (iii) spillways are designed and constructed in a manner to prevent erosion;
 - (iv) a minimum separation distance of 50 metres should be maintained between bores and any part of an effluent disposal field;
 - (v) irrigation areas have a minimum set-back distance of 30 metres from a watercourse, lake or well;
- (h) there will not be deleterious risk of the water table either falling or rising because of excessive irrigation;
- (i) the depth to the water tables is greater than 2.0 metres from the ground surface;
- (j) located outside of the hills face as defined in Marne Watercourse Policy Area Figures HF(MWPA)/1 to 5

Rural Zone – Policy Area Number 14 – Hills Policy Area

Background

The eastern face of the Mount Lofty Ranges, and the ranges themselves, are a dramatic and attractive landscape feature of the Council area and region generally. Development Policies are structured to encourage suitable rural uses and limit built form on the face of the ranges.

Desired Character



Open grazing of the eastern hills face see Figures HF(HPA)/1 to 5 and very limited or no built form to preserve the eastern backdrop of the Murray Plains. The hills face is unsuitable to intensive agricultural uses which would change the existing open and exposed character of the land form. Low intensity uses like grazing of sheep should continue. These plantations on the hills face should be confined to gullies and water courses and building development should, in addition to meeting design criteria, be limited to very large holdings.

Open grazing of the eastern hills face see Figures HF(HPA)/1 to 5 and very limited or no built form to preserve the eastern backdrop of the Murray Plains. The hills face is unsuitable to intensive agricultural uses which would change the existing open and exposed character of the land form. Low intensity uses like grazing of sheep should continue. These plantations on the hills face should be confined to gullies and water courses and building development should, in addition to meeting design criteria, be limited to very large holdings.

Behind the eastern face of the range a wider range of agricultural and horticultural uses are appropriate where built form, providing it relates to primary production, will be evident, but at low densities. These uses include grazing and animal keeping, cropping, viticultural and dairying.

The following forms of development are unacceptable in that part of the Hills Policy Area defined in Figures HF(HPA)/1 to 5 (additional to unacceptable uses for the Rural Zone):

- horticulture, particularly viticulture and olive production;
- forestry;
- buildings on allotments less than 200ha in size.

Objectives - Rural Zone – Policy Area Number 14 – Hills Policy Area

- Objective 1:** Retention of the open rural character as derived from large land holdings used for primary production and dispersed isolated built form.
- Objective 2:** No building development on the eastern face of the Mount Lofty Ranges.
- Objective 3:** Conservation and enhancement of the importance of the area for Aboriginal heritage.

Principles of Development Control - Rural Zone – Policy Area Number 14 – Hills Policy Area

- PDC 1.** Development should not be undertaken unless it is consistent with the desired character for the policy area.
- PDC 3.** Dwellings and non-rural buildings shall not be located where they are prominently visible from a public road without extensive screening first established.
- PDC 4.** The excavation and/or filling of land should:
- (a) be kept to a minimum so as to preserve the natural form of the land and the native vegetation;



- (b) only be undertaken in order to reduce the visual impact of buildings, including structures, or in order to construct water storage facilities for use on the allotment; and
- (c) result in stable scree slopes which are covered with top soil and landscaped so as to preserve and enhance the existing character of the Policy

Council-wide Provisions

Form of Development

- Objective 1:** Orderly development with the economic extension of services and facilities in accordance with Structure Plan for the District Map MiMu/1 (Overlay 2).
- Orderly development achieves economy in the provision of public utilities, and is conducive to the creation of the a safe, convenient and pleasant environment in which to live. Orderly development contributes to the retention of rural land for the purposes of primary production, recreation, and water and nature conservation.
- Objective 2:** Townships, Service Centres and Settlements contained within defined outer boundaries.
- Objective 7:** Development safe from natural or man-made hazards and to be compatible with land capability.
- The risk to life and property caused by natural and man-made hazards including flooding, land slip, bushfire, industrial explosion or discharge is an important consideration. The capability of land in terms of terrain, soil, geology, erosion potential and land use to support a proposed development is an important consideration before allowing the development to proceed. Development should not lead to deterioration in the quality of surface or underground water.
- Objective 8:** Maintenance and promotion of a diverse local economy.
- Sufficient land and infrastructure needs to be available to accommodate economic growth in the region, particularly in the areas of tourism, horticulture and industry. Development providing job opportunities to boost local employment is a high priority.
- Objective 9:** Satisfaction of the social, economic and cultural needs of the community.

Principles of Development Control

- PDC 1.** Orderly Development in accordance with the Structure Plan Maps MiMu/1 (Overlay 1) and Enlargements A to M and MiMu/1 (Overlay 2).
- PDC 5.** Development which is incompatible with other uses within the locality of the proposed development should not be undertaken.



Movement of People and Goods

Objective 14: Safe and efficient movement of people and goods by road.

The primary and secondary road network serving local and district traffic is shown on Map MiMu/1 (Overlay 1).

Objective 15: Provision of a system of scenic routes serving the district and their protection from inappropriate development.

The district's scenic routes are shown on Map MiMu/1 (Overlay 1).

Objective 16: Free flow of traffic on roads by minimising interference from adjoining development.

Principles of Development Control

PDC 34. Development liable to generate traffic volumes which cannot safely and conveniently be accommodated on the existing or proposed road system should not be undertaken.

PDC 37. Development should include an appropriate provision on the site to enable the parking, loading, unloading, turning and fuelling of vehicles and pedestrian or cycle movement in a safe and convenient manner. Shared parking areas or sites located elsewhere other than on site should only be provided where such an arrangement is to be benefit of the community.

PDC 38. The construction of access ways onto public roads should:

- (a) not interfere with or restrict drainage channels or watercourses; and
- (b) be located in a safe and convenient location.

PDC 39. Driveways, access tracks and parking areas should:

- (a) follow the natural contours of the land;
- (b) follow the geometric pattern of plantings;
- (c) be designed and constructed with a minimum amount of excavation and/or fill;
- (d) be designed and constructed to minimise the potential for erosion from run-off; and
- (e) not involve the removal of existing vegetation.

PDC 40. Development should not be undertaken if the design and location of access points will create unsafe conditions or cause interference with the free flow of traffic on any adjoining road.

Design Techniques (Design Techniques illustrate ONE WAY of satisfying the associated principle of development control)

40.1 *In place of direct access to arterial roads use service roads or access to local roads.*

40.2 *Where there is direct access to arterial roads development should allow all vehicles to enter and exit the site in a forward direction.*

PDC 41. Development involving the erection of a building with public access should make suitable provision for access by the disabled.



Public Utilities

Objective 17: New development serviced with adequate public infrastructure commensurate with projected demands at the cost of the proponent.

Principles of Development Control

PDC 42. Provision and maintenance of utility services and easements should be undertaken in such a way that any existing or potentially adverse visual or environmental effects are minimised.

PDC 43. Infrastructure required for development should:

- (a) be able to be economically provided;
- (b) be of a sufficient standard, design and capacity to accommodate the proposed development;
- (c) not have a detrimental impact on the environment qualities and the amenity of the area;
- (d) not necessitate the removal of native vegetation;
- (e) not increase the level of risk to public health;
- (f) be provided at full cost to the developer without public subsidy;
- (g) not compromise the level of service to other existing users; and
- (h) not be at risk of damage by flood waters

PDC 44. Development should only be undertaken where demands placed on essential services such as water supply, common effluent drains or electricity can be met by existing facilities or their expansion.

PDC 46. In rural areas where there is no reticulated or indirect mains water supply, development should have an independent water supply of a nature, design, quality and capacity that can be demonstrated as suitable for meeting the ongoing requirements of the development, particularly for domestic, livestock and fire protection purposes.

PDC 47. Stormwater discharge points should be located and constructed so as to prevent soil erosion.

PDC 48. Development should incorporate on-site stormwater harvesting where possible and residential development should be designed so that as much rainwater as possible is retained on-site through the collection of roof run-off in rainwater tanks and provision of:

- (a) at least one tank of 10 000 litre capacity per dwelling; or
- (b) in the absence of a reticulated supply, tanks should be capable of storing the upper limit of anticipated annual run-off.

PDC 49. Stormwater systems should be designed with structures to minimise the entry of pollutants such as sediment, pesticides and herbicides, bacteria, animal wastes and oil and grease into drainage systems.

PDC 50 Stormwater systems should be located and designed to minimise the hydraulic impact of discharges on streams by mitigating peak flows and providing erosion protection at entry points.

PDC 51 Stormwater drainage systems should preserve rather than eliminate natural drainage systems.



Appearance of Land and Buildings

Objective 18: Amenity of localities not impaired by the appearance of land, buildings and structures including landscape.

Buildings or structures should be sited and designed displaying regard to physical setting qualities and existing built form. In the River Murray Valley in particular buildings should conform to standards covering such matters as building materials, maintenance and colouring, and tree planting.

Objective 19: Development of a high architectural standard that responds to and reinforces positive aspects of the local environment and built form.

Objective 20: Roads, open spaces, buildings and land uses laid out and linked so that they are easy to understand and navigate.

Design and Appearance

Principles of Development Control

PDC 53. Development, including alterations and additions to buildings, should not be undertaken unless it involves a high standard of design with regard to external appearance, building materials, colours, siting and landscaping, so as to preserve and enhance the character of the locality or desired future character of an Area.

PDC 54. The design of a building may be of a contemporary nature and exhibit an innovative style provided the overall form is sympathetic to the scale of development in the locality and with the context of its setting with regard to shape, size, materials and colour.

PDC 55. Development should not be undertaken unless:

- (a) it conforms with the desired future character of an Area; and
- (b) it is sited so as to protect scenic views from public roads or reserves, and is not located on visually-significant ridgelines.

PDC 56. Buildings should be designed and sited to avoid creating extensive areas of uninterrupted walling facing areas exposed to public view.

PDC 57. Buildings should be designed to reduce their visual bulk and provide visual interest through design elements such as:

- (a) articulation;
- (b) colour and detailing;
- (c) small vertical and horizontal components;
- (d) design and placing of windows; and
- (e) variations to facades.

PDC 58. Where a building is sited on or close to a side boundary, the side boundary wall should be sited and limited in length and height to minimise:

- (a) the visual impact of the building as viewed from adjoining properties; and
- (b) overshadowing of adjoining properties and allow adequate sun light to neighbouring buildings.



- PDC 59.** Building form should not unreasonably restrict existing views available from neighbouring properties and public spaces.
- PDC 60.** Transportable buildings and buildings which are elevated on stumps, posts, piers, columns or the like, should have their suspended footings enclosed around the perimeter of the building with brickwork or timber, and the use of verandas, pergolas and other suitable architectural detailing to give the appearance of a permanent structure.
- PDC 61.** The external walls and roofs of buildings should not incorporate highly reflective materials that will result in glare.
- PDC 62.** Structures located on the roofs of buildings to house plant and equipment should form an integral part of the building design in relation to external finishes, shaping and colours.
- PDC 64.** Development should provide clearly recognisable links to adjoining areas and facilities.
- PDC 65.** Buildings, landscaping, paving and signage should have a coordinated appearance that maintains and enhances the visual attractiveness of the locality.
- PDC 66.** Development should be landscaped in a manner that:
- (a) visually screens unattractive buildings and enhances desirable views;
 - (b) screens car parking areas from pedestrian areas;
 - (c) provides shade, and softens the effect of large areas of paved surface;
 - (d) enhances privacy;
 - (e) creates a buffer between incompatible development; and
 - (f) integrates the elements of streetscape.
- PDC 69.** Development should be designed and sited so that outdoor storage, loading and service areas are screened from public view by an appropriate combination of built form, solid fencing and/or landscaping.
- PDC 70.** Trees, other vegetation and earth mounding should be retained or provided as part of the development where the environment will be visually improved by such a provision.
- PDC 71.** Development involving the use of materials or structures which are unsightly, or in a poorly-maintained or dilapidated condition, should not be undertaken.
- PDC 72.** Development having areas for storage of refuse, plant, equipment, machinery or materials, or car parking or service purposes should not be undertaken unless such areas are sited and suitably screened from view from public roads and adjoining allotments by fencing or landscaping
- PDC 73.** Outdoor lighting should not result in light spillage on adjacent land.
- PDC 75.** Development should take place in a manner which will minimise alteration to the existing land form.
- PDC 76.** Excavation and earthworks should take place in a manner that is not extensively visible from surrounding localities.
- PDC 77.** Driveways and access tracks to properties should be designed and constructed to blend sympathetically with the landscape and to minimise interference with natural vegetation and landforms.



PDC 78. Buildings or structures should be sited unobtrusively and be of a character and design which will blend naturally with the landscape.

PDC 79. No development should impair:

- (a) the natural character of the Mount Lofty Ranges; or
- (b) the skyline of the Mount Lofty Ranges.

PDC 80. Set-backs from allotment boundaries in townships and settled areas should achieve a satisfactory relationship with adjacent development and the streetscape. Adequate space for landscaping, where necessary should be provided.

PDC 81. The setback of buildings from public roads should:

- (a) be similar to, or compatible with, setbacks of buildings on adjoining land and other buildings in the locality, accepting that wind farms and ancillary development may need to be located closer to road boundaries;
- (b) contribute positively to the streetscape character of the locality; and
- (c) not result in or contribute to a detrimental impact upon the function, appearance or character of the locality.

Interface Between Land Uses

Objective 25: Development located and designed to prevent adverse impact and conflict between land uses.

Objective 26: Protect community health and amenity and support the operation of all desired land uses.

Principles of Development Control

PDC 87. Development should not detrimentally affect the amenity of the locality or cause unreasonable interference through any of the following:

- (a) the emission of effluent, odour, smoke, fumes, dust or other airborne pollutants;
- (b) noise;
- (c) vibration;
- (d) electrical interference;
- (e) light spill;
- (f) glare;
- (g) hours of operation; or
- (h) traffic impacts.

PDC 88. Development should be designed and sited to minimise negative impact on existing and potential future land uses considered appropriate in the locality.

PDC 89. Development adjacent to a Residential Zone or residential area within a Country Township, Service Centre or Settlement Zone should be designed to minimise overlooking and overshadowing of nearby residential properties.

PDC 91. Sensitive uses likely to conflict with the continuation of lawfully existing developments and land uses considered appropriate for the zone should not be developed or should be designed to minimise negative impacts.



Noise

- PDC 92.** Development should be designed, constructed and sited to minimise negative impacts of noise and to avoid unreasonable interference.
- PDC 93.** Development should be consistent with the relevant provisions in the current Environment Protection (Noise) Policy.

Rural Interface

- PDC 94.** The potential for adverse impacts resulting from rural development should be minimised by:
- (a) not locating horticulture or intensive animal keeping on land adjacent to townships; and
 - (b) maintaining an adequate separation distance between horticulture or intensive animal keeping and townships, other sensitive uses and, where desirable, other forms of primary production.
- PDC 95.** Traffic movement, spray drift, dust, noise, odour, and the use of frost fans and gas guns associated with primary production activities should not lead to unreasonable impact on adjacent land users.
- PDC 96.** Existing primary production uses and mineral extraction should not be prejudiced by the inappropriate encroachment of sensitive uses such as urban development.

Rural Development

- Objective 47:** Retention of rural areas for agricultural and pastoral purposes.
- Objective 48:** Maintenance of the character of rural areas.

Rural areas should be retained primarily for agricultural and pastoral purposes and horticultural use where natural resources such as groundwater supplies and surface catchments are not adversely affected. Conservation of bushland and wildlife are also important considerations. The design and siting of buildings in rural areas should be compatible with the object of conserving rural character.

The use of rural land for residential use should be discouraged because it diminishes rural character; makes the provision of public services uneconomic; increases land values with consequential upward pressure on rates and taxes; and contributes to land use conflicts which has the affect of limiting the right to farm.

The removal of primary production from rural areas also places greater dependence upon the diminishing fertile areas. It is in the community interest therefore as much agricultural land as possible be retained in primary production and without residential incursions other than where residential use is required to manage land.

Siting and Visibility

- Objective 50:** Protection of scenically attractive areas, particularly natural, rural and riverine landscapes.



Principles of Development Control

- PDC 155.** Development should be sited and designed to minimise its visual impact on:
- the natural, rural or heritage character of the area;
 - areas of high visual or scenic value, particularly rural and riverine areas;
 - views from the River Murray, public reserves, tourist routes, walking trails and scenic routes that are identified in [Map MiMu/1 \(Overlay 2\)](#).
- PDC 156.** Buildings should be sited in unobtrusive locations and, in particular, should:
- be grouped together; and
 - where possible be located in such a way as to be screened by existing vegetation when viewed from public roads and especially the River Murray.
- PDC 157.** Buildings outside of urban areas and in undulating landscapes should be sited in unobtrusive locations and in particular should be:
- sited below the ridgeline;
 - sited within valleys or behind spurs;
 - sited in such a way as to not be visible against the skyline when viewed from public roads, and the River Murray; and
 - set well back from public roads, particularly when the allotment is on the high side of the road.
- PDC 158.** Buildings and structures should be designed to minimise their visual impact in the landscape, in particular:
- the profile of buildings should be low and the rooflines should complement the natural form of the land;
 - the mass of buildings should be minimised by variations in wall and roof lines and by floor plans which complement the contours of the land; and
 - large eaves, verandahs and pergolas should be incorporated into designs so as to create shadowed areas that reduce the bulky appearance of buildings.
- PDC 159.** The nature of external surface materials of buildings should not detract from the visual character and amenity of the landscape.
- PDC 160.** The number of buildings and structures on land outside of urban areas should be limited to that necessary for the efficient management of the land.
- PDC 161.** Driveways and access tracks should be designed and surfaced to blend sympathetically with the landscape and to minimise interference with natural vegetation and landforms.
- PDC 162.** Development should be screened through the establishment of landscaping using locally indigenous plant species:
- around buildings and earthworks to provide a visual screen as well as shade in summer, and protection from prevailing winds;
 - along allotment boundaries to provide permanent screening of buildings and structures when viewed from adjoining properties and public roads; and
 - along the verges of new roads and access tracks to provide screening and minimise erosion.



Natural Resources

- Objective 51:** Native flora, fauna and ecosystems protected, retained, conserved and restored.
- Objective 52:** Restoration, expansion and linking of existing native vegetation to facilitate habitat corridors for ease of movement of fauna.
- Objective 53:** Minimal disturbance and modification of the natural landform.

Conservation

- Objective 54:** Conservation, preservation or enhancement of scenically attractive areas, including land adjoining water or scenic routes.
- Objective 55:** Preservation and replanting of roadside vegetation.
- Objective 56:** Preservation of natural vegetation of historic, local or particular visual significance.
- Objective 57:** Conservation of land, buildings, structures and other items of significant historical, social and architectural or other Aboriginal or European heritage significance.

The region contains buildings and sites of European historic and cultural interest, and Aboriginal burial grounds and camp sites important to the study of archaeology and anthropology. The area north of the Marne River contains examples of Aboriginal and early European settlement, and the eastern escarpment of the Mount Lofty Ranges, north of Palmer, contains sites of early settlement, historic relics and unusual granite tors. These and other geological sites should be protected for education and research purposes and to provide historic links with the past.

With the Murray River Valley are areas of outstanding importance for the conservation of wildlife and their habitats, wilderness areas and other areas of natural vegetation. They include sites of scientific, cultural, educational or historic importance, sites of former Aboriginal occupation, and land necessary to preserve the scenic attractiveness of the Murray Valley.

Other areas of conservation significance in the balance of the Council area are identified in Structure Plan (Map MiMu/1 (Overlay 2)) and Policy Areas. It is anticipated that additional areas on private and public land will be recognised over time.

- Objective 58:** Retention of environmentally-significant areas of native vegetation.

Retention of native vegetation where clearance is likely to lead to problems of: soil erosion; slip and salinisation; flooding; or a deterioration in the quality of surface waters is of particular importance.

Buildings and other structures and use of land undertaken in a manner which minimises the requirement to clear or remove native vegetation.



Fragmentation of homogenous areas of native vegetation through use of land or establishment of buildings should not occur.

Land division, including boundary re-arrangement, should not fragment native vegetation.

Retention and reinstatement of native vegetation including roadside vegetation for amenity purposes, for livestock shade and shelter and for the movement of native wildlife.

Principles of Development Control

PDC 163. Development liable to create significant adverse effects on natural features, areas of significant native vegetation, drainage systems, water catchments and storage areas, the River Murray or any associated water bodies, fragile land, scenic routes or scenically attractive areas, or areas of environmental significance, should not be undertaken. Development which produces strong organic, chemicals or other intractable waste should not be established in water catchment areas.

PDC 164. The natural character of rivers and creeks should be preserved.

PDC 165. Important natural resources including watercourses and water catchment areas, scenic areas and significant flora and fauna should be conserved and protected from development which would affect them adversely.

PDC 166. Development should not detract from the natural and rural landscape character of the region.

PDC 167. The nature, features and the character of areas and items, other than building development and vegetation, should be conserved which are of special:

- (a) historical (including archaeological and cultural) significance or heritage value;
- (b) scientific interest; or
- (c) scenic value or natural beauty.

Biodiversity and Native Vegetation

Principles of Development Control

PDC 168. Development should retain existing areas of native vegetation and where possible contribute to revegetation using locally indigenous plant species.

PDC 169. Development should be designed and sited to minimise the loss and disturbance of native flora and fauna.

PDC 170. The provision of services, including power, water, effluent and waste disposal, access roads and tracks should be sited on areas already cleared of native vegetation.



- PDC 171.** Native vegetation should be conserved and its conservation value and function not compromised by development if the native vegetation does any of the following:
- (a) provides an important habitat for wildlife or shade and shelter for livestock;
 - (b) has a high plant species diversity or includes rare, vulnerable or endangered plant species or plant associations and communities;
 - (c) provides an important seed bank for locally indigenous vegetation;
 - (d) has high amenity value and/or significantly contributes to the landscape quality of an area, including the screening of buildings and unsightly views;
 - (e) has high value as a remnant of vegetation associations characteristic of a district or region prior to extensive clearance for agriculture;
 - (f) is growing in, or is characteristically associated with a wetland environment.
- PDC 172.** Native vegetation should not be cleared if such clearing is likely to lead to, cause or exacerbate any of the following:
- (a) erosion or sediment within water catchments;
 - (b) decreased soil stability;
 - (c) soil or land slip;
 - (d) deterioration in the quality of water in a watercourse or surface water runoff;
 - (e) a local or regional salinity problem;
 - (f) the occurrence or intensity of local or regional flooding.
- PDC 173.** Development that proposes the clearance of native vegetation should address or consider the implications that removing the native vegetation will have on the following:
- (a) provision for linkages and wildlife corridors between significant areas of native vegetation;
 - (b) erosion along watercourses and the filtering of suspended solids and nutrients from run-off;
 - (c) the amenity of the locality;
 - (d) bushfire safety;
- PDC 174.** Where native vegetation is to be removed, it should be replaced in a suitable location on the site with locally indigenous vegetation to ensure that there is not a net loss of native vegetation and biodiversity.
- PDC 175.** Development should be located and occur in a manner which:
- (a) does not increase the potential for, or result in, the spread of pest plants, or the spread of any non-indigenous plants into areas of native vegetation or a conservation zone;
 - (b) avoids the degradation of remnant native vegetation by any other means including as a result of spray drift, compaction of soil, modification of surface water flows, pollution to groundwater or surface water or change to groundwater levels;
 - (c) incorporates a separation distance and/or buffer area to protect wildlife habitats and other features of nature conservation significance.
- PDC 176.** Development should promote the long-term conservation of vegetation by:



- (a) avoiding substantial structures, excavations, and filling of land in close proximity to the trunk of trees and beneath their canopies;
- (b) minimising impervious surfaces beneath the canopies of trees;
- (c) taking other effective and reasonable precautions to protect both vegetation and the integrity of structures and essential services.

- PDC 177.** No change of land use should occur in or near areas of native vegetation which is likely to adversely impact on the vegetation.
- PDC 178.** The provision of services, including power, water, effluent and waste disposal, access road and tracks should be effected over areas already cleared of native vegetation or, if this is not possible, cause the minimum interference or disturbance to native vegetation.
- PDC 179.** Land should not be divided, or allotment boundaries rearranged in a way which increases the number of allotments or part allotments over areas of native vegetation or adjoining areas of native vegetation, and which provides for development to occur without the need to clear native vegetation.
- PDC 180.** Development or change in land use which has the potential to damage or interfere with the hydrology or water regime of a swamp or wetland, or pollution of surface or groundwater, through its proximity of location or other reasons, should not occur.
- PDC 181.** Trees and other vegetation, including native flora and bushland remnants which are of:
- (a) special visual, historical, cultural or scientific significance or interest or heritage value;
 - (b) existing or possible future value in the screening of a building or unsightly views;
 - (c) existing or possible future value in the provision of shade or as a windbreak;
 - (d) existing or possible future value in the prevention of soil erosion;
 - (e) value as a habitat or feeding area for native fauna;
- should be conserved and their value and function not compromised by development.
- Design Techniques (Design Techniques illustrate ONE WAY of meeting the criteria in the associated principle of development control)*
- 181.1: *Vegetation within 10m of a watercourse should not be removed other than declared noxious species*
- 181.2: *Where noxious species join a watercourse and are removed it should not encourage erosion.*
- PDC 182.** Buildings and other structures should not be sited adjacent to native vegetation where such siting will necessitate the clearance of vegetation to ensure the safety of the proposed structure from fire hazard.
- PDC 183.** Development should not increase the potential for, or result in, pest plant infestation of areas of native vegetation.
- PDC 184.** Roadside vegetation should be preserved and replanted where practical.
- PDC 185.** Development should be undertaken so as to minimise excavation and filling of land.



- PDC 186.** Buildings requiring substantial earthworks which would be prominently visible from adjoining areas, or susceptible to erosion, should not be erected.
- PDC 187.** Development liable to impair the character or nature of buildings, relics and sites of heritage, archaeological, scientific or agricultural importance should not be undertaken.
- PDC 188.** Development adjacent to, or near, buildings of heritage, cultural, scientific or visual significance, should not be undertaken if it would significantly detract from the appearance of the building or the character of the locality.
- PDC 189.** Individual buildings or groups of buildings should be conserved and, where possible, restored which are of special:
- (a) architectural merit, significance or interest;
 - (b) visual interest;
 - (c) historical significance or heritage value; or
 - (d) scientific interest.
- PDC 230.** Development adjoining buildings, structures or sites of heritage significance should be visually compatible with that building, structure or site.

Water Resources

- Objective 59:** Retention, protection and restoration of the natural resources and environment.
- Objective 60:** Protection of the quality and quantity of South Australia's surface waters, including inland and underground waters.
- Objective 61:** The ecologically sustainable use of natural resources including water resources, including ground water, surface water and watercourses.
- Objective 62:** Natural hydrological systems and environmental flows reinstated, and maintained and enhanced.
- Objective 63:** Development consistent with the principles of water sensitive design.
- Objective 64:** Development sited and designed to:
- (a) protect natural ecological systems;
 - (b) achieve the sustainable use of water;
 - (c) protect water quality, including receiving waters;
 - (d) reduce runoff and peak flows and prevent the risk of downstream flooding;
 - (e) minimise demand on reticulated water supplies;
 - (f) maximise the harvest and use of stormwater; and
 - (g) protect stormwater from pollution sources.
- Objective 65:** Storage and use of stormwater which avoids adverse impact on public health and safety.



Objective 66: Water resources protected from excessive usage and pollution.

Principles of Development Control

- PDC 190.** Development should be undertaken with minimum impact on the natural environment, including air and water quality, land, soil, biodiversity, and scenically attractive areas.
- PDC 191.** Development should ensure that South Australia's natural assets, such as biodiversity, water and soil, are protected and enhanced.
- PDC 192.** Development should not significantly obstruct or adversely affect sensitive ecological areas such as creeks and wetlands.
- PDC 193.** Development should be appropriate to land capability and the protection and conservation of water resources and biodiversity.

Water Sensitive Design

- PDC 194.** Development should be designed to maximise conservation, minimise consumption and encourage re-use of water resources.
- PDC 196.** Development should be sited and designed to:
- (a) capture and re-use stormwater, where practical;
 - (b) minimise surface water runoff;
 - (c) prevent soil erosion and water pollution;
 - (d) protect and enhance natural water flows required to meet the needs of the natural environment;
 - (e) protect water quality by providing adequate separation distances from watercourses and other water bodies;
 - (f) not contribute to an increase in salinity levels;
 - (g) avoid the water logging of soil or the release of toxic elements; and
 - (h) maintain natural hydrological systems and not adversely affect:
 - (i) the quantity and quality of groundwater;
 - (ii) the depth and directional flow of groundwater; or
 - (iii) the quality and function of natural springs.
- PDC 197.** Water discharged from a developed site should:
- (a) be of a physical, chemical and biological condition equivalent to or better than its pre-developed state; and
 - (b) not exceed the rate of discharge from the site as it existed in pre-development conditions.
- PDC 198.** Development should include stormwater management systems to protect it from damage during a minimum of a 1 in 100 year average return interval flood.
- PDC 199.** Development should have adequate provision to control any stormwater over-flow run-off from the site and should be sited and designed to improve the quality of stormwater and minimise pollutant transfer to receiving waters.
- PDC 200.** Development should include stormwater management systems to mitigate peak flows and manage the rate and duration of stormwater discharges from the site to ensure the carrying capacities of downstream systems are not overloaded.



- PDC 201.** Development should include stormwater management systems to minimise the discharge of sediment, suspended solids, organic matter, nutrients, bacteria, litter and other contaminants to the stormwater system
- PDC 202.** Stormwater management systems should preserve natural drainage systems, including the associated environmental flows.
- PDC 203.** Stormwater management systems should:
- (a) maximise the potential for stormwater harvesting and re-use, either on-site or as close as practicable to the source; and
 - (b) utilise, but not be limited to, one or more of the following harvesting methods:
 - (i) the collection of roof water in tanks;
 - (ii) the discharge to open space, landscaping or garden areas, including strips adjacent to car parks;
 - (iii) the incorporation of detention and retention facilities; or
 - (iv) aquifer recharge.
- PDC 204.** Where it is not practicable to detain or dispose of stormwater on site, only clean stormwater runoff should enter the public stormwater drainage system.
- PDC 205.** Artificial wetland systems, including detention and retention basins, should be sited and designed to:
- (a) ensure public health and safety is protected; and
 - (b) minimise potential public health risks arising from the breeding of mosquitoes.

Water Catchment Areas

- PDC 206.** Development should ensure watercourses and their beds, banks, wetlands and floodplains are not damaged or modified and are retained in their natural state, except where modification is required for essential access or maintenance purposes.
- PDC 207.** No development should occur where its proximity to a swamp or wetland will damage or interfere with the hydrology or water regime of the swamp or wetland.
- PDC 208.** A wetland or low-lying area providing habitat for native flora and fauna should not be drained, except temporarily for essential management purposes to enhance environmental values.
- PDC 209.** Along watercourses, areas of remnant native vegetation, or areas prone to erosion, that are capable of natural regeneration should be fenced off to limit stock access.
- PDC 210.** Development such as cropping, intensive animal keeping, residential, tourism, industry and horticulture, that increases the amount of surface run-off should include a strip of land at least 20 metres wide measured from the top of existing banks on each side of a watercourse that is:
- (a) fenced to exclude livestock;



- (b) kept free of development, including structures, formal roadways or access ways for machinery or any other activity causing soil compaction or significant modification of the natural surface of the land; and
- (c) revegetated with indigenous vegetation comprising trees, shrubs and other groundcover plants to filter run-off so as to reduce the impacts on native aquatic ecosystems and to minimise soil loss eroding into the watercourse.

- PDC 211.** Development resulting in the depositing of an object or solid material in a watercourse or floodplain or the removal of bank and bed material should not:
- (a) adversely affect the migration of aquatic biota;
 - (b) adversely affect the natural flow regime;
 - (c) cause or contribute to water pollution;
 - (d) result in watercourse or bank erosion; or
 - (e) adversely affect native vegetation upstream or downstream that is growing in or adjacent to a watercourse.
- PDC 214.** Development should comply with the current Environment Protection (Water Quality) Policy.
- PDC 215.** Development liable to cause soil erosion or contribute to the silting of any watercourse should not be undertaken.
- PDC 216.** Development should take place in a manner which will not interfere with the utilisation, conservation or quality of water resources and protects the natural systems that contribute to natural improvements in water quality.
- PDC 217.** Development should not be undertaken unless all wastes produced can be managed so as to prevent pollution of surface or underground water resources or risk to health
- PDC 218.** Development involving alteration to natural drainage systems should not be undertaken unless there would be no adverse effects to existing vegetation within adjoining properties or roads, no increase in the risk of flooding of existing development or erosion downstream, and no detrimental hydrological effects.
- PDC 219.** Unsewered development outside of townships should be located at least 100 metres from the River Murray and/or other significant watercourses; development connected to a common effluent drainage scheme outside of township areas should not be located closer than 25 metres to any watercourse.

Hazards

- Objective 84:** Maintenance of the natural environment and systems by limiting development in areas susceptible to natural hazard risk.
- Objective 85:** Development located away from areas that are vulnerable to, and cannot be adequately and effectively protected from the risk of natural hazards.
- Objective 86:** Protection of human health and the environment wherever site contamination has been identified or suspected to have occurred.



Objective 87: Appropriate assessment and remediation of site contamination to ensure land is suitable for the proposed use and provides a safe and healthy living and working environment.

Objective 88: Minimisation of harm to life, property and the environment through appropriate location of development and appropriate storage, containment and handling of hazardous materials.

Principles of Development Control

PDC 371. Development should be excluded from areas that are vulnerable to, and cannot be adequately and effectively protected from, the risk of hazards.

PDC 372. There should not be any significant interference with natural processes in order to reduce the exposure of development to the risk of natural hazards.

PDC 373. Parts of the Mid Murray Council contain naturally occurring elevated concentrations of some chemical compounds in the soils due to local geological factors. Where this has been confirmed, the use and development of the land should be undertaken in accordance with the recommendations contained within the relevant Audit Report.

Flood Protection

Objective 89: Protection of life and property from the effects of flooding.

Development in floodplains of the River Murray Valley and Marne Valley increases the risk of both life and property. Areas known to be subject to occasional flooding should be kept free of new development or developed to protect property whilst development itself should not impede the flow of flood waters.

Objective 90: Prevention of development which could lead to a potential hazard in the event of a major flood.

Control of all development within floodplains is necessary to ensure that hazards are not created.

Principles of Development Control

PDC 220. Development should not occur on land where the risk of flooding is likely to be harmful to safety or damage property.

PDC 221. Development should not be undertaken in areas liable to inundation by drainage or flood waters unless the development can achieve all of the following:

- (a) it is developed with a public stormwater system capable of catering for a 1 in 100 year average return interval flood event;
- (b) buildings are designed and constructed to prevent the entry of floodwaters in a 1 in 100 year average return interval flood event.

PDC 222. Development, including earthworks associated with development, should not do any of the following:

- (a) impede the flow of floodwaters through the land or other surrounding land;



- (b) increase the potential hazard risk to public safety of persons during a flood event;
- (c) aggravate the potential for erosion or siltation or lead to the destruction of vegetation during a flood;
- (d) cause any adverse effect on the floodway function;
- (e) increase the risk of flooding of other land;
- (f) obstruct a watercourse.

Sloping Land

Objective 93: Development on sloping land designed to minimise environmental and visual impacts and protect soil stability and water quality.

Landslip

Principles of Development Control

PDC 377. Land that is at risk from landslip should not be developed.

PDC 378. Development in areas susceptible to landslip should:

- (a) incorporate split level designs to minimise cutting into the slope;
- (b) ensure that cut and fill and heights of faces are minimised;
- (c) ensure cut and fill is supported with engineered retaining walls or are battered to appropriate grades;
- (d) control any erosion that will increase the gradient of the slope and decrease stability;
- (e) ensure the siting and operation of an effluent drainage field does not contribute to landslip;
- (f) provide drainage measures to ensure surface stability is not compromised; and
- (g) ensure natural drainage lines are not obstructed.

PDC 379. Development, including associated cut and fill activities, should not lead to an increased danger from land surface instability or to the potential of landslip occurring on the site or on surrounding land.

PDC 380. Development on steep slopes should promote the retention and replanting of vegetation as a means of stabilising and reducing the possibility of surface movement or disturbance.

Sloping Land

PDC 381. Development and associated driveways and access tracks should be sited and designed to integrate with the natural topography of the land and minimise the need for earthworks.

PDC 382. Development and associated driveways and access tracks, including related earthworks, should be sited, designed and undertaken in a manner that:

- (a) minimises their visual impact;
- (b) reduces the bulk of the buildings and structures;
- (c) minimises the extent of cut and/or fill;



- (d) minimises the need for, and the height of, retaining walls;
- (e) does not cause or contribute to instability of any embankment or cutting;
- (f) avoids the silting of watercourses; and
- (g) protects development and its surrounds from erosion caused by water run-off.

PDC 383. Driveways and access tracks across sloping land should be accessible and have a safe, all-weather trafficable surface.

PDC 384. Development sites should not be at risk of landslip.

PDC 385. Development on steep land should include site drainage systems to minimise erosion and avoid adverse impacts on slope stability of the site and adjoining land.

PDC 386. Steep sloping sites in unsewered areas should not be developed unless the physical characteristics of the allotments enable the proper siting and operation of an effluent drainage field suitable for the development intended.

PDC 387. The cutting and/or filling of land outside townships and urban areas should:

- (a) be kept to a minimum and be limited to a maximum depth or height no greater than 1.5 metres so as to preserve the natural form of the land and the native vegetation;
- (b) only be undertaken in order to reduce the visual impact of buildings, including structures, or in order to construct water storage facilities for use on the allotment;
- (c) only be undertaken if the resultant slope can be stabilised to prevent erosion; and
- (d) result in stable scree slopes which are covered with top soil and landscaped so as to preserve and enhance the natural character or assist in the re-establishment of the natural character of the area.

Bushfire Protection

Bushfire Protection Objectives apply to the General, Medium and High Bushfire Risk areas shown on Bushfire Protection Area Figures MiMu(BPA)/1 to 9, except where exempted.

Objective 94: Development should minimise the threat and impact of bushfires on life and property while protecting the natural and rural character.

Objective 95: Buildings and the intensification of non-rural land uses directed away from areas of high bushfire risk.

Principles of Development Control

PDC 388. Buildings and structures should be located away from areas that pose an unacceptable bushfire risk as a result of one or more of the following:

- (a) vegetation cover comprising trees and/or shrubs;
- (b) poor access;
- (c) rugged terrain;
- (d) inability to provide an adequate building protection zone; or



- (e) inability to provide an adequate supply of water for fire-fighting purposes.

PDC 391. Buildings and structures should be designed and configured to reduce the impact of bushfire through using simple designs that reduce the potential for trapping burning debris against the building or structure, or between the ground and building floor level in the case of transportable buildings.

PDC 395. Development in a Bushfire Protection Area should be in accordance with those provisions of the Minister's Code: Undertaking development in Bushfire Protection Areas that are designated as mandatory for Development Plan Consent purposes.

Renewable Energy

Objective 96: Development of renewable energy facilities that benefit the environment, the community and the state.

Objective 97: The development of renewable energy facilities, such as wind farms and ancillary development, in areas that provide opportunity to harvest natural resources for the efficient generation of electricity.

Objective 98: Location, siting, design and operation of renewable energy facilities to avoid or minimise adverse impacts on the natural environment and other land uses.

Principle of Development Control

PDC 396. Renewable energy facilities, including wind farms and ancillary development, should be:

- (a) located in areas that maximize efficient generation and supply of electricity; and
- (b) designed and sited so as not to impact on the safety of water or air transport and the operation of ports, airfields and designated landing strips.

Wind Farms and Ancillary Developments

PDC 397. The visual impacts of wind farms and ancillary development (such as substations, maintenance sheds, access roads and wind monitoring masts) should be managed through:

- (a) wind turbine generators being:
 - (i) setback at least 1000 metres from non-associated (non-stakeholder) dwellings and tourist accommodation;
 - (ii) setback at least 2000 metres from defined and zoned township, settlement or urban areas (including deferred urban areas);
 - (iii) regularly spaced;
 - (iv) uniform in colour, size and shape and blade rotation direction;
 - (v) mounted on tubular towers (as opposed to lattice towers);
- (b) provision of vegetated buffers around substations, maintenance sheds and other ancillary structures



- PDC 398.** Wind farms and ancillary development should avoid or minimise the following impacts on nearby property owners/occupiers, road users and wildlife:
- (a) shadowing, flickering, reflection or glint;
 - (b) excessive noise;
 - (c) interference with television and radio signals and geographic positioning systems;
 - (d) interference with low altitude aircraft movements associated with agriculture;
 - (e) modification of vegetation, soils and habitats;
 - (f) striking of birds and bats.
- PDC 399.** Wind turbine generators should be setback from dwellings, tourist accommodation and frequently visited public places (such as viewing platforms) a distance that will ensure that failure does not present an unacceptable risk to safety.

Rural Living Zone - Objectives

- Objective 1:** A zone for detached dwellings on large allotments and associated compatible rural activities of a minor nature.
- Objective 2:** A zone which includes compatible business activities where nominated on structure plans.
- Objective 3:** Development adjacent to the Conservation Zone should not degrade the vegetation, wildlife, scientific or cultural value of land or water in that zone.

Desired Character

The predominant use in the zone is residential development on large allotments which are capable of supporting hobby rural activities such as animal keeping and horse keeping.

Development and use of land must give attention to land management to ensure land is not degraded or untidy, with tree planting around the perimeter of properties and buildings strongly encouraged.

Native vegetation should be maintained throughout the zone. There are currently limitations on access to reticulated water supply in many areas. All development should incorporate adequate rainwater catchment, ie roof area, and associated rainwater storage, to provide for domestic internal water use requirements, applicable to the locality.

The zone is distributed across sixteen separate locations namely: Mannum; Mannum North; Morgan; Truro; Tungkillo; Anna; Cadell; Cambrai; Marne Valley; Ruedigers; Sanderston; Swan Reach Environs; Swan Reach; Keyneton; Palmer and Section 80/83.

The following forms of development are acceptable in the Rural Living Zone:

- animal keeping in limited numbers on a non-commercial basis



- detached dwelling in accordance with specified standards
- land division in accordance with specified standards
- small-scale business activities where nominated

Sanderston

The Sanderston part of the zone follows the old stock routes and extends from the settlement of Sanderston to the boundary township of Cambrai.

The zone is at the interface of the Hills Face and Murray River and being only lightly treed. Visual issues associated with new development are of critical importance. These can be addressed by appropriate siting of development, minimising changes in land form and promoting extensive tree plantings. There are few large allotments, well above the medium size, which can be divided to a minimum size of 10 hectares.

Rural Living Zone - Principles of Development Control

Land Use

- PDC 1** The following forms of development are envisaged in the zone:
- animal keeping in limited numbers on a non-commercial basis
 - detached dwelling
 - domestic outbuildings in association with a detached dwelling
 - domestic structure
 - dwelling addition
 - farm
 - farm building
 - horse keeping in limited numbers on a non-commercial basis and associated stable or shelter
 - land division
 - small-scale business activities where nominated.
- PDC 2** Development should not be undertaken unless it is consistent with the desired character and envisaged forms of development for the zone.
- PDC 3** Development listed as non-complying is generally inappropriate.
- PDC 4** Development should be primarily detached dwellings and associated rural activities of a minor nature, with the maximum of one dwelling per allotment.
- PDC 5** No commercial or industrial development should be undertaken in the zone apart from minor additions to existing uses at Morgan. Any expansion of existing uses should only occur where the uses:
- (a) would not adversely affect residential amenity
 - (b) are associated with an existing residential use of land in question; and
 - (c) do not operate after 7pm or before 7am.

Form and Character



- PDC 9** Buildings and structures should be located in unobtrusive locations and in particular should:
- (a) be set-back from public roads;
 - (b) be located in such a way as to maximise the retention of existing native vegetation;
 - (c) have external materials with surfaces of a low light reflective nature (not zincalume or similar material); and
 - (d) be of natural colours so as to be unobtrusive, blend with the rural landscape and minimise visual intrusion.
- PDC 10** Development should retain existing areas of native vegetation and where possible contribute to revegetation using locally indigenous plant species.
- PDC 11** Any development that results in the clearance of regenerating vegetation should incorporate the provision of a Significant Environmental Benefit to offset the loss of vegetation.
- PDC 12** Local indigenous plant species should be planted along property boundaries and around dwellings and structures.
- PDC 22** Sheds, garages, and similar outbuildings should be limited to a combined total area of **200 square metres**.
- PDC 27** The erection of dwellings, alterations and additions to an existing dwelling and land division shall conform with the following criteria:
- (a) will not be located in areas subject to inundation by a 100 year return period flood event or sited on land fill which would interfere with the flow of such flood waters;
 - (b) will be connected to an approved sewerage or common effluent disposal scheme or has an on-site waste water treatment and disposal method which complies with the Standard for the Installation and Operation of Septic Tank Systems in South Australia (including supplements A and B) as prepared by the South Australia Health Commission;
 - (c) will not have any part of a septic tank effluent drainage field or any other waste water disposal area (eg irrigation area) located within 50 metres of a bore, well or watercourse where a watercourse is identified as:
 - (i) a blue line on a current series Government Standard topographic map; or
 - (ii) any river, stream, creek or channel in which water is contained or flows permanently, intermittently or occasionally; or
 - (d) will not have a waste water disposal area located on any land with a slope greater than 20 percent (1 in 5), or depth to bedrock or seasonal or permanent watertable less than 1.2 metres; and
 - (e) will not have a septic tank or any other waste water treatment facility located on land likely to be inundated by a 10-year return period flood event.

Land Division

- PDC 28** Allotments proposed by land division should be in accordance with the following standards:...
- Sanderston 10 hectares



Procedural Matters

Non-complying Development

Land division which would result in the creation of allotments less than the allotment sizes specified in Principle 28, or no additional allotments where that is specified in Principle 29

More than one dwelling on an allotment

Industry, except for minor additions to existing development at Morgan

3. Landscape and Visual Impact Assessment

3.1 Overview

A landscape character and visual impact assessment has been undertaken to assess the potential visual impact of the proposed Palmer Wind Farm and its associated infrastructure elements. The Report by WAX & BGLA contains a detailed account of the methodology used, the assessment findings and photomontages used to evaluate impact.

For ease of reference the full Report is contained in Volume 4 of this Application Package.

It is recognised that infrastructure of any reasonable scale is difficult to manage from a visual impact perspective. A key consideration is whether the existing landscape has the capacity to 'absorb' the effect and where it cannot, whether the ultimate visual impact is acceptable, having regard to a range of outcomes.

In addition to this, whilst the approach to visual assessment is based on a methodical assessment process, it is highlighted that different individuals may have different views about the potential visual impact: *"The degree of viewer sensitivity remains the personal preference of the viewer, as to whether the visual changes is positive or negative"*.

All individuals will have a view regarding the matter of visual impact. The aim of this assessment is to provide a greater degree of quantitative measurement about the potential visual effect relative to the current landscape character and having regard to broad community values.

A more quantitative approach is provided to assist the Development Assessment Panel with an on-balance assessment. The visual assessment was undertaken independently by two highly experienced and well regarded individuals: Warwick Keates and Dr Brett Grimm using a methodology that has been developed to specifically aid in the evaluation of wind farm and infrastructure developments.

It is important to note that the Landscape and Visual Impact Assessment process was undertaken in two key stages. An initial assessment based on an early layout, which then led to a number modifications to the final layout as presented in this Development Application.

3.2 Assessment Methodology

The Report describes the general and specific aspects of the methodology used to undertake the assessment. The methodology was also developed having regard to key policy documents, relevant research and recognised best practice guides.

The visual assessment included an overview of the landscapes of the surrounding area at local, sub-regional and regional scales in order to provide a context for the assessment. The evaluation considers the probable visual effect and degree of visual change that will occur. Consideration was also given to the broad community values placed on these landscapes.

This then provided a basis upon which the evaluation of the suitability of the development was made using photomontages. The report describes in detail how the turbine locations and dimensions as well as landscape features were "plotted" for accuracy.

Criteria were then used to qualify the landscape character and measure the visual effect. This lead to recommendations to modify the layout or to remove turbines.

The final Report includes a final assessment based on the final layout (i.e. that presented in this application).

3.3 Key Findings and Recommendations

As indicated above, this assessment was undertaken in a number of stages. The table contained in section 5.2.2 identifies the quantum of change that occurred as the project was refined in response to the advice from the specialist consultants. This table highlights the changes that were made in response to visual impact consideration as well as others that arose.

In particular the report notes (5.2.3):

The revised proposal of 122 turbines (Palmer layout 5.5) has considered a number of variables such as noise, flora and fauna, economic feasibility and visual impact to determine the preferred layout. Comparing the original turbine layout with the proposed 122 turbine layout, it is evident that the visual effect has been reduced specifically surrounding Harrison's Gorge and from views from the Murray Plains towards the escarpment and the set back of wind turbines on the existing landform of the eastern escarpment.

It is also noted that:

- The final layout of 114 WTG and the separation of the turbines into three clusters provides additional visual mitigation;
- The overall degree of visual change was predominately described as moderate, mainly because surrounding rural landscape has reasonable capacity to accommodate development due to the existing agricultural context and presence of existing infrastructure;
- However, the visual effect around Harrison Gorge is assessed to be higher than moderate mainly due to the visual amenity of the gorge and the sensitivity of this particular landscape to visual change. The introduction of wind turbines in this particular landscape area increases the potential for visual contrast, in turn increasing the degree of visual change and potential for an adverse visual effect.
- Consideration was given to the visual impacts of the overhead transmission lines. The 33kV lines were considered to have little appreciable impact due to their size and scale and the presence of other similar infrastructure. The 275kV was similarly considered to have little impact, again due to the presence of other similar infrastructure. Although some localised impacts is possible depending on the detailed siting arrangements.

With respect to **Landscape and Visual impact** it was concluded that the proposed wind farm, for the majority of the regional landscape, is likely to be experienced as a moderate visual effect. Areas of potential substantial effect were identified, particularly around Harrison Gorge, where the turbine layout was refined and number of turbines removed to minimise impacts. These visually effected locations remain defined within well contained topographic landscapes where views of the wider wind farm are often partially or completely screened.

3.4 Agreed Impact Management Response

- The final wind farm layout will ensure no non-involved landholder dwellings, existing at the time of lodgment of this Development Application, are located within 1km from a turbine (in accordance with Council Wide PDC 397(a)(i) of the Mid Murray Development Plan).
- Minimise the extent of cut and fill requirements for access roads by following natural contours and tops of ridgelines where practicable.
- As far as possible source road materials locally to blend with existing landscape.
- Re-vegetate temporary construction facilities as soon as practical after construction completion.
- Plant vegetation screening around the permanent Substation and Operations & Maintenance Compound.
- Avoid use of advertising, signs or logos mounted on turbine structures, except those required for safety purposes.
- Turbines must be within approved turbine corridors and spaced in an ellipse of no less than three times the rotor diameter by two times the rotor diameter. The ellipse will be oriented into the predominant wind direction.



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4. Flora and Fauna Assessment

4.1 Overview

EBS Ecology undertook a detailed assessment of the potential ecological impacts of the proposed wind farm and associated facilities. Their full report is provided in Volume 4. The specific objectives of the assessment were to:

- Identify and map vegetation communities within surveyed corridors;
- Identify and map the extent and significance of fauna habitat, including targeted specific survey for bird and bat species;
- Identify species of national, state or local conservation significance known or likely to occur in the area and details on possible impacts;
- Identify areas of conservation value, including areas of high biodiversity value;
- Identify pest plants and animals; and
- Provide recommendations to mitigate potential ecological impacts, including managing areas of sensitivity and appropriate buffer distances.

The full report is contained in Volume 4, Appendix B to enable easier cross referencing.

This assessment has provided guidance to the project at three key levels:

- Initial investigations and survey results identified areas that should be avoided, relative to the nature of the impact posed by the project element, in order to avoid impacts;
- Identification of areas within which greater siting care is needed at the detailed design and siting stage to avoid impacts; and
- Techniques to be used to manage impacts.

4.2 Assessment Methodology

EBS Ecology undertook their assessment using a number of research techniques including:

- A desktop - A search and review of relevant National and State level databases/datasets, relevant reports/plans/policies and aerial photography.
- An assessment of the likely occurrence of threatened species.
- Field Survey Work – on-ground vegetation survey of corridors and targeted fauna survey.

The aim of this work was to identify the presence of threatened species, map the locations of vegetation of value (species and habitat) and provide a basis upon which to evaluate the likely impact of the proposed wind farm development.

As with the other impact assessment processes, EBS Ecology initially based their investigations on the corridors identified for the early draft layout of 130 turbines. The initial findings highlighted locations that needed to be avoided because they contained threatened species or habitat areas of value or posed a risk to fauna.

These recommendations were then taken into consideration as the layout was refined to produce the layout presented in this application.

The Executive Summary of the EBS report provides an overview of the key findings that relate to the wind farm layout proposed in this application.

4.3 Key Findings and Recommendations

The EBS Ecology study did identify matters for further consideration related to a number of locations proposed for infrastructure in the initial layout. These have been resolved through the redesign of the turbine layout and infrastructure corridors or through recommendations as to how a number of matters can be resolved at the detailed siting stage and during the construction and operation phases. These included:

- Avoiding woodland habitats;
- Avoiding scattered trees (including dead trees);
- Avoiding, as a priority, areas identified as Threatened Ecological Communities (or potential Threatened Ecological Communities), listed species and/or areas of significance;
- Avoiding, where practical, preferred fauna habitat including riparian habitats and rocky outcrops. These areas are generally in the valleys and therefore are avoided because the turbines and associated infrastructure are focused on the ridge tops;
- Providing a 500 m buffer between turbines and known Wedge-tailed Eagle nests;
- Providing a 1000 m buffer between turbines and known nesting sites for Peregrine Falcons;
- Manage the potential impact of construction activity near nesting sites during the relevant seasonal period; and
- Utilising existing tracks where possible.

A number of matters will require resolution at the detailed siting stage and during the construction and operation phases. These matters are summarised below.

Native Vegetation & Flora

While the majority of the project will be located within grazing land with minimal or no native vegetation component, clearance of native vegetation will be required in a number of specific locations. A large proportion of this is considered to be in poor or moderate condition although approximately 36% of clearance relates to vegetation assessed as in good or excellent condition.

Applications will need to be made under the Native Vegetation Act and the EPBC Act to address the specific approach to detailed avoidance and management techniques and native vegetation clearance and offset approvals. These applications will need to be made when the detailed layout is produced and the impacts or avoidance/management techniques can be more specifically defined for the specific sites. As noted within the EBS report, there are three locations of potential EPBC, Category B, Lomandra grass sites that will require confirmation prior to the final site design. Should these be highlighted as Category B and are not practicably able to be avoided, the necessary EPBC referral will include this.

Fauna

A number of species of importance were identified including several bird species including several Peregrine Falcons and Wedge-tailed Eagles which were recorded as nesting or having nested in the project area. Recommendations were made to avoid impacts on these species in particular by applying a buffer around all recorded nests to achieve a suitable separation from any wind turbine generators. These buffers have been achieved with the layout proposed in this application but the buffers will also be applied to any subsequent final layout.

Conclusions

The EBS report concludes that “Provided the recommendations within this report are embedded into the final design of the wind farm, the scale of impact in relation to flora and fauna is expected to be minor and localised”.

4.4 Agreed Impact Management Response

The buffers and avoidance measures recommended by EBS have been achieved with the layout proposed in this application. However, these and additional recommendations will also be applied to any subsequent detailed layout considerations.

Trustpower have agreed to commit to the following actions in the next stages of the project:

- An EPBC referral will be lodged and approval secured (if required) prior to construction for Lomandra Grassland.
- A clearance approval will be obtained from the Native Vegetation Council for any native vegetation clearance and associated offset plans for the final layout prior to construction.
- A Weed and pest management plan and Site rehabilitation plan will be prepared and approved prior to construction.
- Develop an internal reporting system for any potential bird strikes at the Palmer Wind Farm.
- Where construction activities are planned within 500 and 1000 m of known Wedge-tailed Eagle and Peregrine Falcon nests respectively during their peak breeding seasons, nest checks should be employed to determine their breeding status and if necessary buffers put in place or specific management strategies implemented to minimise any potential impact on the breeding success of these birds.
- A 1000 m buffer will be maintained around all recorded Peregrine Falcon nests for all wind turbine generators.
- A 500 m buffer will be maintained around all recorded Wedge-tailed Eagle nests for all wind turbine generators.
- Use existing access tracks where possible to minimise additional disturbance.
- Minimise clearance of significant native vegetation as a principle of the detailed layout planning stage and the miro-siting stage where complete avoidance is not possible.
- Undertake additional detailed surveys in Areas A and C at the detailed layout stage where EBS have proposed alternative access routes in order to minimise impact on sensitive vegetation should this be confirmed as such.
- Consult and collaborate with horse riding clubs and/or enthusiasts prior to construction to accommodate current agreements with host landowners for riding activities, including consideration of the existing trails or assistance towards alternative routes as required. This will be subject to standard site health and safety considerations.
- Consider horse familiarisation events to assist with overcoming any short term concerns for horses and assist with the familiarisation of with the sound and movements of turbines, subject to standard site health and safety considerations.



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5. Noise Impact Assessment

5.1 Overview

Noise impact estimates have been a significant guiding design consideration for the development of the project concept and turbine layout. Sonus have provided advice on the layout of the proposed wind farm in order to minimise noise impacts and ensure compliance with the 2009 South Australian *Wind farms environmental noise guidelines* (SA Guidelines). The initial advice provided by Sonus lead to the following responses including:

- Ensuring that turbines were located far enough away from residences to meet the noise level criteria; and
- In one case, reaching an agreement that a current residence owned by a host landowner will be vacated and remain unoccupied for the life of the project should the wind farm noise level at the residence be above 45dB(A)..

A final Environmental Noise Assessment was undertaken by Sonus for the final layout as proposed in this Development Application and is included in full in Volume 4, Appendix 3.

It should be noted that the noise assessment was based on existing, approved and occupied dwellings. This excluded abandoned dwellings (e.g. ruins). It has not considered any applications that have been lodged but not yet determined.

The noise assessment was conducted in parallel with a process of landowner negotiation. Those landowners that are participating in the project acknowledge that the modeled noise levels could be higher (but not exceeding the relevant criteria) than that for non-participating dwellings due to their proximity to the wind farm.

5.2 Assessment Methodology

There are very well documented and accepted procedures for undertaking noise impact assessments. There are also well established approaches to how noise is measured, modeled and evaluated.

In principle noise assessments:

- Are guided by the policies and approaches set out by the regulators (eg the EPA and the World Health Organisation);
- Are based on real measurements of the noise levels that exist in the subject location;
- Are modeled using assumptions that include 'worst-case' consideration; and
- Use programs and technology that are well understood by the specialists.

In this case the assessment undertaken by Sonus has been made in accordance with the SA Guidelines.

Background noise monitoring was undertaken at 16 locations in the vicinity of the project site. Noise predictions were then made for all residences located within approximately 3km from the wind farm.

In Chapter 6, the report also covers a number of specific issues of interest to the wider community (e.g. impacts on animals, infrasound etc.)

5.3 Key Findings and Recommendations

The Sonus report (pg 10) identified that the applicable noise criteria for the project should seek to achieve the following noise limits:

Table 3.1: Applicable noise requirements.

Landowners	Zone	Noise Criteria
Without commercial agreement	Rural Living (Sanderston)	35 dB(A), <i>or</i> background noise (L _{A90,10}) plus 5 dB(A), <u>whichever is greater.</u>
	Rural	40 dB(A), <i>or</i> background noise (L _{A90,10}) plus 5 dB(A), <u>whichever is greater.</u>
With commercial agreement	Any	45 dB(A), <i>or</i> background noise (L _{A90,10}) plus 5 dB(A), <u>whichever is greater.</u>

It is noted that the rural living zone criteria have also been applied at the boundary of vacant land (of non-involved landowners) for this assessment in accordance with the SA Guidelines.

It then modelled the noise predictions and confirmed that the wind farm Layout 7.0 would not exceed the noise criteria stated above.

More specifically it concluded (pg 35):

- *Based on the assessment, the predicted noise levels achieve the requirements of the SA Guidelines at all relevant locations;*
- *Based on above, it is considered that the proposed wind farm will meet the relevant noise provisions of the Mid Murray Council Development Plan; and*
- *Should the proposal gain approval, an assessment of the final turbine selection will be made by Trustpower to ensure that the proposal will comply with the SA Guidelines.*

It is important to note that the noise compliance is based on the assumptions that commercial agreements are in place with all landholders listed as involved landholders. The house identified as R139 on Plan 3 (near turbine 110) is excluded from the noise compliance criteria in the noise assessment report on the basis that an agreement will be in place with the landholder for the structure not to be used as a residence for the life-time of the project should the wind farm noise level at the residence be above 45dB(A)..

Evidence of commercial arrangements with all dwellings categorised as involved landholders will be provided to the Mid Murray Council together with a final noise assessment report prior to construction to confirm noise compliance for the final layout.

Further it recommended the preparation of an Operational Noise Management Plan to establish a testing methodology (to ensure the noise criteria are achieved post construction), an action plan (should the noise levels be exceeded) and a complaint response plan.

The Sonus Report also acknowledged the issue of noise and vibration occurring during construction. It recommended the preparation of a Construction Noise and Vibration Management Plan to provide for a consultation and complaint assessment process for the duration of the construction phase.

5.4 Agreed Impact Management Response

Trustpower have agreed to implement the following as recommended by Sonus:

- A final noise assessment will be undertaken on the final turbine selected and wind farm layout to ensure that it complies with the required SA EPA noise criteria for wind farms.
- Confirmation of commercial arrangements with houses listed as involved landholders will be provided to the Council prior to construction commencement.
- Ensure final turbine selection and layout complies with the World Health Organisation Guidelines for Community Noise requiring 45 dB(A) or background plus 5 dB(A) (whichever is higher) for all involved residential receivers who have entered into a noise agreement with Trustpower in accordance with the SA EPA Noise Guidelines.
- A final Construction, Vibration and Operational Noise Management Plan will be prepared and approved prior to construction (draft contained in Appendix B).
- An Operational Noise Management Plan will be finalised and approved prior to operation (draft contained in Appendix B).
- Include the following in the noise management plans:
 - Develop and implement an operational noise compliance testing program in accordance with the SA EPA noise guidelines;
 - Develop a complaints response procedure in relation to any noise complaints as a result of the operation of the wind farm;
 - Locate fixed noise sources such as crushing plant at the maximum practical distance from the nearest dwellings and where possible use existing landforms to block line of sight between equipment and the dwelling; and
 - Implement a community consultation process to ensure adequate community awareness and notice of expected construction noise.
- Construction hours will be limited to Monday to Saturday between 7am and 7pm. Works carried out outside of the hours will only entail:
 - works that do not cause noise emissions which exceed the noise limits of SA Policy at any nearby dwelling not associated with the project; or
 - the delivery of materials as requested by Police or other authorities for safety reasons; or
 - emergency work to avoid the loss of lives, property, and/or to prevent environmental harm; or
 - works with the prior consent of the Environment Protection Authority (EPA) (an example might be occasional concrete pours on hot days).



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6. Cultural Heritage Assessment

6.1 Overview

The assessment of cultural heritage issues has focused on two key areas of consideration:

- Aboriginal Heritage.
- Historical cultural Heritage.

The protection of Aboriginal Heritage is primarily addressed by the *Aboriginal Heritage Act 1988* which includes a 'duty of care' responsibility to address the likelihood of undertaking an activity that may impact on heritage. It is important to note that a number of new unregistered Aboriginal sites have been identified through extensive on-ground surveys with the traditional community representatives (MACAI) and the cultural heritage consultants. Various mitigation and avoidance measures have been agreed under a separate Aboriginal Work Area Survey and Clearance agreement between MACAI and Trustpower. Under the confidentiality restrictions of this agreement, the exact locations of the additional sites found cannot be disclosed publically. However, the locations have been provided to Trustpower with agreement to avoid any impacts through agreed exclusion areas.

The on ground Aboriginal heritage surveys are still underway and are likely to continue with agreement from MACAI but a preliminary report of the findings is provided in this section. A final survey report will be submitted to Council once all surveys have been completed.

Natural and historical cultural heritage is addressed by a range of other legislation identified in the report. No specific items or places of heritage value are likely to be directly affected by the project.

Notwithstanding the legislative requirements, Trustpower also acknowledges that the dry stone walls that occur across part of the project area are a special, localised feature. It is proposed that where possible the detailed design process will aim to avoid these walls. If this is not possible then strategies will be implemented to minimise any potential impact.

6.2 Assessment Methodology

Australian Cultural Heritage Management Pty Ltd (ACHM) was initially engaged by Trustpower Australia (Trustpower) to undertake a desktop assessment of the Palmer Wind Farm proposal.

The desk top study found 88 recorded sites of Aboriginal or historical heritage within close proximity of the project. At that time it was the opinion of the ACHM that there was moderate to high potential for the project area to contain Aboriginal heritage sites but a low potential for it to contain historical heritage sites.

This led to the commencement of a series of anthropological and archaeological surveys within the project corridors. These surveys are still underway and will continue as needed and in response to any detailed design requirements. The surveys have identified a number of sites of interest.

Those that relate to Aboriginal Heritage are protected by the Aboriginal Heritage Act 1988. Additional historical heritage sites were also identified and recorded including dry stone walls, other dry stone structures and an old homestead ruin. Camel Hump road was also identified as having social value for the Palmer community.

Consultation

The Palmer Wind Farm location is within the traditional lands of the Peramangk Aboriginal group. The Peramangk Aboriginal group does not have a native title claim lodged over its asserted traditional land and is represented for heritage matters by the Mannum Aboriginal Community Association Incorporated (MACAI).

Detailed site surveys conducted with MACAI and ACHM identified a number of unregistered sites and areas of sensitivity. Appropriate management and impact mitigation measures have been agreed with MACAI, including avoiding disturbing any sites in excluded areas and agreed locations for construction monitoring of any earthworks.

Consultation has also occurred with the Dry Stone Wall Association in order to identify a detailed approach to avoiding or managing any potential impacts. The key issue will be the detailed approach to the design and location of access tracks. The ACHM Report contains recommendations with respect to how impact could be avoided or minimised.

6.3 Key Findings

The on-ground surveys identified a number of sites of Aboriginal significance. These are protected under the *Aboriginal Heritage Act* and will not be disturbed by the project. Trustpower will continue to work with ACHM and MACAI to manage these sites via an agreed process and in accordance with the Act.

While there are recorded places nearby, the site of the Palmer Wind Farm does not contain places of historical heritage significance that require protection under either the Development Act or other historical heritage legislation or convention.

Notwithstanding this, there are places of community heritage value (not listed) which may be important in the context of general landscape and amenity values, including the dry stone walls. There is potential to avoid or minimise impact on these places through detailed design, careful siting and agreed management responses.

6.4 Agreed Impact Management Response

Trustpower have agreed to undertake the following:

- Ensure where necessary all areas of infrastructure in the final layout have been surveyed prior to construction and compliance with impact mitigation measures agreed with the traditional owners (MACAI), such as construction monitoring where requested;
- Avoid impacting on or disturbing any registered or newly identified Aboriginal sites in accordance with the Aboriginal Heritage Act and agreement with MACAI;
- Work with the MACAI to agree and subsequently manage potential issues during the construction phase;
- Comply with the Aboriginal site discovery procedure provided in the Heritage Assessment report if Aboriginal sites, objects or remains are discovered during works in the Project Area;
- Prior to work commencing, construction workers on the project will be given appropriate cultural heritage awareness training in consultation with MACAI;
- All on site workers should remain within the project footprint at all times and avoid going into nearby gullies and rocky outcrops outside of the project footprint wherever possible as these are likely to contain Aboriginal heritage sites;

- Utilise as much as possible existing access tracks and avoid any disturbance or development in the gullies between hills. Wherever possible, access tracks should keep to the crest or upper slopes of the hills within the project area; and
- Avoid impacts on the dry stone walls, where possible. If impacts cannot be avoided, to limit and mitigate these impacts in consultation with the Dry Stone Wall Association (e.g. use damaged areas, minimise the access road width).



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7. Traffic Impact Assessment

7.1 Overview

The key objective of the Traffic Impact Assessment was to determine:

- That access can be achieved (identifying major up-grades where these are needed).
- The most appropriate access arrangements for both the project construction phase and the on-going operational phase (maintenance access).

Due to the size and weight of the turbine parts, the analysis of construction access arrangements is particularly important in order to ensure that safety and design considerations can be addressed.

However, the detailed arrangements cannot be fully defined until more detailed technical information is available about the construction approach.

Both Council (for Council owned roads) and DPTI (for State owned roads) play a role in evaluating and approving/agreeing the detailed approach. Council and DPTI place an emphasis in making sure the access arrangements are safe by stipulating the routes to be used and requiring roads/intersections to be up-graded where necessary. They will also require that road pavements are resurfaced after construction where they have suffered wear and tear from the heavy loads.

The common approach is to undertake the initial traffic impact assessment, seek Provisional Development Plan Consent and then undertake detailed discussions and negotiations with Council and DPTI. In this case Trustpower have already commended a more detailed review process with Council on the matter of access. As part of this process it is likely that more detailed issues will be addressed and agreed that may differ from this initial impact assessment report.

7.2 Assessment Methodology

The traffic impact assessment has undertaken a review of the issues associated with the project having regard to:

- The existing conditions including the nature of the locality and the relevant road network arrangements;
- The transport requirements of the project including the nature of the project and its activities, Council and DPTI issues, possible access arrangements;
- A traffic impact assessment to identify the likely traffic to be generated both for the construction phase and on an on-going basis;
- The potential for traffic and transport impacts on the surrounding road network (taking into account the matters identified in the previous stages of the assessment); and
- Any management and mitigation measures that may be available.

While the study gave consideration to the identification of feasible routes, the final choice of routes will need to be determined as part of the detailed construction phase planning. This will also need to be agreed by Council , DPTI and potentially other state jurisdictions.

7.3 Key Findings

The assessment process found that:

- The most significant impact on traffic will be during the construction phase;
- No major impacts are expected post construction as the access requirements will be minimal;
- The surrounding network is capable of providing access, although works are likely to be required to up-grade the road infrastructure to support access in various locations;
- The overall impacts and disturbance to infrastructure and other road users will need to be managed via an agreed Traffic Management Plan and Environmental Management Plan (traffic related); and
- There will be a need to undertake a heavy vehicle assessment in accord with DPTI requirements.

7.4 Agreed Impact Management Response

Trustpower have agreed to undertake the following:

- In consultation with the Council, DPTI and any other relevant agency, develop a final Traffic Management Plan (construction and operational) to manage the overall impacts and disturbance to infrastructure and other road users during the construction and ongoing operation phases of the project, including any special safety considerations for historic traffic hot spot areas and impact mitigation measures for residential dwellings along proposed public access routes;
- Implement a thorough public notification and complaints process for advance notifications of anticipated construction and over dimensional traffic; and
- Enter into a commercial Deed of Agreement with Council on any Council road upgrade and or ongoing maintenance contributions by Trustpower prior to construction commencement.



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Traffic Impact
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Trustpower
Palmer Wind Farm Traffic
Impact Assessment

August 2014

Executive Summary

Project Overview

Trustpower Australia is investigating the potential for a wind farm development in the Mid Murray Council area located on the ranges between the settlements of Palmer, Tungkillo and Sanderston.

This site is approximately 30 km long along the ridgelines on roughly 10,000 hectares and has been selected due to the excellent wind energy potential and its close proximity to the Tungkillo substation.

The proposed project will include up to 114 turbines. Each turbine will be up to a tip height of 165 m, with an approximate installed capacity of up to 375 MW. The turbines will be connected by underground and overhead electrical cables to an on-site substation.

The current layout has three distinct clusters (Northern, Central and Southern) of turbines.

This Traffic Impact Assessment is one of several key technical studies that have been carried out in preparation of the development application and details the principal impacts of the transport related activities associated with the development.

The key issue with regard to traffic and transport relate to the impacts likely to arise from the additional vehicles accessing the proposed wind farm site both during its construction and operation. Particular consideration has been given to the transportation of the proposed wind farm components (including nacelles, hubs, blades, modularised tower sections and substation transformers) on account of the size and weight of these components during the 18 to 24 month construction period. A large proportion of equipment associated with the proposed wind farm will exceed South Australia's (and the majority of states throughout Australia) over mass and over dimensional vehicle limits and will therefore require special permits for transport.

Surrounding Road Network

The key roads surrounding the proposed wind farm site include the following:

- Minor Roads / Access Tracks – There are a number of minor roads surrounding each proposed cluster of turbines. These roads are generally unsealed gravel roads with a cross-section width that varies between 4 m to 6 m. The majority of these local access roads are not suitable for two-way heavy vehicle traffic, however roads accessing the proposed turbine locations will be upgraded where required to improve safety and accessibility.
- Regional / Local Collector Roads – Including Birdwood Road, Mount Pleasant-Kyneton Road, Angas Valley Road, Milendella Road, Ridley Road, Randell Road; and Adelaide-Mannum Road. These roads are two-lane two way sealed roads with a typical speed limit of 100 km/h., with the exception of townships where speed limits are generally reduced to 50 km/hr. Mount Pleasant-Kyneton Road, Birdwood Road, Walker Flat-Mount Pleasant Road and Adelaide-Mannum Road/Randell Road all have significant bends or grades along these roads that may cause difficulties for the transport of the proposed wind farm equipment during construction. Randell Road, Ridley Road, Milendella Road and a section of Walker Flat-Mount Pleasant Road are currently designated as general B Double freight routes making them the most suitable roads for accessing the proposed wind farm site during construction.

- Highways / Major Roads – Including the South Eastern Freeway, Sturt Highway and Dukes Highway. All are currently designated as a key B Double freight routes, as well as a principal routes for over mass and over dimensional loads. These highways and major roads are primarily single carriageway, but with frequent overtaking lanes along the route.

Site Access Routes

All road routes from Adelaide and / or Melbourne are primarily either National Highways or State Roads and, subject to statutory permit conditions, can accommodate the proposed wind farm related over dimensional and over mass vehicles.

While this study has given consideration to feasible road transport routes, the final choice of route is dependent upon the final delivery location of the wind turbine equipment, the transport contractor selected, the availability and type of vehicles at the contractor's disposal and the route that is acceptable to authorities. Trustpower, together with the transport contractor(s) will develop alternate transport strategies dependent on the item being delivered and where it is being sourced.

Access to the proposed wind farm site may be via three main transportation routes:

- Port Adelaide to Palmer (via Sturt Highway);
- Port Adelaide to Palmer (via South Eastern Freeway); and
- Melbourne to Palmer (via Dukes Highway)

In identifying the preferred site access route(s) the following road constraints associated with transporting over dimensional and / or over mass loads were considered:

- Structural constraints such as bridges and drainage culverts;
- Sharp bends, curved sections and steep grades; and
- Height constraints such as tunnels and bridges.

Current approved B Double and Over Dimensional Routes are to be utilised where possible.

Traffic Impact Assessment

The primary impact, in terms of road network performance and safety, will be during the 18 to 24 month construction period where a large number of vehicle movements will be generated over a short period of time.

The total one-way vehicle trips estimated for the construction phase of the proposed wind farm are shown to be reasonably significant, comprising of approximately:

- 2 554 over mass and over dimensional trips;
- 49 293 truck trips; and
- 105 600 car trips.

The above listed trips however, will occur over a minimum 18 month period. When broken down to average trips per month and per day the impacts on the road network are shown to be more reasonable. The average daily trips are:

- 6 over mass and over dimensional trips. If these trips are carried out during off-peak hours and are delivered to Palmer from Port Adelaide, the impacts on the road network would be minimised. It should be noted that this number accounts for loaded vehicles accessing the site and unloaded vehicles leaving the site. It is likely that the over mass vehicles will be within mass limits once unloaded and a number of the over dimensional vehicles will be within legal size requirements once unloaded, hence this figure is very conservative;

- 124 truck trips. The average number of daily truck trips on the surrounding road network could be further reduced if materials for concrete and pavement could be sourced on site or from a nearby location. The implementation of a temporary storage area for equipment and vehicles within the temporary construction compound would also further assist in reducing the number of heavy vehicle trips generated; and
- 267 car trips. These trips will primarily be associated with employees arriving to/from work. Carpooling should be encouraged amongst employees.

The above estimated worst case increase in daily traffic volumes will be approximately 365 additional vehicles per day (vpd) on the key roads surrounding the proposed wind farm site. The key issue to be addressed is that over 25% of vehicle movements associated with the construction of the proposed wind farm will be heavy vehicle movements. This will be managed through the development of a detailed Traffic Management Plan (TMP). It should be noted that these figures are conservative and are representative of the “worst case scenario”. The trips are able to be reduced if measures are in place such as sourcing locally produced quarried materials.

During the operations phase the proposed wind farm is designed for stand-alone remote operation. Generally the proposed wind farm will operate unattended for most of its operational life and accordingly the traffic associated with the long-term operation of the wind farm will be minimal.

Conclusion

The traffic and transport issues arising from the proposed wind farm development will have an effect on the daily activities of the local community surrounding the proposed wind farm site due to potentially increased traffic delays and noise. This will primarily be on the adjacent landowners and the Town Centres of Palmer, Sedan, Cambrai, Tungkillo and Sanderston.

A detailed Traffic Management Plan (TMP) and Construction Environmental Management Plan (CEMP) will need to be prepared prior to construction in close consultation with both DPTI and VicRoads State Road departments and local council's en-route to ensure that the overall impact and disturbance to infrastructure and other road users is minimal. A heavy vehicle route assessment will also need to be undertaken in accordance with DPTI requirements. Input from residents will also form an important part of the route assessment.

No major concerns should arise during the operations phase of the proposed wind farm as the need to access the site is minimal.

In conclusion, taking into account the current road usage near the proposed Palmer Wind Farm site and the expected increase in traffic, particularly during the construction phase, the impacts from traffic and traffic related activities are not considered to be significant. Where impacts are identified these can be mitigated with good management and the implementation of a detailed TMP and CEMP during construction.

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Appendices

- Appendix A – Proposed Site Plan
- Appendix B – Council Comments
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1. Introduction

1.1 Overview

Trustpower Australia is investigating the potential for a wind farm development in the Mid Murray Council area located on the ranges between the settlements of Palmer, Tungkillo and Sanderston.

This site is approximately 30 km long along the ridgelines on roughly 10,000 hectares and has been selected due to the excellent wind energy potential and its close proximity to the Tungkillo substation.

The proposed project will include up to 114 turbines. Each turbine will be up to a tip height of 165 m, with an approximate installed capacity of up to 375 MW. The turbines will be connected by underground and overhead electrical cables to an on-site substation.

The current layout has three distinct clusters (northern, central and southern) of turbines. A site plan indicating the location of the proposed turbines, substations and access tracks is presented in Appendix A.

This Traffic Impact Assessment (TIA) is one of several key technical studies that have been carried out in preparation of the proposed Palmer Wind Farm development application and details the principal impacts of the transport related activities associated with the development.

The key issue with regard to traffic and transport relates to the impacts likely to arise from the additional vehicles accessing the proposed wind farm site both during its construction and operation.

Particular consideration has been given to the transportation of the proposed wind farm components (including nacelles, hubs, blades, modularised tower sections and substation transformers) on account of the size and weight. The components will either be imported from overseas or manufactured locally in Australia. Components will arrive via a port and road or via road (for components manufactured in South Australia or Interstate). The key transport routes that have been investigated as part of this assessment include:

- Port Adelaide to Palmer; and
- Melbourne to Palmer (Desktop Analysis Only)

It should be noted that there have been a number of inconsistencies in relation to road names and as such, some of the road names may be different to that known to local users.

2. Methodology

The methodology carried out to assess the traffic and transport impacts associated with the proposed wind farm and accordingly the structure of this report is described in Figure 1.

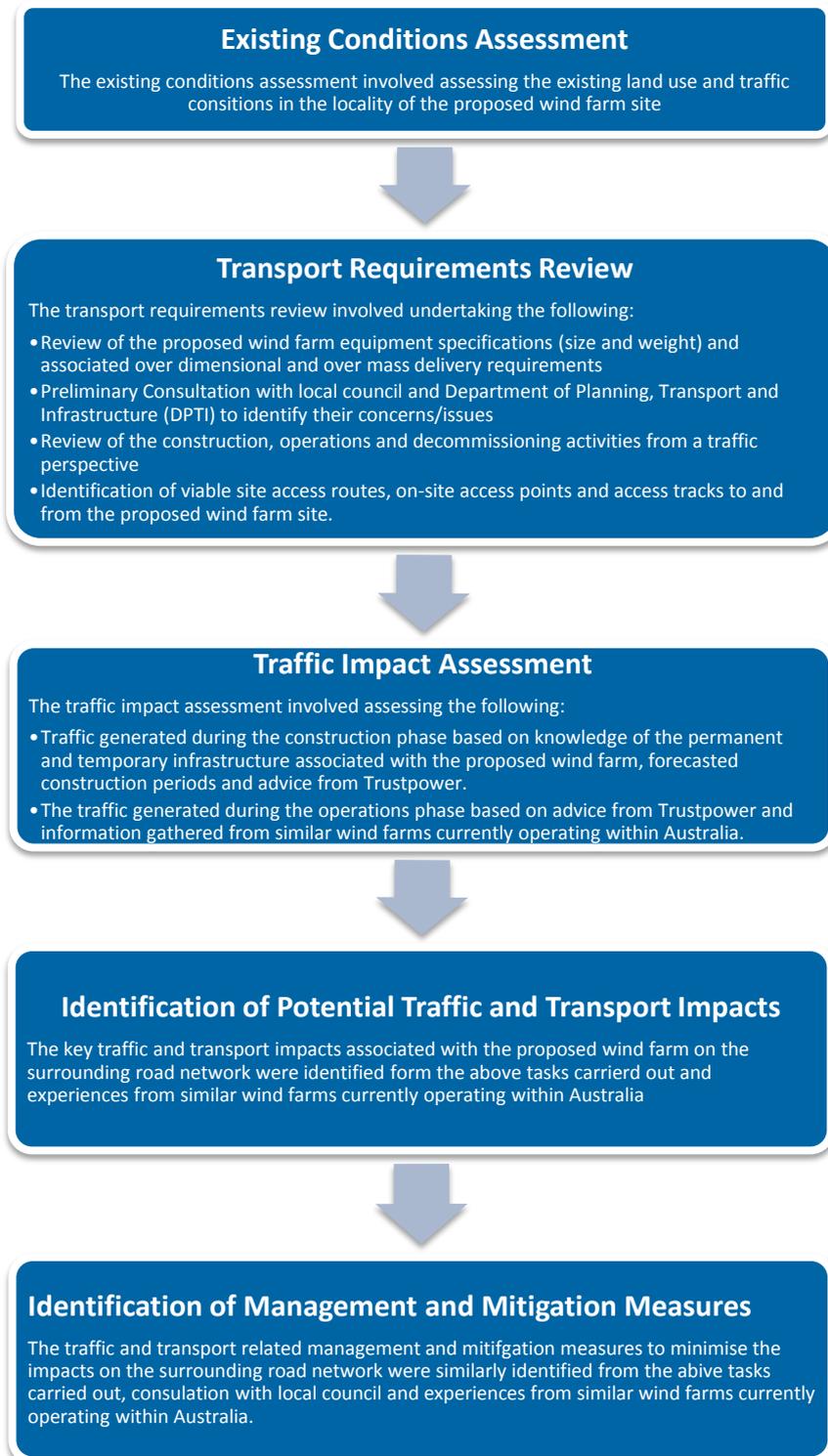


Figure 1 Summary of the methodology carried out for the proposed wind farm TIA

3. Existing Conditions

3.1 Location and Land Use

The proposed wind farm will be located on a number of private properties (involving approximately 20-30 landowners) that are primarily used for farming across a 10,000 hectare site. The area comprising of the proposed wind farm is primarily rural in nature with limited residential properties.

The four towns that will be most impacted by the development of the proposed wind farm are Palmer, Tungkillo, Cambrai, Sanderston and Milendella, as highlighted in Figure 2.

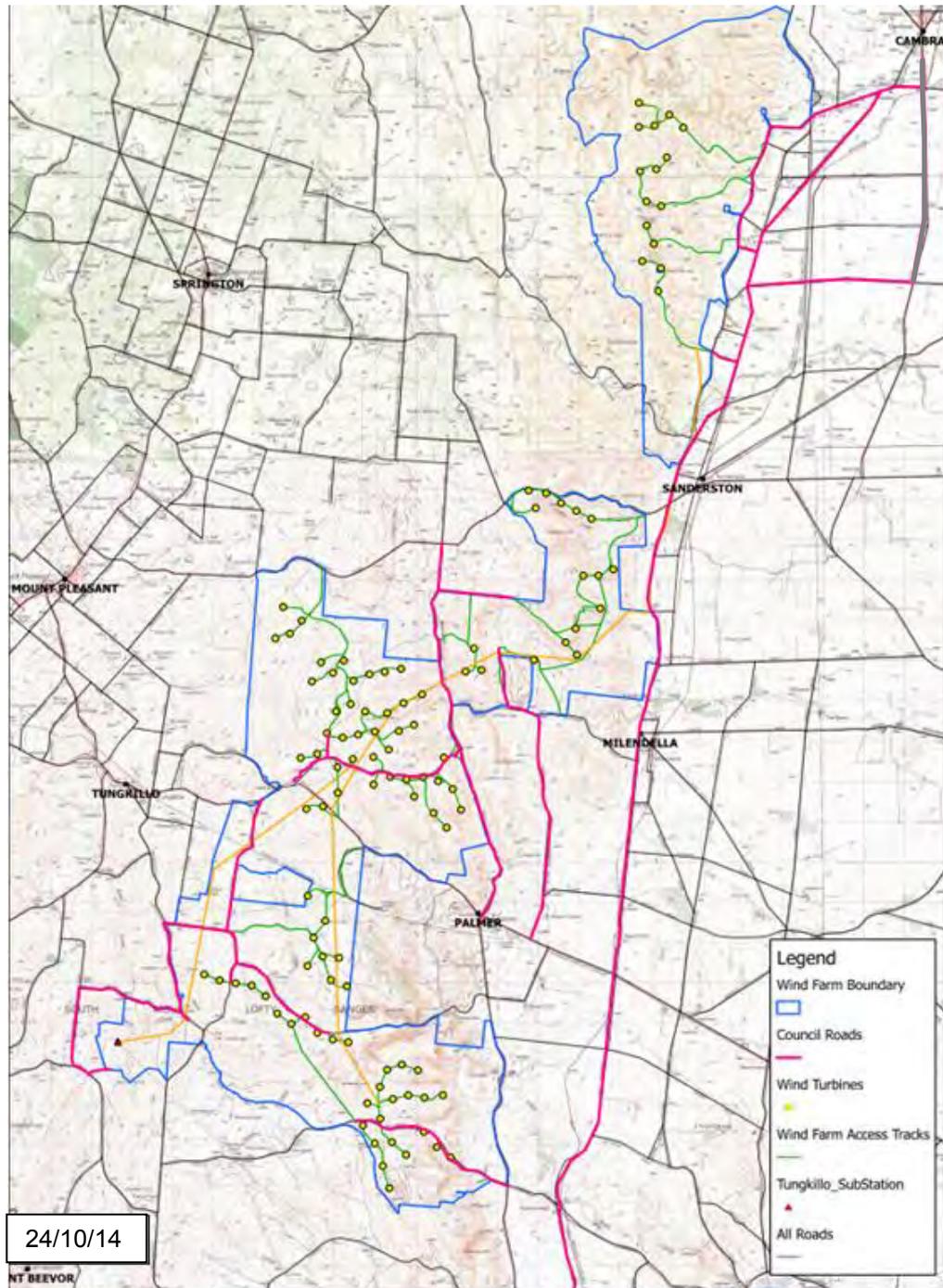


Figure 2 Location plan - Proposed Palmer Wind Farm

(Alternative access roads not shown for clarity purposes)

Mount Pleasant is the regional centre of the area with a population of approximately 1000 people. Mount Pleasant has a number of facilities, including a small primary school and kindergarten. To minimize the impacts to this small community, and in particular school children, it will be proposed for the majority of construction traffic to bypass the township of Mount Pleasant.

The area of Tungkillo has a population of approximately 600 people, and includes the township of Tungkillo and the town of Palmer, a small township (approximate population 75 people) that consists of a general store, hotel and a small primary school consisting of approximately 25 students. These students are primarily from families living outside of the town, with many students travelling in by bus from nearby farms.

3.2 Public Transport

There is limited public transport currently operating within the vicinity of the proposed wind farm site. However, school bus routes operate on local roads within the vicinity of the proposed wind farm site to drop off and pick up students from Palmer Primary School and Cambrai Primary School.

It is assumed that the school bus services operate on school days between 8.00 am and 9.00 am, and between 2 pm and 4.00 pm, for the duration of the school year. The timetable and route for school buses varies from year to year (and possibly within the year) as it is dependent on the location of students utilising the service.

3.3 Surrounding Road Network

3.3.1 Minor Roads

The current layout has three distinct clusters (A, B and C) of turbines that are bounded by a number of minor access roads.

The majority of these roads are unsealed gravel roads with a cross-section width that varies between 4 m to 6 m. Figure 3 shows a typical configuration of the minor access roads bounding the proposed wind farm site. These roads are owned and maintained by the Mid Murray Council.

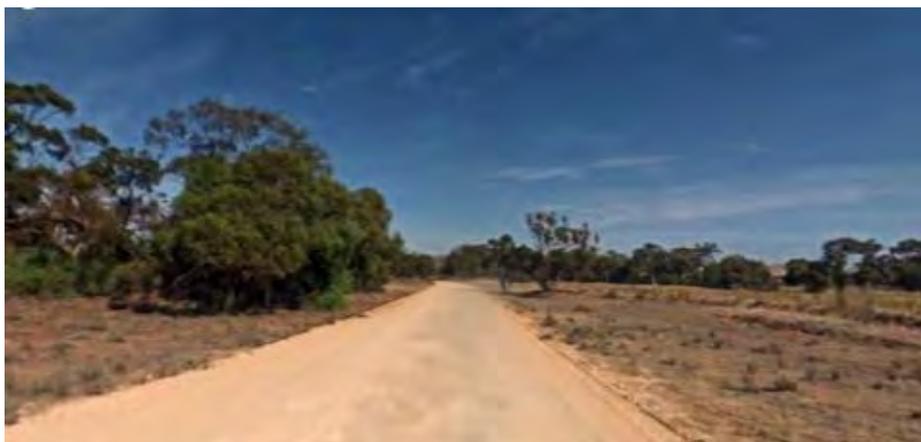


Figure 3 Typical Configuration of Minor Access Road (Bundilla Road)

The majority of these local access roads are not suitable for two-way heavy vehicle traffic; and it is proposed that roads accessing the proposed turbine locations will be widened up to 6 m where required.

The existing traffic volumes along these roads are low and the roads are generally only used by local farmers for access to their properties and transportation of farming equipment and materials.

Northern Site

The Northern Site is bound by the following minor roads, as shown in Figure 4:

- Three Chain Road and extension of Three Chain Road;
- Bundilla Road;
- Sanderston Road; and
- Glen Roy Road
- Preece Road
- Paynes Road
- Pohl Road

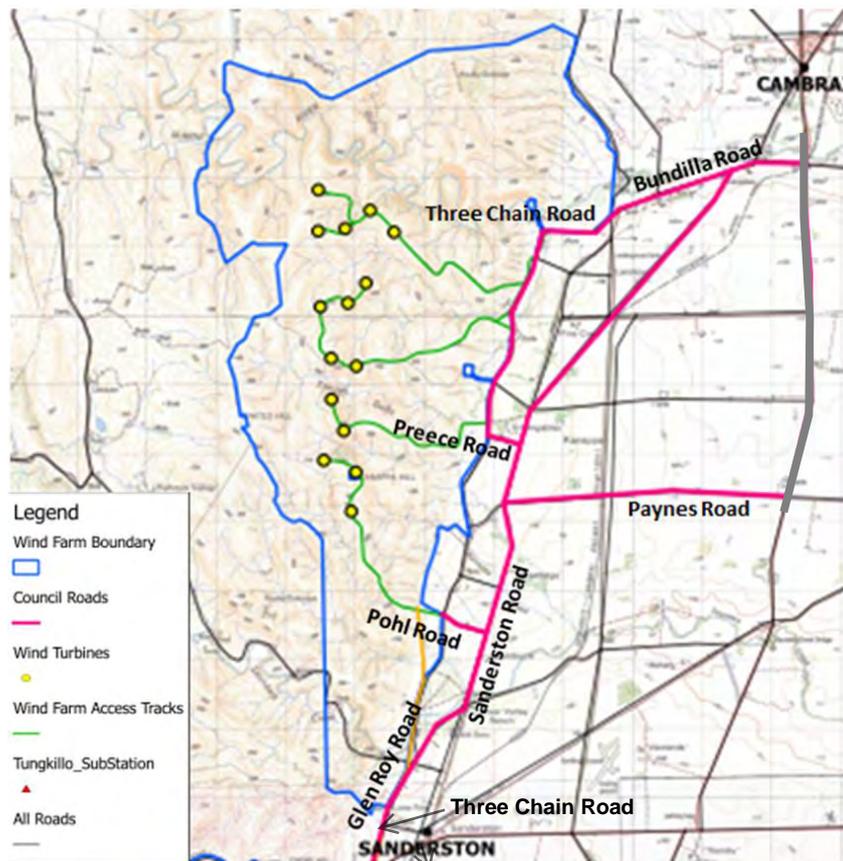


Figure 4 Key Minor Roads bounding Proposed Wind Farm Northern Site

Central Site

The Central Site is bound and intersected by the following minor roads, as shown in Figure 5:

- Gap Road – it has been identified that the western section is not to be utilised by design traffic due its steep terrain and cultural and environmental significance.
- Palmer-Cooke Hill Road/Davenport Road;
- Rathjen Road;
- Borthwick Brae Road; and
- D Collins Road.

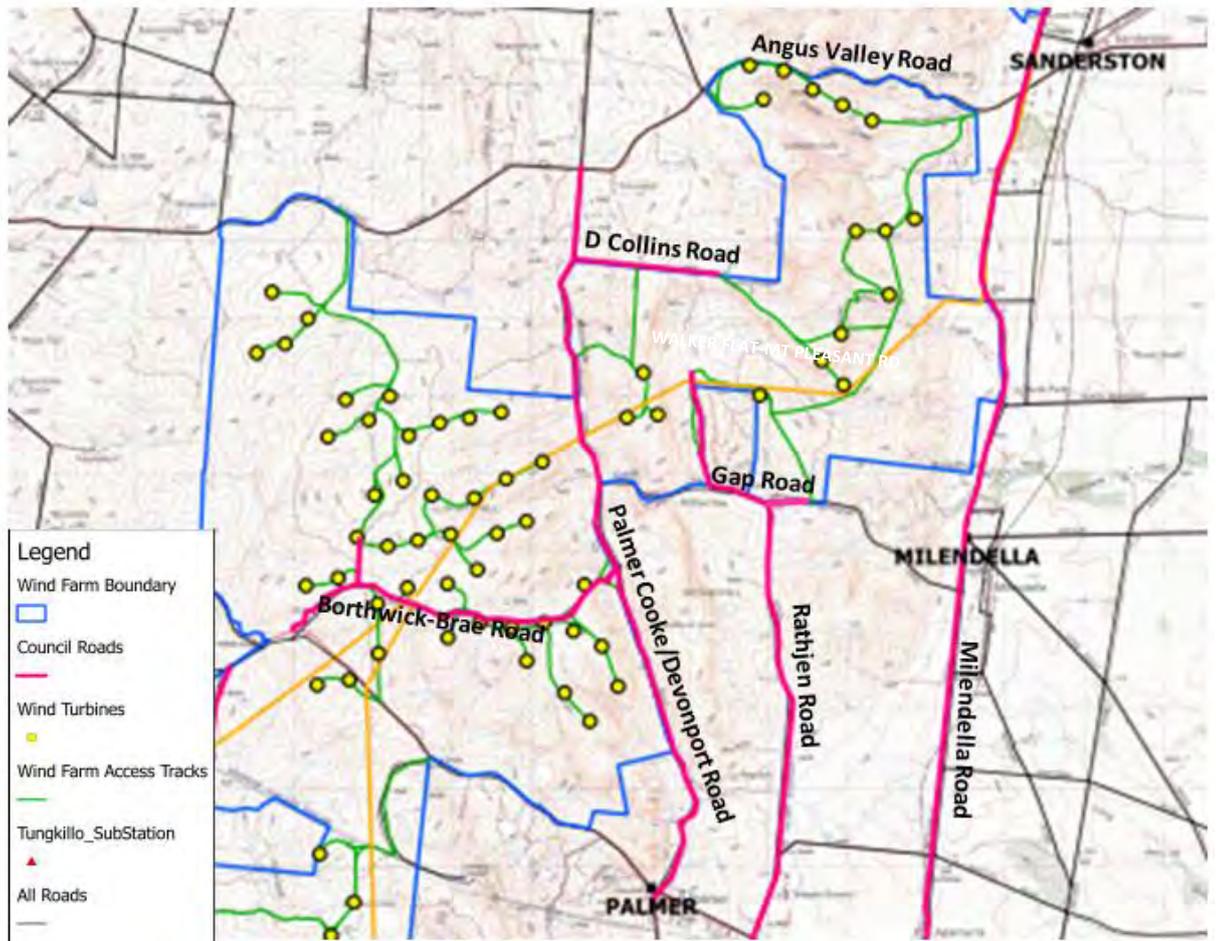


Figure 5 Key Minor Roads bounding Proposed Wind Farm Central Site

Southern Site

The Southern Site is bound and intersected by the following minor roads, as shown in Figure 6:

- Botroff Hill Road;
- Camel Hump Road;
- Brinkworth Road;
- Brinkworth Range Road;
- Collins Road
- John Rolland Road; and
- Ayers Road.

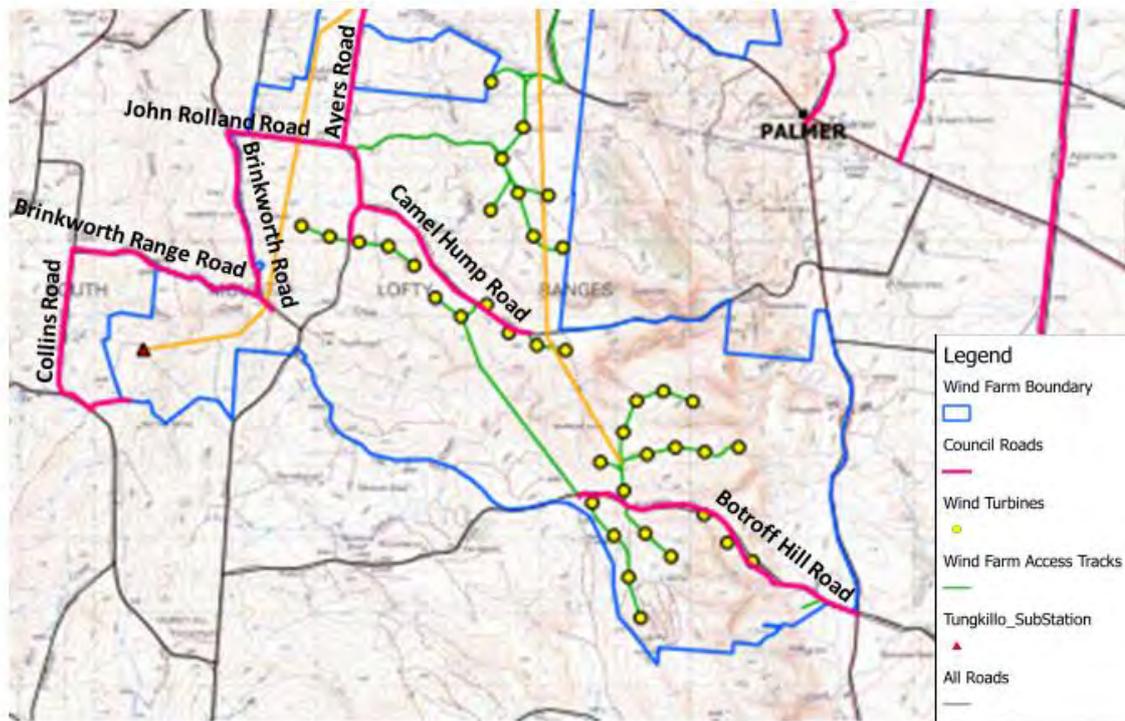


Figure 6 Key Minor Roads bounding Proposed Wind Farm Southern Site

3.3.2 Regional Collector Roads

General

The nearest regional / collector roads that will provide the main access to the proposed wind farm are shown in Figure 7 and include:

- Birdwood Road (B10);
- Mount Pleasant-Kyneton Road (B10);
- Onkaparinga Valley Road (B34);
- Old Princes Highway;
- Angas Valley Road;
- Milendella Road;
- Ridley Road;
- Randell Road (B36); and
- Adelaide-Mannum Road (B35)

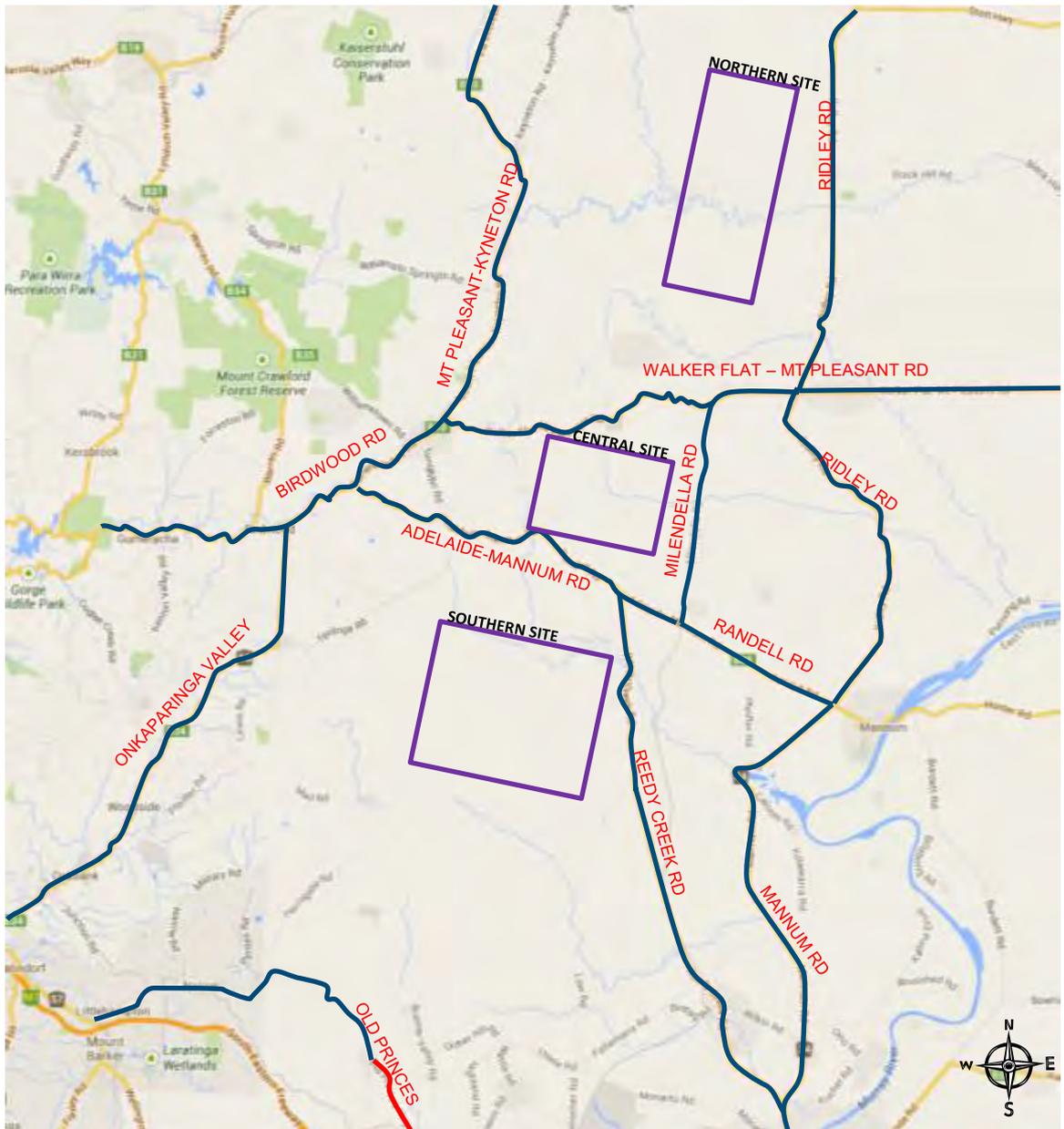


Figure 7 Key Regional/Collector Roads providing access to the proposed wind farm

The roads are generally two-lane two way sealed roads with a typical speed limit of 100 km/h, except where passing through townships.

It should be noted that Mount Pleasant-Kyneton Road, Birdwood Road, Old Princes Highway, Walker Flat-Mount Pleasant Road and Adelaide-Mannum Road all have significant bends or grades along these roads that may cause difficulties for the transport of the proposed wind farm equipment during construction. These difficulties are likely to include a slower travel time for larger vehicles, and possible restrictions on these roads for over size/over mass vehicles.

DPTI Approved Freight Routes

Performance Based Standards (PBS) set minimum heavy vehicle 'performance' standards to ensure trucks are stable on the road and can turn and stop safely. PBS vehicles are referred to as SMART trucks - because they work smarter. The Standards are a national program that focuses on how the vehicle behaves on the road, rather than how big and heavy it is. The

standards have been approved by the Council of Australian Governments and the Australian Transport Commission.

PBS vehicle routes are classified into four national networks levels (Levels 1 to 4). These network levels include a Class A and Class B category for the vehicle lengths shown below (Table 1). Both Class A and Class B categories cover General Mass Limits, Concessional Mass Limits and Higher Mass Limits. PBS Classification Level 2A is approximately equivalent to a GML B-Double Route.

Table 1 PBS Route Network Classifications

Vehicle Performance Level	Network Access by Vehicle Length (m)	
	Access Class "A Existing Networks	Access Class "B Classified PBS Networks
Level 1	L≤20 m	Not Applicable
Level 2	L≤26 m	L≤30 m
Level 3	L≤36.5 m	L≤42 m
Level 4	L≤53.5 m	L≤60 m

DPTI RAVnet provides up to date information on PBS route network classification of DPTI owned roads in SA.

Mannum Road, Randell Road, Ridley Road, a section of Milendella Road and a section of Walker Flat-Mount Pleasant Road (Angas Valley Road) are currently designated as Level 2A Routes, (as highlighted in Figure 8) making them the most suitable roads for larger vehicles accessing the proposed wind farm site during construction. Reedy Creek Road and the remainder of Walker Flat-Mt Pleasant Road are classified as Level 1A Routes (as highlighted in Figure 9) making them preferred alternative routes for larger vehicles accessing the proposed wind farm sites.

It should be noted that a RAV route assessment is not necessarily required in this instance as the vehicles and combinations used are generally going to be jinker trailers, low loaders, mobile cranes and possibly platforms. A RAV route assessment is only required for B-Double, Road Train etc. access when a route is to be gazetted as part of the approved route network. However, the above routes provide a good guide to the existing condition of major roads, and they should be utilised as part of the proposed route where possible.

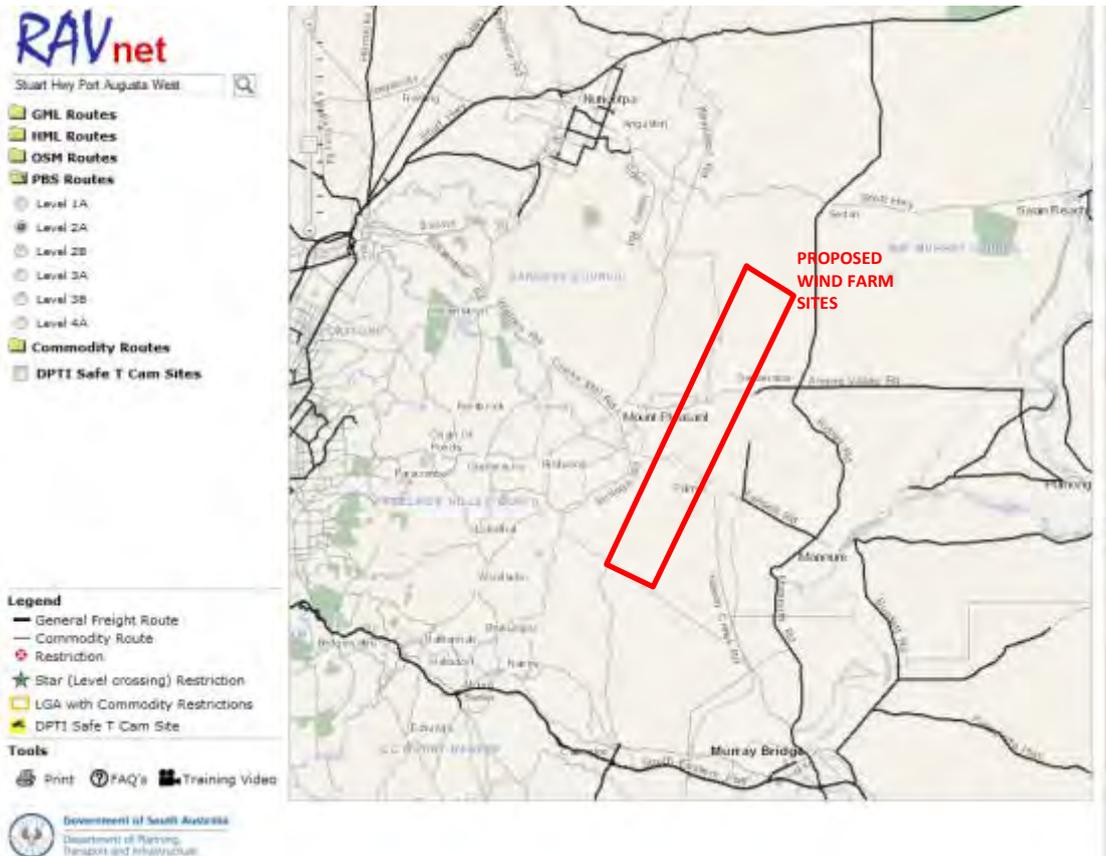


Figure 8 PBS Route Network Level 2A

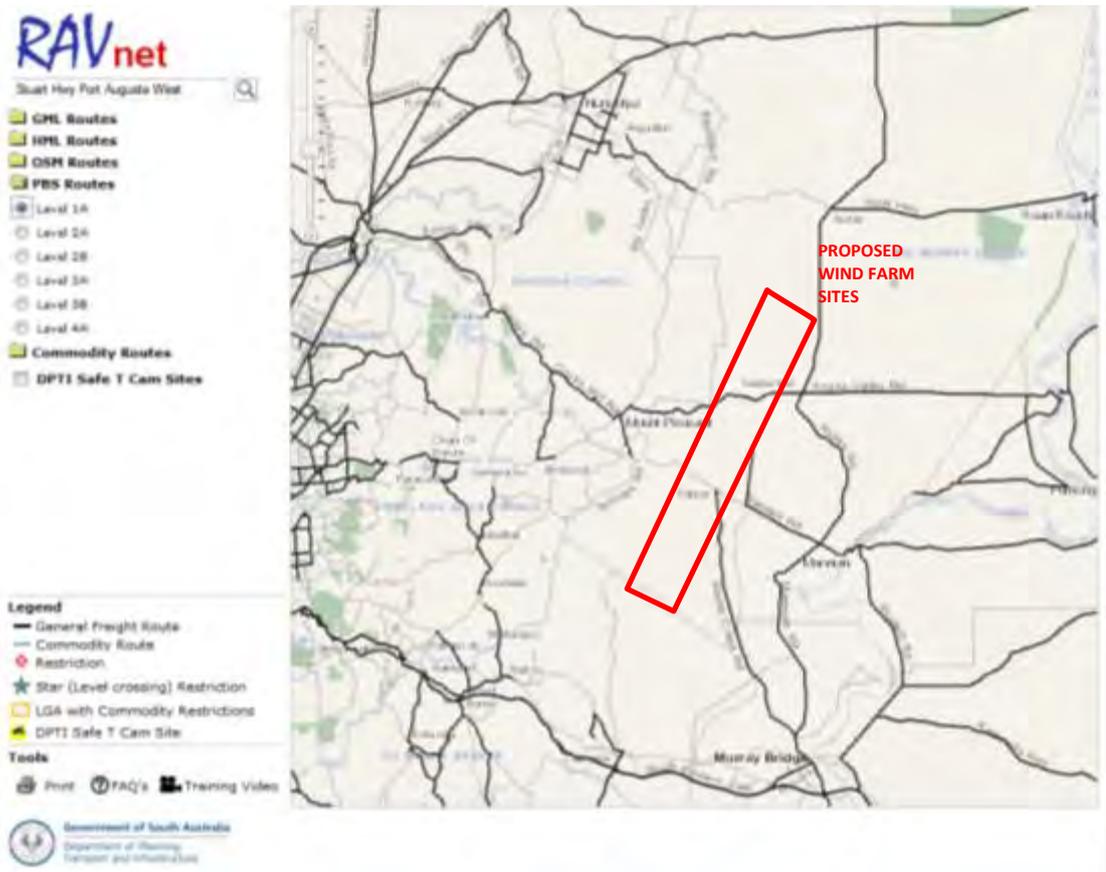


Figure 9 PBS Route Network Level 1A

Annual Average Daily Traffic Volumes

The Annual Average Daily Traffic (AADT) estimate represents the total bi-directional traffic volume passing a roadside observation point over a period of a year, divided by the number of days in a year.

Details of traffic volumes have been obtained from the Rural Traffic Estimate Maps and Metropolitan Estimate Maps, produced by the Road Asset Management System, DPTI. These traffic counts identify the two way AADT volumes and % of Heavy Vehicles (%HV) and are shown in Figure 10.

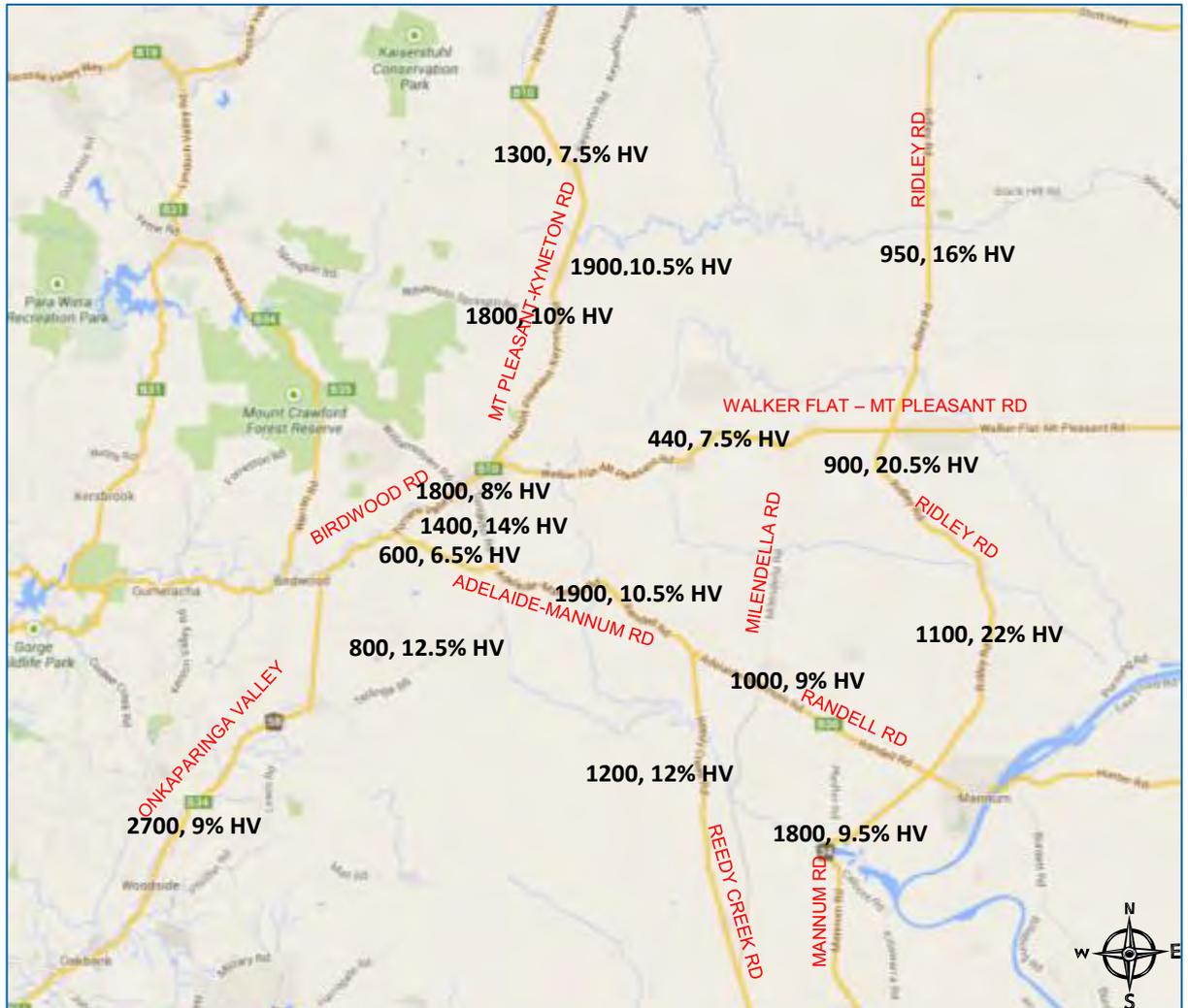


Figure 10 Annual Average Daily Traffic, DPTI¹

Adelaide-Mannum Road has the highest volume of traffic at 1900 AADT, closely followed by Mount Pleasant-Kyneton Road and Mannum-Murray Bridge Road at 1800 AADT. Ridley Road has a high percentage of Heavy Vehicles, which is expected given it is an existing B-Double freight route (refer to Figure 8 and Figure 9).

3.3.3 Major Transport Routes (Motorways and Highways)

The wind farm equipment and construction materials that are sourced from Adelaide will likely traverse either the Sturt Highway or the South Eastern Freeway. If materials are required to be

¹ Source: DPTI Annual Average Daily Traffic Estimates 24 Hour Two-Way Flow – Map MT10, 4th August 2010 and Map RT8, 4 August 2013

sourced from Victoria, vehicles will likely use the Dukes Highway (A8) to access the proposed wind farm site. These routes are shown in Figure 11.

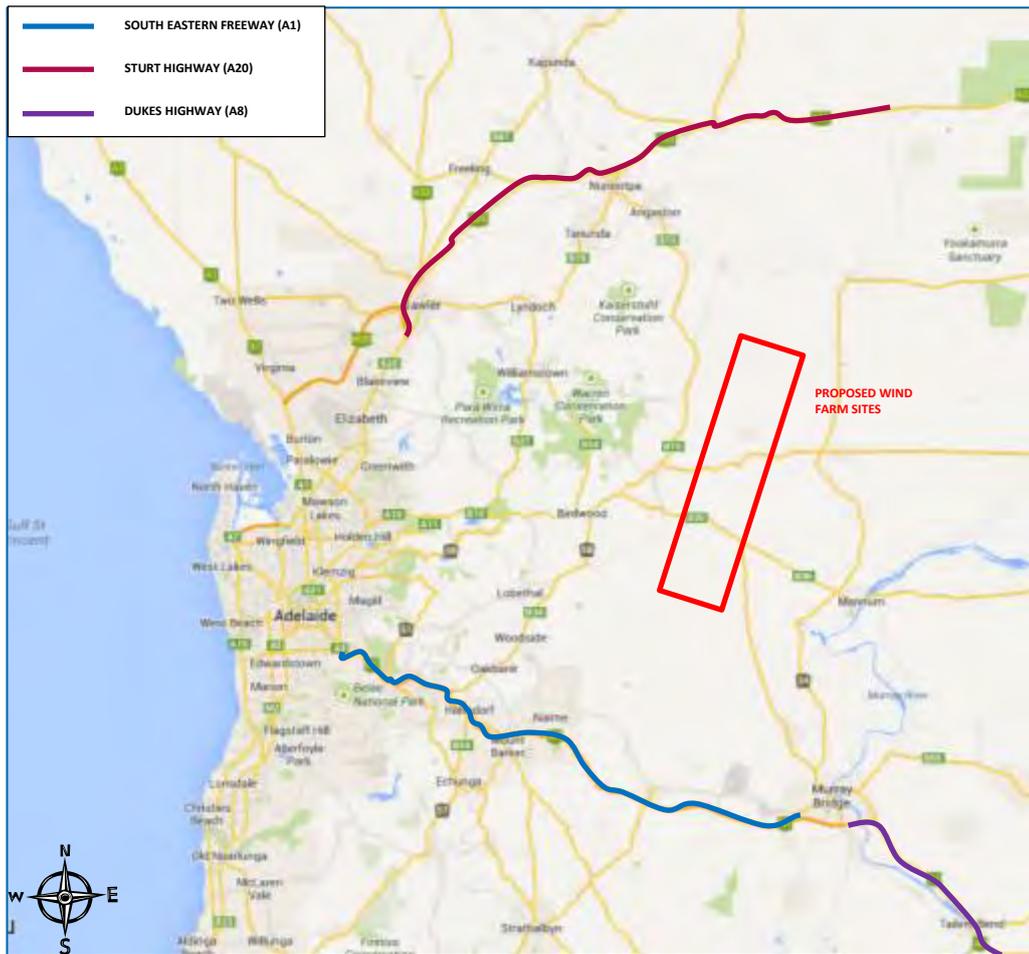


Figure 11 Key Major Transport Routes accessing the proposed wind farm site

The Sturt Highway commences at the end of the Gawler Bypass Link, heading north east and allowing access to the towns of Nuriootpa, Angaston and Blanchetown before continuing into Victoria and NSW. The Sturt Highway is mostly a single carriageway in each direction, with frequent overtaking lanes and most town centres bypassed. The section between the Gawler Bypass Link and Greenock has recently been upgraded to a freeway standard.

The M1 and A1 section of the South Eastern Freeway is the major route from Adelaide to the east, carrying the National Highway to Tailem Bend and onto the Dukes Highway (A8). The South Eastern Freeway is almost entirely freeway with only the single carriageway at Swanport Bridge breaking the dual carriageway conditions.

A constraint along the South Eastern Freeway for over dimensional loads is the height restrictions at the Heyson Tunnel. The height clearance for the Heyson Tunnels is 5.3 metres (this is also the clearance height for the Mt Osmond and Crafers interchanges). It is therefore recommended that vehicles over 5 m height utilise an alternative route. This is discussed further in Section 7.7.10.

The Dukes Highway (A8) provides the main east-west route in south western Victoria, providing a strategic link between Melbourne and the South Australian border. It is primarily a single carriageway in each direction, but with frequent overtaking lanes along the route.

The Sturt Highway, South Eastern Freeway and Dukes Highway are all classified as PBS Classification Level 2A.

The principal heavy vehicle, over mass and over dimensional routes providing access east of the South Australian/Victorian border (as provided by VicRoads on-line heavy vehicle access maps database) are shown in Figure 12.



Figure 12 Principal Heavy Vehicle, over mass and over dimensional routes providing access to the proposed wind farm, east of the Victorian/South Australian Border²

The routes used during the construction phase will be dependent on the delivery location of the turbine components and preferred supplier / manufacturer of construction materials and equipment.

The principal site access routes identified to the proposed wind farm site are discussed further in Section 5.

²Source: http://maps.vicroads.vic.gov.au/website/Heavy_Vehicles/viewer.htm, VicRoads

4. Transport Requirements

4.1 Introduction

This section details the transport requirements during the construction, operations and decommissioning phases of the proposed wind farm. The transport requirements during the construction phase is the main focus of this section, as it will involve significantly more vehicle movements to deliver the permanent and temporary infrastructure (equipment and materials) associated with the proposed wind farm, compared to the operations phase. The permanent infrastructure associated with the proposed wind farm includes the following, but isn't limited to:

- Wind turbines;
- Internal access tracks;
- Underground electrical and communications cables;
- Operations and Maintenance facilities; and
- Overhead Transmission Lines.

The temporary infrastructure associated with the proposed wind farm during construction is likely to include the following:

- Temporary Construction Compound; and
- Onsite temporary Concrete batching plant.

4.2 Equipment Specifications

During the construction phase the delivery of the wind turbine components and substation transformers will have the most significant impact on the road network due to the size and weight of equipment. A large portion of equipment associated with the proposed wind farm will exceed South Australia's (and the majority of states throughout Australia) over mass and over dimensional vehicle limits as defined in Table 2.

Table 2 South Australia's over mass and over dimensional vehicle limits³

Over Mass Limit	Over dimensional Limits		
	Width (m)	Height (m)	Length (Prime mover & trailer)
42.5 t	2.5 m	4.3 m	19 m

4.2.1 Wind Turbines

The turbines proposed will have a maximum height of up to 165 m (at the blade tip), comprising towers of approximately 100 m and blades of approximately 65 m. Each wind turbine comprises of the following (as indicatively shown in Figure 13):

- 3 blades (62 m long);
- 1 nacelle (delivered in 2 sections);
- 4 tower sections; and
- 1 turbine hub.

³ Mass and Dimension Limits for General Access Heavy Vehicles Operating in South Australia, DPTI

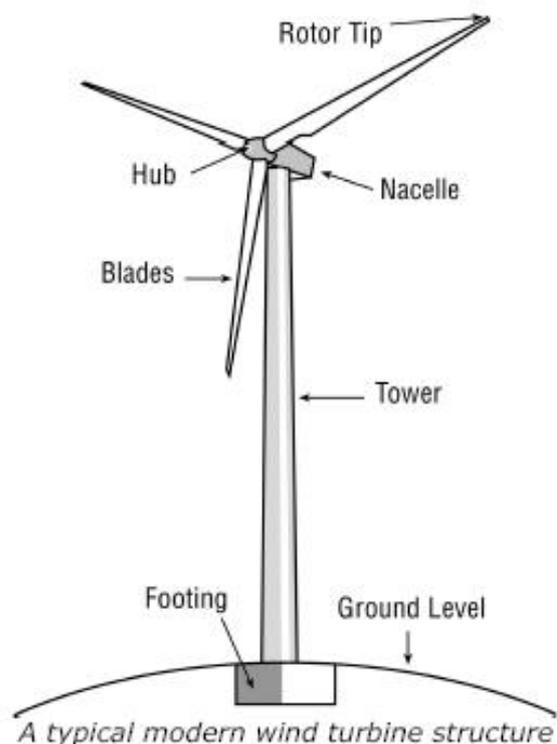


Figure 13 A typical wind turbine structure

To facilitate transportation and ease of installation of these large items, each item will likely be delivered to the proposed wind farm as single packages.

The approximate weight and dimensions of the individual wind turbine components are summarised in Table 3 and Table 4. Table 3 and Table 4 also highlight that all components will need either an over mass, over dimensional or both permits to be obtained by the relevant road authorities prior to delivery.

Table 3 Approximate weight and dimensions of the wind turbine components

Component	Height (m)	Length (m)	Width (m)	Weight (Tonnes)	Over dimensional	Over Mass
Nacelle	3.4	12.8	4	70	✓	✓
Hub	3.74	5.42	3.75	70	✓	✓
Blades	4	62	-	5.5-6.5	✓	

(Vestas 126 Model has been selected for the purpose of this assessment).

Table 4 Approximate weight and dimensions of the 100 m Tower components

Component	Min Diameter (m)	Max Diameter (m)	Length (m)	Weight (Tonnes)	Over dimensional	Over Mass
Top	2 - 2.5	3 - 3.5	25 - 35	30 - 35	✓	
Middle Upper	3 - 3.5	3.5 – 4	25 - 30	45 - 50	✓	✓
Middle Lower	3 - 3.5	3.5 – 4	25 - 30	45 - 50	✓	✓
Bottom	3.5 - 4	4.5 – 5	15 - 20	40 - 50	✓	✓

4.2.2 Wind Monitoring Masts

In addition to the wind turbines, wind monitoring masts will also need to be delivered including power performance testing masts (estimated at 80 m to 100 m tall).

Masts will be up to 100 m in height and will have the same height as the constructed turbine hub height. The type of mast that is most common for wind farms is a lattice mast. This configuration can be easily transported and installed. The lattice masts facilitate access to the monitoring equipment, being more climbable than other structures. Cables will be installed to stabilise the masts.

Similar to the wind turbines, over dimensional and / or over mass permits will need to be obtained by the relevant road authorities for delivery of equipment.

4.2.3 Substation

The wind farm development proposes to make use of the existing Tungkillo Substation located towards the southwest boundary of the site. This will require a small amount of additional equipment at the site to 'plug-in' to the substation which can be transported using semi-trailer vehicles. The access tracks to the existing substation are in good condition and will be able to accommodate the proposed development traffic.

It is also proposed to construct a new substation facility in the central site along Borthwick-Brae Road. It is expected that there will be 2 transformers on the proposed substation facility site. The type and weight of transformer to be transported is shown in Table 5. It is likely that the main transformer will be the heaviest load requiring transportation.

Table 5 Approximate weight and dimensions of the transformer components

Component	Height (m)	Length (m)	Width (m)	Weight (Tonnes)	Over dimensional	Over Mass
Main Transformer	4.5	8.5	3	132	✓	✓

The delivery of these transformers will also require over dimensional and / or over mass permits to be obtained by the relevant road authorities for delivery of equipment. Other equipment required for the construction of the new facility will be nominal and can be transported using semi-trailer vehicles.

4.3 Wind Farm Development Phases

4.3.1 Construction Phase

General

As discussed previously, the construction phase of the project is anticipated to be of 18 to 24 months period and will have the most significant impact on the surrounding road network. The principal construction traffic and transport activities that will be carried out during the construction phase include the following:

- Delivery of the wind turbine components. The turbine towers may be produced locally in Australia (from Adelaide or Melbourne) but most likely imported and all other turbine components will likely be imported from overseas;
- Delivery of the substation equipment. The transformer may be sourced locally or imported from overseas depending on the supplier;
- Delivery of other construction equipment and materials. Where possible the construction equipment and materials will be sourced locally; and
- Transport of construction staff.

Over Mass and Over Dimensional Permits

From the above listed transport activities, the main issue will be the delivery of the wind turbine components and substation transformers on account of the size and weight. As highlighted in Table 3 and Table 4, the delivery of this equipment will require either an over mass, over dimensional or both permit(s) to be obtained from the relevant road authorities (Department for Planning, Transport and Infrastructure (DPTI) and / or VicRoads) for travel on DPTI owned roads.

Each state transport authority, as part of its permit approval process independently undertake an assessment of the adequacy of the road infrastructure on the routes proposed and includes sufficiency assessments of infrastructure such as bridge structures and culverts identified en route.

It is the transport contractor's responsibility to conduct surveys of road conditions prior to applying for the necessary transport permits. It is usual for the authorities to specify any required precautionary works to be undertaken before carrying out the transport task. Subsequent disputes on road damage are typically resolved between the transport contractor and the authorities and included in the service fee charges. The final choice of route will be dependent upon what is acceptable to the authorities.

Typical conditions employed for the transport of over mass and / or over dimensional loads include:

- Travel during daylight only and preferably during off-peak times;
- The use of pilot vehicles for over dimensional and over mass loads to warn approaching road-users that an over dimension vehicle is on the road;
- The use of police escorts for over dimensional loads to ensure safe traffic control and movements in and around these large vehicles;
- The use of infrastructure authority escorts to lift overhead wires for high loads; and
- The implementation of speed restrictions for over mass loads while travelling along bridge structures.

Where Council owned local collector roads are to be utilised for transportation of wind turbine equipment, it is recommended that a maintenance agreement be developed between the owning Council and Trustpower, outlining maintenance and rehabilitation responsibilities.

Delivery Vehicle Types

The type of vehicles accessing the site will be dependent upon the equipment and personnel being transported. The typical transport vehicles employed for erecting the turbines are likely to include the following:

- A low loader trailer system and prime mover for the transport of each tower section as shown in Figure 14. With an approximate diameter of 4.5 m and an overall travel height approaching 5 m, attention to overhead clearance will be critical for the movement of the tower sections.



Figure 14 Example of a low loader trailer system for the transportation of tower sections

- An example of a typical low loader trailer system and prime mover used for the transport of the nacelles and hubs is shown in Figure 15. Overhead clearance will need to be checked and the significant mass will be a factor with regard to bridge limits and climb grades.



Figure 15 Example of a typical low loader trailer system for the transportation of the nacelle and hub

- A semi-trailer in conjunction with a rear wheel steering trailer for the transport of each blade as shown in Figure 16. With blades of up to 62 m long, the semi-trailer will likely be approximately 68 m long. A rear wheel steering trailer will need to be used to facilitate in turning movements for the long load. When assessing the transport route for the blades consideration of allowable bend radius, changes in grade and road alignment on approach to bridges and rail crossings will be critical.



Figure 16 Example of a semi-trailer with a rear wheel steering trailer for the transportation of the blades

- A boom truck for transporting the top controller, switch cabinet, transformers and fasteners.
- In addition to the wind turbine components, large cranes will also be required on site to lift the nacelle, hub, blades and tower sections as shown in Figure 17. These may require over mass and over dimensional vehicles in order to initially access the site.



Figure 17 Example of the cranes employed to erect a wind turbine

- The substation transformers, weighing approximately 132 tonnes each, will also require the use of a prime mover and large multi-axle low loader trailer for delivery.

4.3.2 Operations Phase

The proposed wind farm is designed to operate without intervention, with each turbine capable of operating independently of all other wind turbines. The operations phase of the proposed wind farm is forecast to be up to 30 years.

A 24 hour monitoring and fault response will be maintained during the operations phase. The vast majority of maintenance during the operations phase will be preventative maintenance that will be undertaken through a schedule that will cycle through all the wind turbines to ensure service intervals are met. In addition to preventative maintenance, some repair work will be required should breakdowns occur.

The principal traffic and transport activities that will occur during the operations phase include the following:

- General staff travel to the proposed wind farm site for regular inspections;
- Routine servicing of wind turbine components;
- Corrective maintenance of wind turbine components;
- Replacement of major wind turbine components
- Parts delivery to and from the proposed wind farm site; and
- Maintenance of roads and access tracks.

4.3.3 Decommissioning Phase

At the end of the operations phase of the proposed wind farm a decision will be made whether to erect new turbines on the site or to formally decommission the proposed wind farm, remove the existing turbines and rehabilitate the site.

Decommissioning will be undertaken in accordance with legal requirements, conditions of approval and landowner requirements.

4.4 Port Review

The wind turbine components will most likely be imported from overseas to Port Adelaide on account of its proximity to the proposed wind farm site. Port Adelaide has the necessary facilities to handle the non-standard containers such as those associated with the wind turbine equipment, and has previously hosted the arrival of wind farm equipment from Denmark for the Wattle Point 59-turbine plant on the Yorke Peninsula as shown Figure 18, and the arrival of equipment for the Snowtown 47-turbine plant (and Snowtown 2 turbine components).



To assist with storage of the 45 m blades prior to delivery to Wattle Point, Port Adelaide prepared an additional port area of 20,000 m² behind number 20 berth.



Wind farm equipment discharged at Port Adelaide for the Wattle Point Wind Farm.

Figure 18 Previous Wind Farm equipment delivery to Port Adelaide⁴

⁴ Source: <http://www.flindersports.com.au/>

5. Site Access Routes

5.1 General

All road routes from Adelaide and / or Melbourne are primarily either National Highways or State Roads and, subject to statutory permit conditions, can accommodate the proposed wind farm related over dimensional and over mass vehicles.

A traffic management plan (TMP) detailing the specific route, time of travel, load type and proposed vehicles has been prepared and is currently being reviewed by Council at the time of this report will need to be prepared by the truck hauling contractor. The TMP will need to be submitted to the South Australian DPTI and possibly Victorian VicRoads (if parts are distributed from Victoria) before an over dimensional and / or over mass permit can be issued.

While this study gives consideration to feasible road transport routes, the final choice of route is dependent upon the final delivery location of the wind turbine equipment, the transport contractor selected, the availability and type of vehicles at the contractor's disposal, recommendations in the TMP and the route that is acceptable to authorities. Trustpower, together with the transport contractor(s), will need to develop alternate transport strategies dependent on the item being delivered and where it is being sourced.

Access to the proposed wind farm site could be via three main transportation routes depending on the location where personnel, equipment, materials are going to and from. These include:

1. Port Adelaide to Palmer (via Sturt Highway);
2. Port Adelaide to Palmer (via South Eastern Freeway); and
3. Melbourne to Palmer.

A high level site visit (including discussions with Council) was undertaken by GHD on the 23rd September 2013 to identify any potential constraints to identify the preferred site access route(s). The following road constraints associated with transporting over dimensional and / or over mass loads were considered in the analysis:

- Structural constraints such as bridges and drainage culverts;
- Sharp bends, curved sections and steep grades; and
- Height constraints such as tunnels and bridges.

Where possible, the identified site access route(s) to the proposed wind farm utilise existing over dimensional and over mass networks for South Australia and Victoria.

Discussions on route alternatives are focussed on Council roads as DPTI roads are generally considered available to facilitate heavy vehicle use and accordingly are not shown on the provided plans in this section of the report.

5.2 Port Adelaide to Palmer (via Sturt Highway)

5.2.1 Route

It is anticipated that an element of wind farm equipment and materials will need to be sourced from the port of Port Adelaide.

One of the identified key transport route for heavy vehicle movements between Adelaide and Palmer is via the Sturt Highway (A20), as shown in Figure 19.

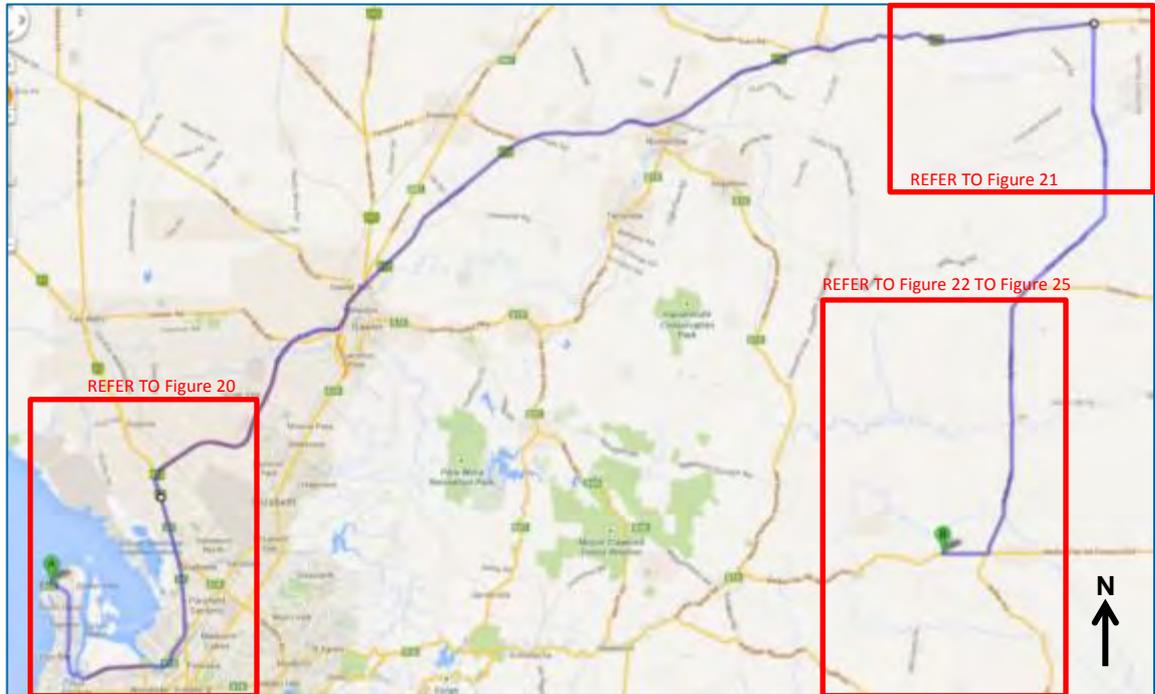


Figure 19 Proposed Route between Port Adelaide and Palmer

To access the Sturt Highway from Port Adelaide it is recommended that vehicles use the below route (Figure 20):

- Exit the dock area onto Victoria Road and continue as it turns into the Port River Expressway;
- Travel along the Port River Expressway, continuing along Salisbury Highway;
- Turn left onto Port Wakefield Road, travel along Port Wakefield Road before taking the Northern Expressway exit;
- Travel along the Northern Expressway to Gawler, continuing as it merges into the Sturt Highway (A20).

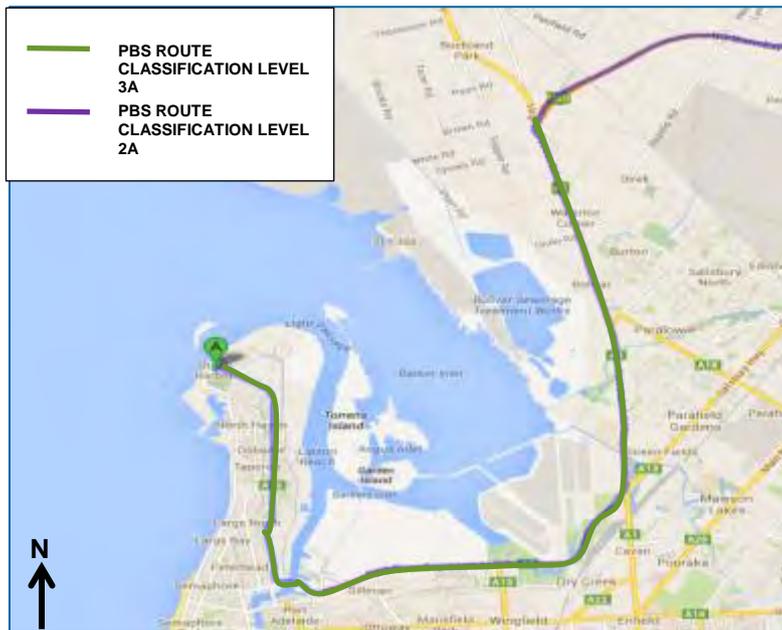


Figure 20 Proposed Route between Port Adelaide and Sturt Highway (A20)

To access the sites from the Sturt Highway it is recommended that vehicles use the following route (Figure 21):

- Sturt Highway (A20) Turnoff at Halfway House Road;
- Continue travelling along Halfway House Road as it continues into Blanchetown Road and then Ridley Road.

The vehicles would then use separate routes, as outlined overleaf, to reach each of the sites.

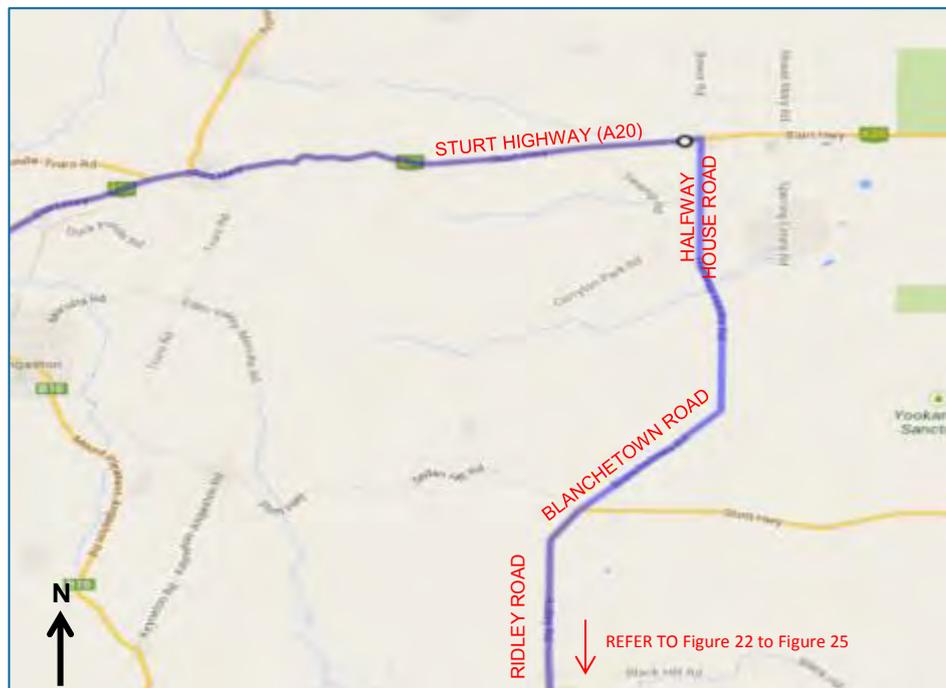


Figure 21 Proposed Route between Sturt Highway (A20) and Site Access Points

5.2.2 Northern Site Access

Primary Route

To access the Northern Site Access Points, it is proposed that vehicles continue along the following route, as outlined in Figure 22:

Travel along Ridley Road,

AND/OR

- Turn right onto Bundilla Rd and continue onto Three Chain Road to access the Northern Wind Farm Access Points;
- Turn right onto Bundilla ,turn left onto Sanderston Rd(North) accessing Three Chain Rd via Preece Rd and accessing Pohl Rd by continuing to travel along Sanderston Rd(South) to access the Northern Wind Farm Access Point;

AND/OR

- Continue along Ridley Road, turning right onto Paynes Rd accessing both Pohl Rd and Three Chain Rd (via Preece Rd) from Sanderston Rd(South) to access the Northern Wind Farm Access Point;

AND/OR

- Continue along Ridley Rd, turning right onto Angas Valley Rd and then turning right onto Three Chain Rd and accessing Pohl Rd and Three Chain Rd (via Preece Rd) by traveling along Glenroy Rd and Sanderston Rd(South) to access the Northern Wind Farm Access Point;

It is estimated that this route will take just over 2 hours for a car travelling at designated speed limits.

Alternative Routes

Should the above routes be deemed by the relevant road authority to not adequately be able to accommodate the proposed development traffic generated by the wind farm, a number of alternative access routes have been identified, as shown in Table 6.

Table 6 Alternative Access Routes to Northern Site

Proposed Route Segment	Alternative Route
Bundilla Road	Ridley Road, Walker Flat/Mt Pleasant Road, and Sanderston Road (Southern Section)
Southern Section of Three Chain Road and Glenroy Road	Southern section of Sanderston Road
Minor Access Roads (including Preece and Pohl Road)	Private property access

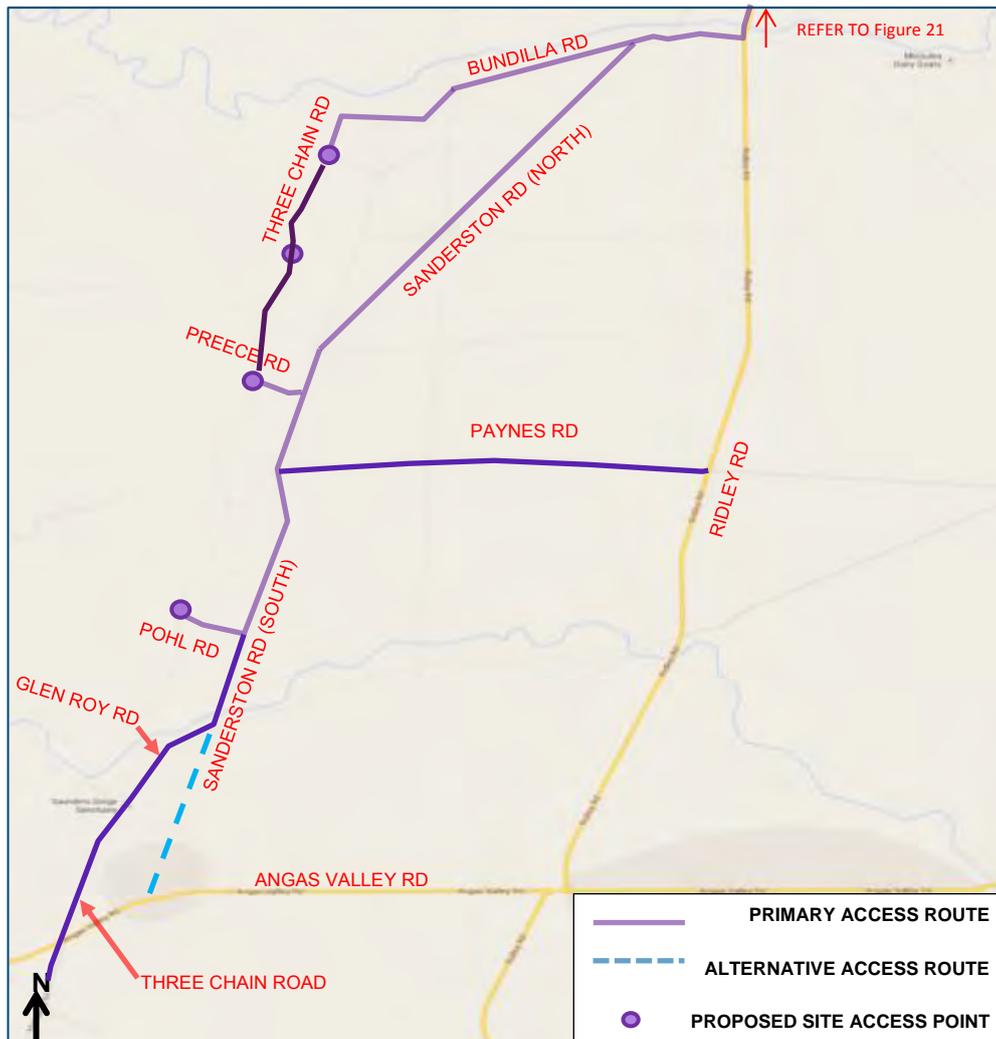


Figure 22 Proposed Route between Sturt Highway (A20) and Northern Site Access Points

5.2.3 Central Site Access

Primary Route

To access the Central Site Access Points, it is proposed that vehicles continue along the following route, as outlined in Figure 23:

- Travel along Ridley Rd, turning right onto Angas Valley Rd;

AND/OR

- Turn left onto Milendella Road, then right onto Randell Road to access a Central Wind Farm Access Point via Rathjen Rd (to access Gap Rd), Davenport Rd, wind farm access point on Randal Rd and/or Borthwick Brae Road (west access point) to access the Central Wind Farm Access Points;
- Davenport Rd will have a potential 3 wind farm access points and/or will be used to access both D Collins Rd and/or Borthwick Brae Rd (East access point).

AND/OR

- Continue along Angas Valley Rd turning left onto Davenport Rd and/or using the 3 site access points on Angas Valley Rd to access the central wind farm site.

- Davenport Rd will have potentially 3 wind farm access points and will be used to access both D Collins Rd and/or Borthwick Brae Rd (East access point).

It is estimated that this route will take just over 2 hours for a car travelling at designated speed limits.

Alternative Routes

Should the above routes be deemed by the relevant road authority to not adequately be able to accommodate the proposed development traffic generated by the wind farm, a number of alternative access routes have been identified, as shown in Table 7.

Table 7 Alternative Access Routes to Central Site

Proposed Route Segment	Alternative Route
Angas Valley Road	No Alternatives Identified
Milendella Road	Davenport Road, Randell Road, .
Davenport Road	Milendella Road, Randell Road, Angas Valley Road and Borthwick Brae Road
Borthwick Brae Road	Private Property Access

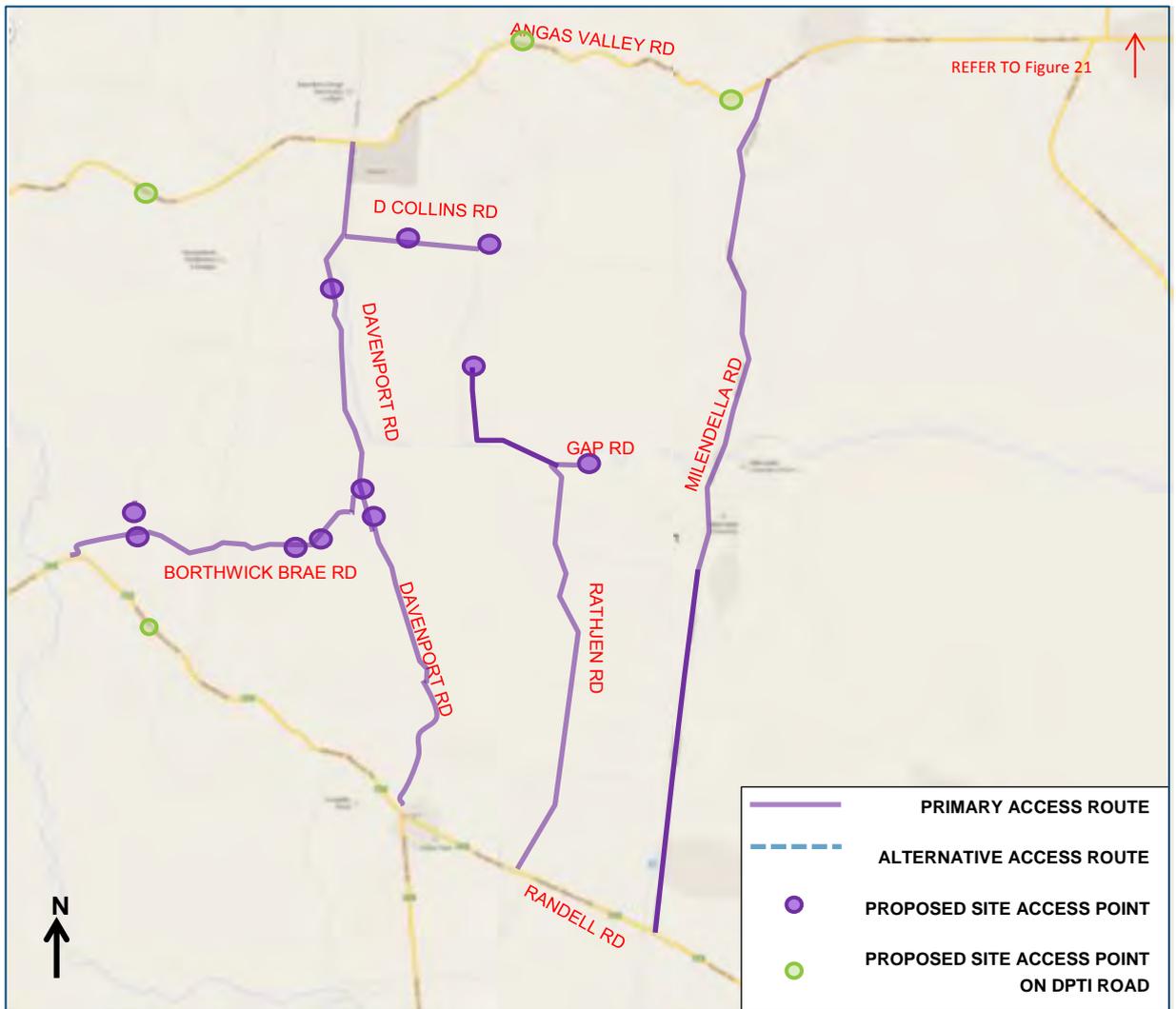


Figure 23 Proposed Route between Sturt Highway (A20) and Central Site Access Points

5.2.4 Southern Site Access

Primary Route

To access the Southern Site Access Points, it is proposed that vehicles continue along the following route, as outlined in Figure 24 and Figure 25:

- Travel along Ridley Road, turning right onto Angas Valley Rd;
- Turn left onto Milendella Rd, travelling to the junction of Randell Rd;
- Turn right onto Randell Rd;

AND /OR

- Continue along Randell Rd to access Southern wind farm access points;
- Turn left onto Reedy Creek Rd and right onto Botroff Hill Road and access the Southern Wind Farm Access Points from Botroff Hill Road;
- Turn left onto Ayers Road and continue as it turns into Henschke Road;
- Access the Southern Wind Farm Access Point from Henschke Road;
- Turn left onto Camel Hump Road and access the Southern Wind Farm Access Points.

Tungkillo Substation/Transmission Line

- John Rollond Rd, Brinkworth Rd, Brinkworth Range Rd, Collins Rd will be accessed via Ayres Road and will be used for the construction of the Transmission line and access to the existing Tungkillo Substation for upgrade and connection works.

It is estimated that this route will take just over 2 hours for a vehicle travelling at designated speed limits.

Alternative Routes

Should the above route be deemed by the relevant road authority to not adequately be able to accommodate the proposed development traffic generated by the wind farm, a number of alternative access routes have been identified, as shown in Table 8.

Table 8 Alternative Access Routes to Southern Site

Proposed Route Segment	Alternative Route
Milendella Road	Ridley Road and Randell Road Walker Flat/Mt Pleasant Road and Davenport Road
Adelaide-Mannum Road	No Alternatives Identified
Reedy Creek Road	Western Boundary Road and Southern Section of Reedy Creek Road Randell Road, Ayers Road, Henschke Road and Hoads Fire Track Randell Road, Ayers Road, Henschke Road, Brinkworth Road and Pebbly Range Road Randell Road, Ayers Road, John Holland Road, Brinkworth Road and Hoads Fire Track Randell Road, Ayers Road, John Holland Road, Brinkworth Road and Pebbly Range Road
Botroff Hill Road	Randell Road, Ayers Road, Henschke Road and Hoads Fire Track Randell Road, Ayers Road, Henschke Road, Brinkworth Road and Pebbly Range Road Randell Road, Ayers Road, John Holland Road, Brinkworth Road and Hoads Fire Track Randell Road, Ayers Road, John Holland Road, Brinkworth Road and Pebbly Range Road
Ayers Road	Reedy Creek Road and Botroff Hill Road.
Henschke Road	Reedy Creek Road and Botroff Hill Road. John Rolland Road and Brinkworth Road
Camel Hump Road	Reedy Creek Road

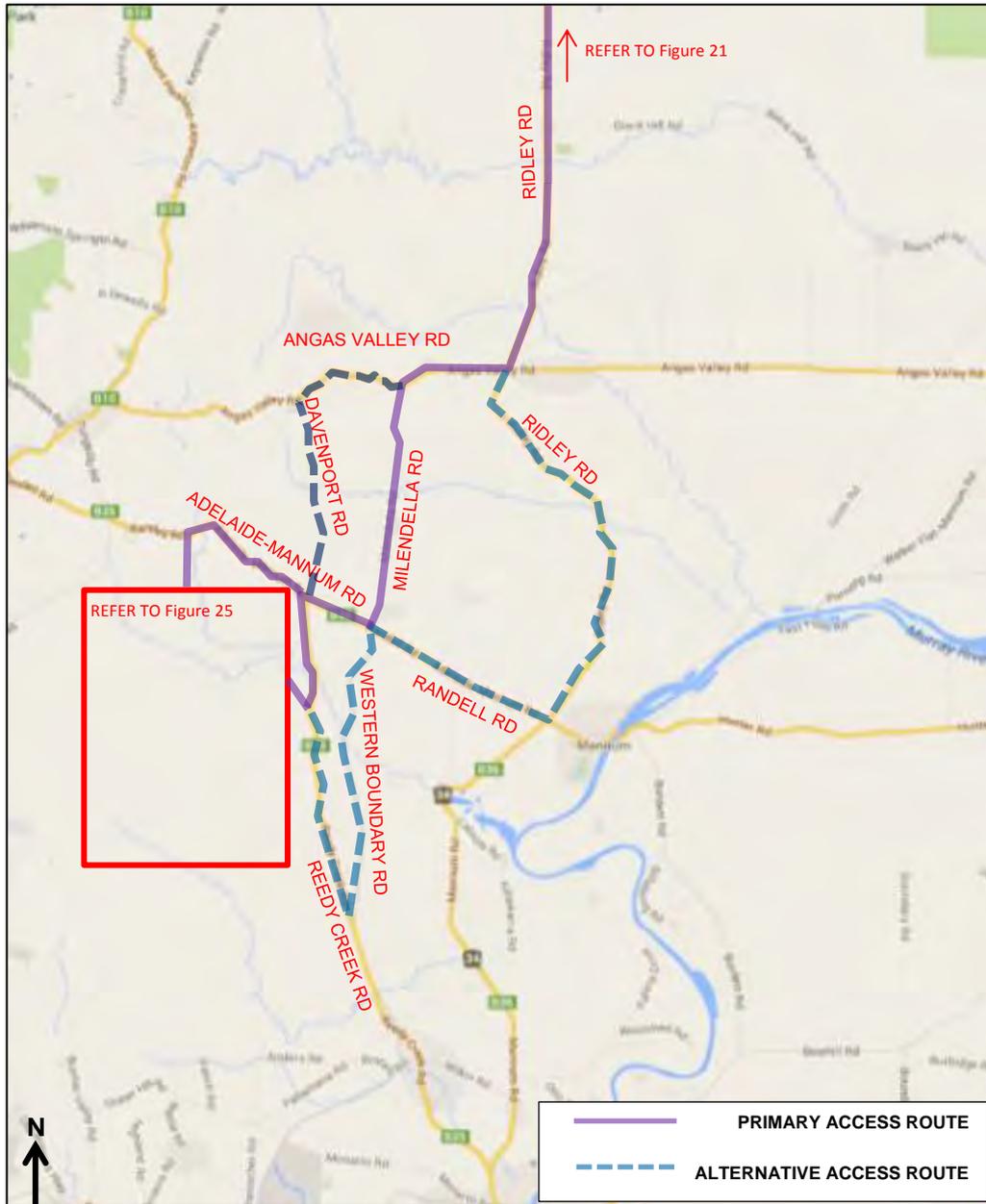


Figure 24 Proposed Route between Sturt Highway (A20) and Southern Site

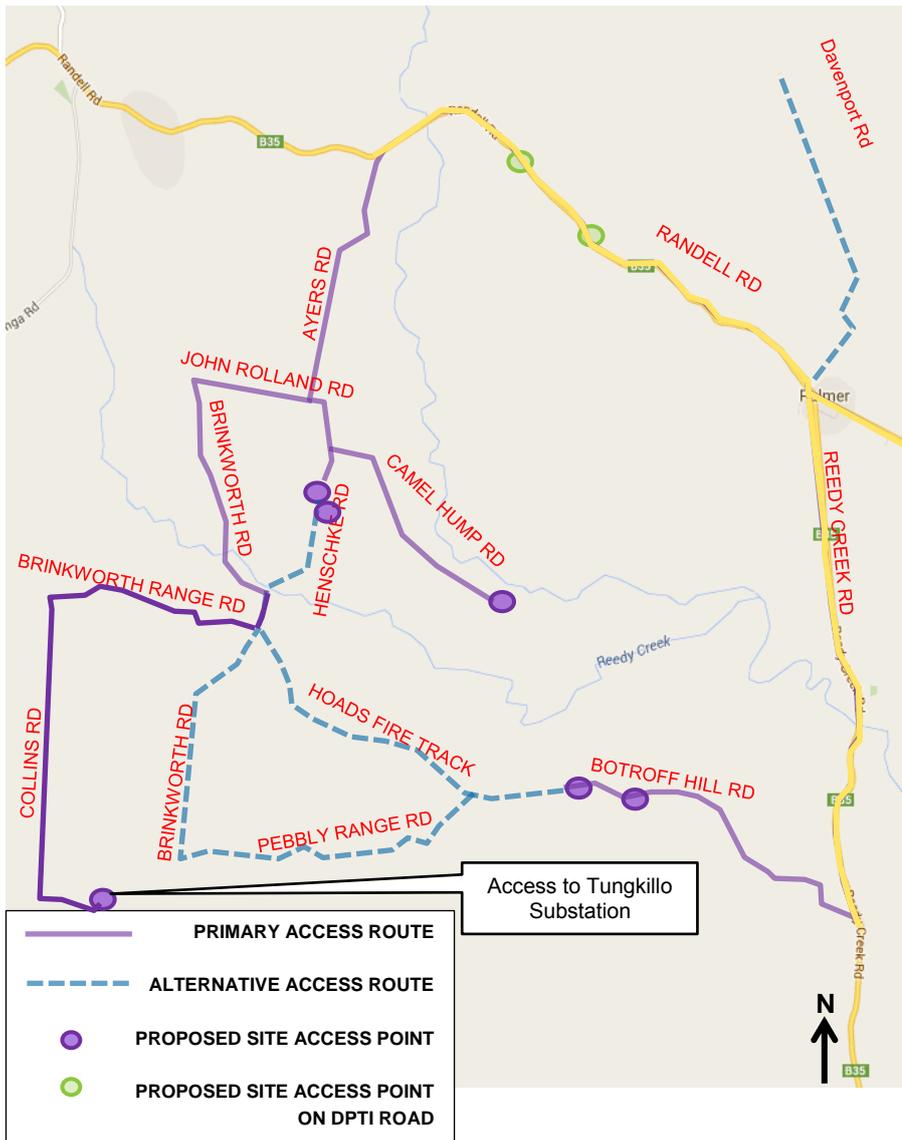


Figure 25 Proposed Route between Sturt Highway (A20) and Southern Site Access Points

5.3 Port Adelaide to Palmer (via South Eastern Freeway)

5.3.1 Route

An alternative key transport route for heavy vehicle movements between Adelaide and Palmer is via the South Eastern Freeway (M1), as shown in Figure 26.

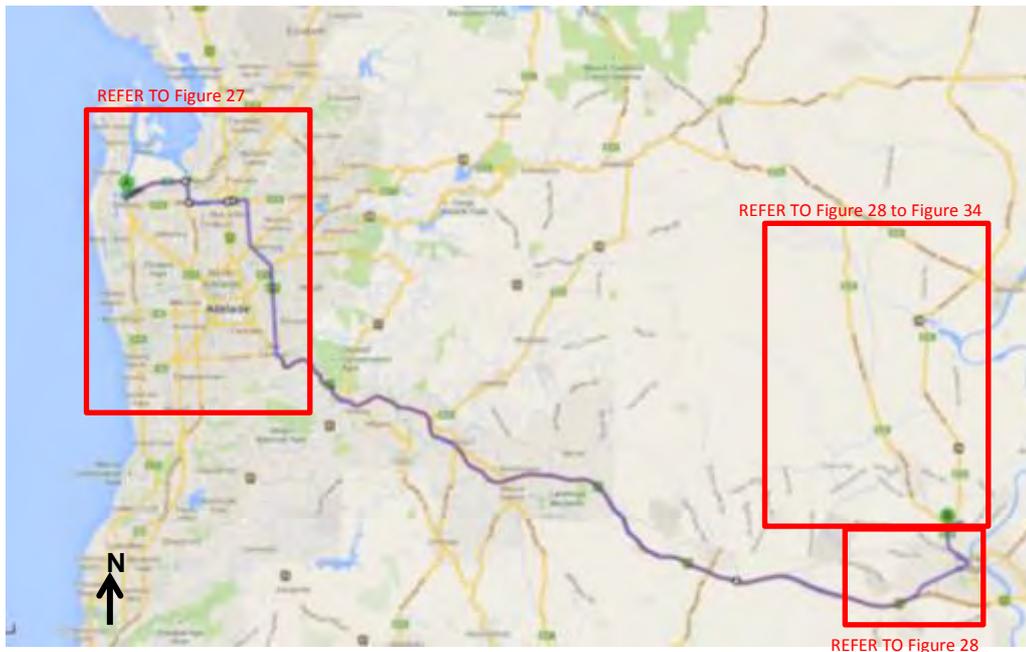


Figure 26 Proposed Route between Port Adelaide and Palmer

To access the South Eastern Freeway from Port Adelaide it is recommended that vehicles use the below route (Figure 27):

- Exit the dock area onto Victoria Rd and continue as it turns into the Port River Expressway;
- Travel along the Port River Expressway;
- Take the Wingfield Exit at Salisbury to South Rd; travel along South Rd to Grand Junction Rd;
- Turn left at Grand Junction Rd. Travel along Grand Junction Rd, crossing over Port Wakefield Rd;
- Turn right onto Hampstead Rd. Follow Hampstead Rd;
- Veer left onto Ascot Avenue, Continuing along Ascot Avenue as it turns into Portrush Road;
- Follow Portrush Road to the base of the South Eastern Freeway (M1).

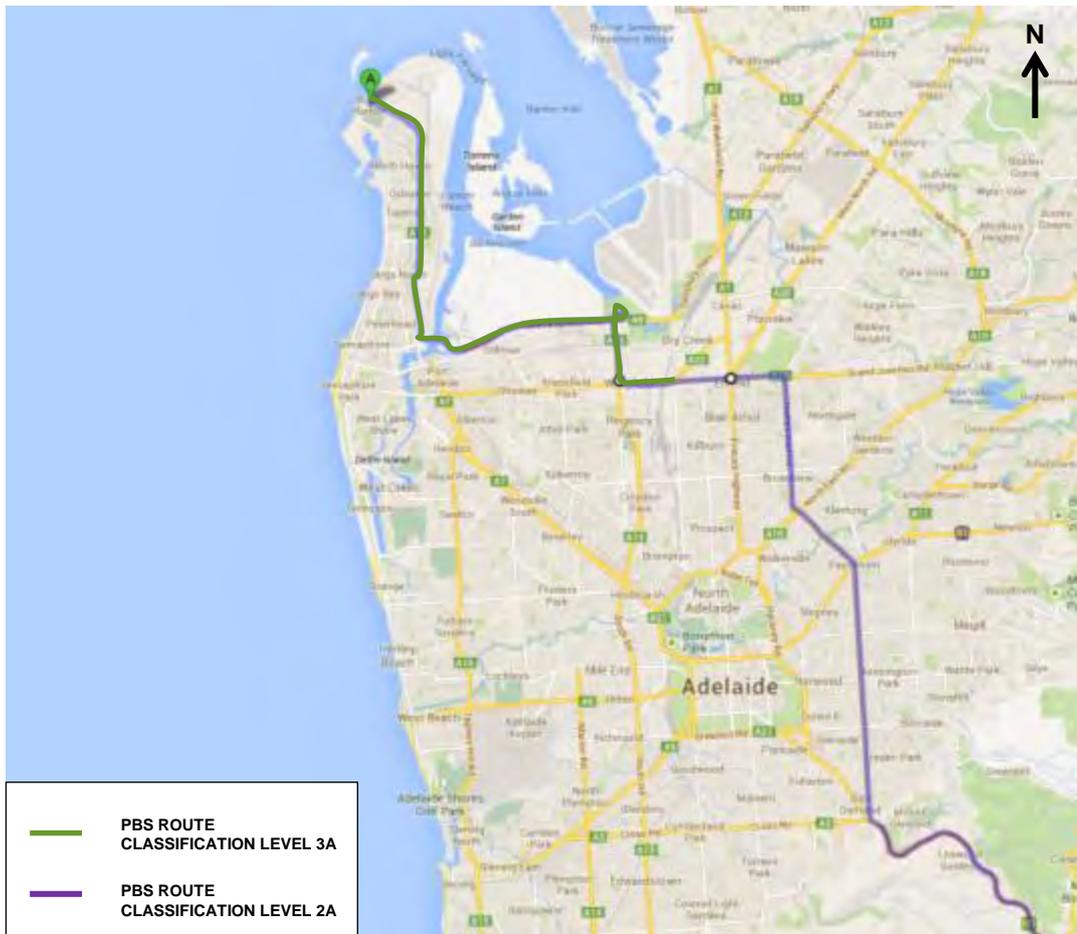


Figure 27 Proposed Route between Port Adelaide and the South Eastern Freeway (M1)

To access the site from the South Eastern Freeway it is recommended that vehicles use the below route (Figure 28):

- South Eastern Freeway (M1) turnoff at Murray Bridge at Princes Highway(Old)/Adelaide Road (B55);
- Turn left onto Maurice Road (Murray Bridge Heavy Vehicle Bypass Route) before turning right onto Cyprus Tce (Murray Bridge Heavy Vehicle Bypass Route);
- Follow Cyprus Terrace before turning left onto Mannum Rd; and
- Turn Left onto Reedy Creek Road and travel along Reedy Creek Road.

The vehicles would then use separate routes, as outlined below, to reach each of the sites.

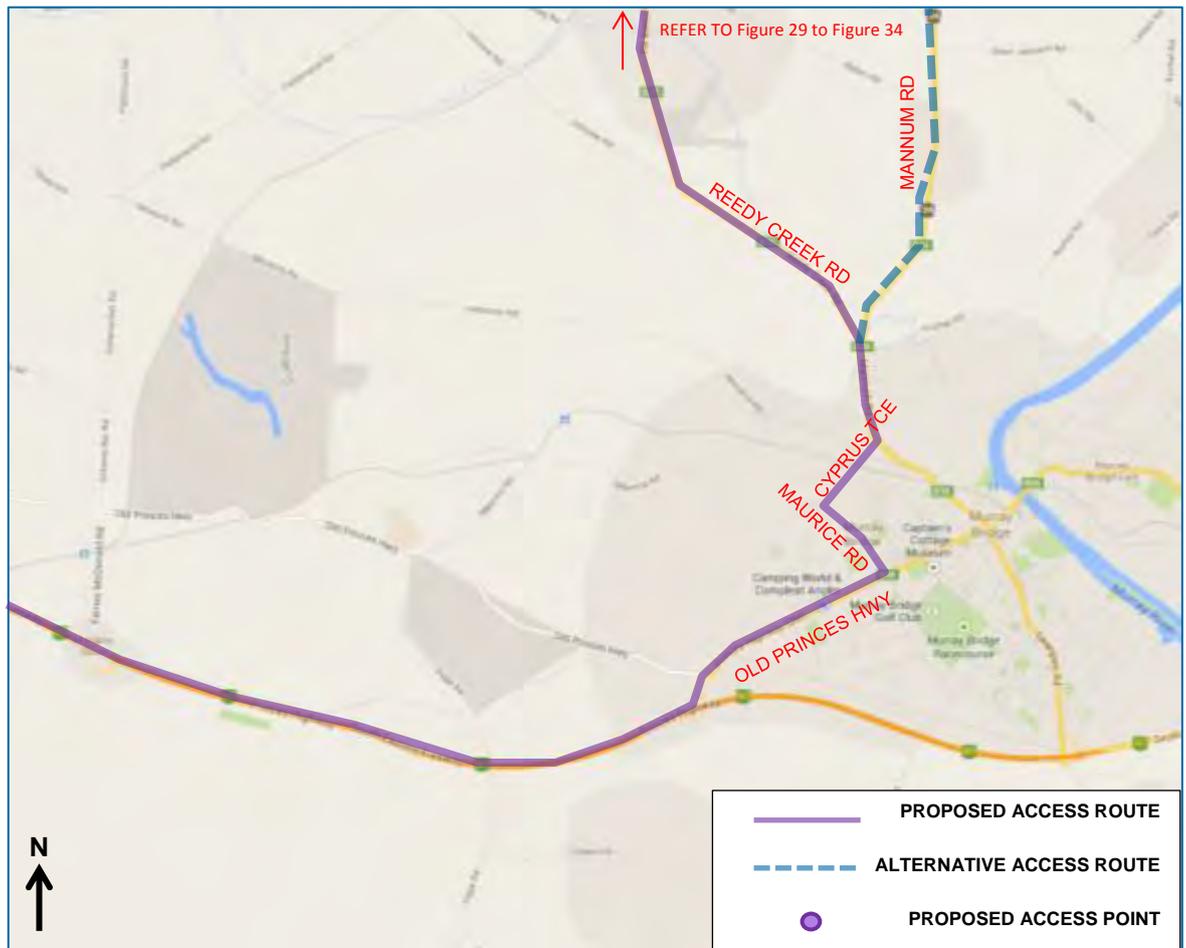


Figure 28 Proposed Route between the South Eastern Freeway (M1) and the proposed Wind Farm Sites

5.3.2 Northern Site Access

Primary Route

To access the proposed Northern Site Access Points, it is proposed that vehicles continue along the following route, as outlined in Figure 29 and Figure 30:

- Travel along Reedy Creek Rd;
- Turn right onto Randell Rd, travelling for short distance before turning left into Milendella Rd.

AND/OR

- Travel along Milendella Rd, continuing across the junction with Angas Valley Rd and onto Three Chain Rd, onto Glenroy Rd and then onto Sanderston Rd;
- Access Northern Wind Farm Access Points from Pohl Rd and Three Chain Road (via Preece Rd).

AND/OR

- Travel along Milendella Rd then turn right onto Angas Valley Rd and then turn left onto Ridley Rd. Continue along Ridley Road, turning left onto Paynes Rd accessing both Pohl Rd and Three Chain Rd (via Preece Rd) from Sanderston Rd(South).

AND/OR

- Travel along Milendella Rd then turn right onto Angas Valley Rd and then turn left onto Ridley Rd. Continue along Ridley Road, turning left onto Bundilla Rd accessing both Pohl Rd and Peerce Rd via Sanderston Rd and/or Three Chain Road via Bundilla Rd.

It is estimated that this route will take 2 hours and 30 minutes for a car travelling at designated speed limits.

Alternative Routes

There has also been a number of alternative access routes identified, as shown in Table 9.

Table 9 Alternative Access Routes to Northern Site

Proposed Route	Alternative Route
Reedy Creek Road	Mannum Road and Randell Road Mannum Road and Ridley Road Southern Section of Reedy Creek Road and Western Boundary Road
Randell Road	Mannum Road and Ridley Road
Milendella Road	Mannum Road and Ridley Road
Angas Valley Road	Mannum Road and Ridley Road
Glen Roy Road	Angas Valley Road and southern section of Sanderston Road
Sanderston Road	Angas Valley Road, Ridley Road and Bundilla Road Continuation of Glen Roy Road, Ridley Road and Bundilla Road. Pine Crest Road
Minor Access Roads (including Preece and Pohl Road)	Private property access

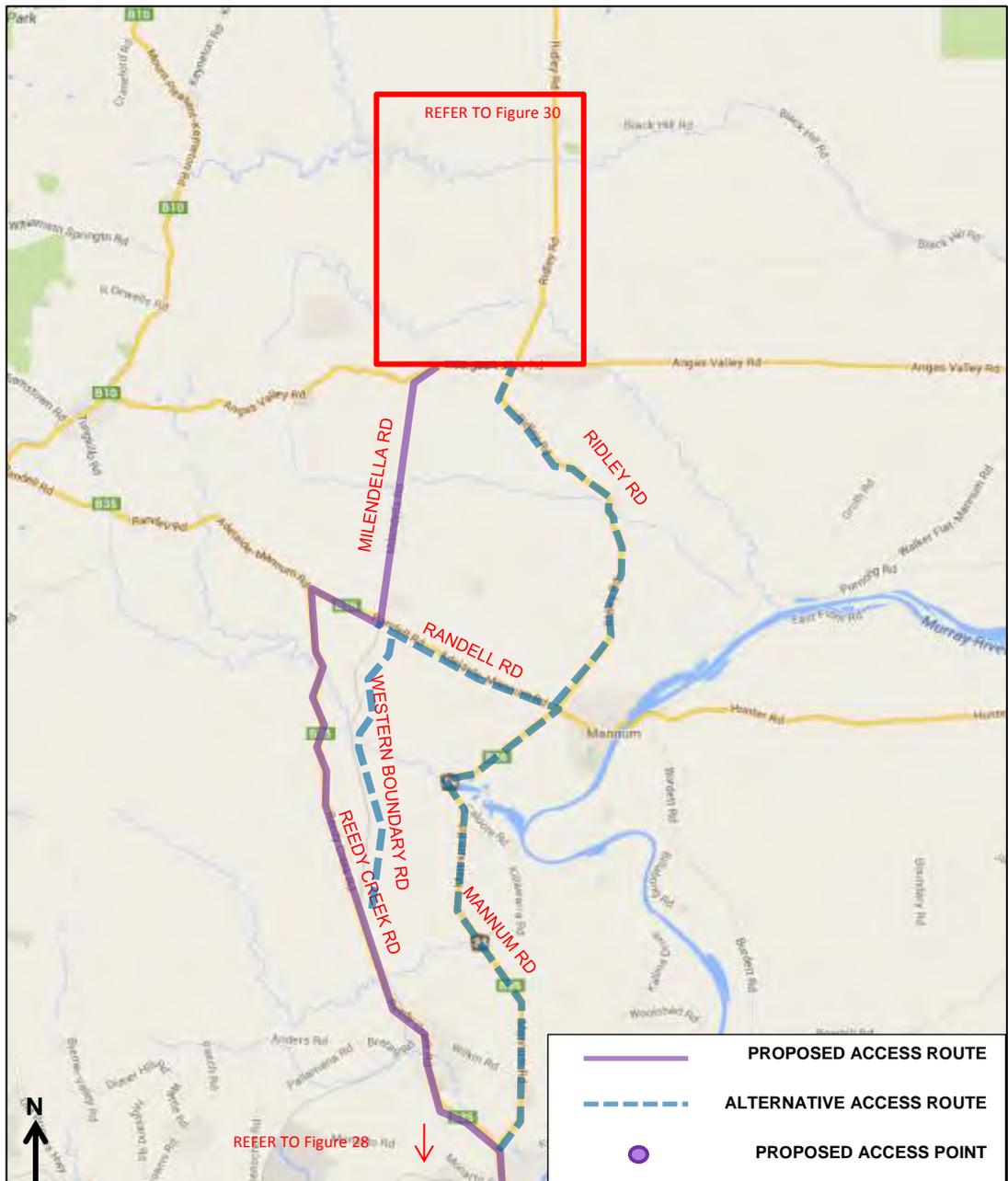


Figure 29 Proposed Route between South Eastern Freeway (M1) and Northern Site

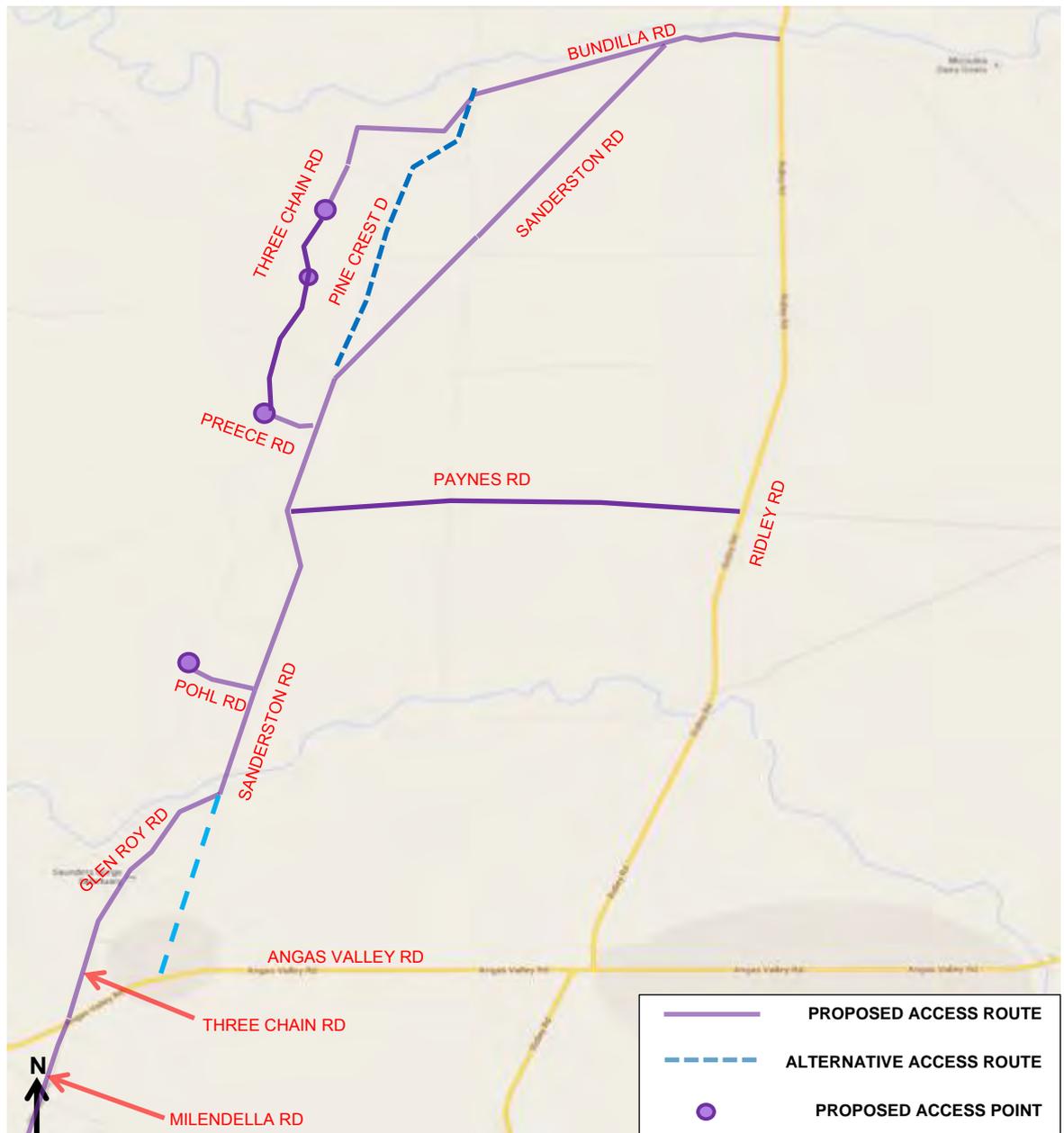


Figure 30 Proposed Route between South Eastern Freeway (M1) and Northern Site Access Points

5.3.3 Central Site Access

Primary Route

To access the Central Site Access Points, it is proposed that vehicles continue along the following route, as outlined in Figure 31 and Figure 32

- Travel along Reedy Creek Road;

AND /OR

- Turn right onto Randell Road and then turn left onto Milendella Road. Continue along Milendella Rd turning left onto Angas Valley Road accessing the Central site via Davenport Rd and through the 3 access points on Angas Valley Rd and;
- Davenport Road will have potentially 3 wind farm access points and will be used to access both D Collins Road and Borthwick Brae Road (East access point).

AND/OR

- Continue across the junction with Randell Road onto Davenport Road;
- Turn left onto Borthwick Brae Road to access Central Site Access Points and/or
- Continue on Davenport Road and turn right onto D Collins Road to access Central Site Access Points and/or
- Continue on Davenport Road, before turning onto Angas Valley Road to access the 3 wind farm access points along Angas Valley Road.

AND/OR

- Turn right onto Randell Rd and then left onto Rathjen Rd. Continue along Rathjen Rd and turn onto Gap Rd using the wind farm access points along Gap Rd.

AND/OR

- Turn left onto Randell Rd using the wind farm access point along Randell Rd and turning right onto Borthwick Brae Rd (western access point).

It is estimated that this route will take just over 2 hours for a car travelling at designated speed limits.

Alternative Routes

There has also been a number of alternative access routes identified, as shown in Table 10.

Table 10 Alternative Access Routes to Central Site

Proposed Route	Alternative Route
Reedy Creek Road	Mannum Road and Randell Road Mannum Road, Ridley Road and Angas Valley Road Southern Section of Reedy Creek Road and Western Boundary Road
Davenport Road	Randell Road, Milendella Road and Angas Valley Road Randell Road and Borthwick Brae Road Randell Road, Alternative Access Route and Borthwick Brae Road
Borthwick Brae Road	Private access tracks
Milendella Road	Randell Road

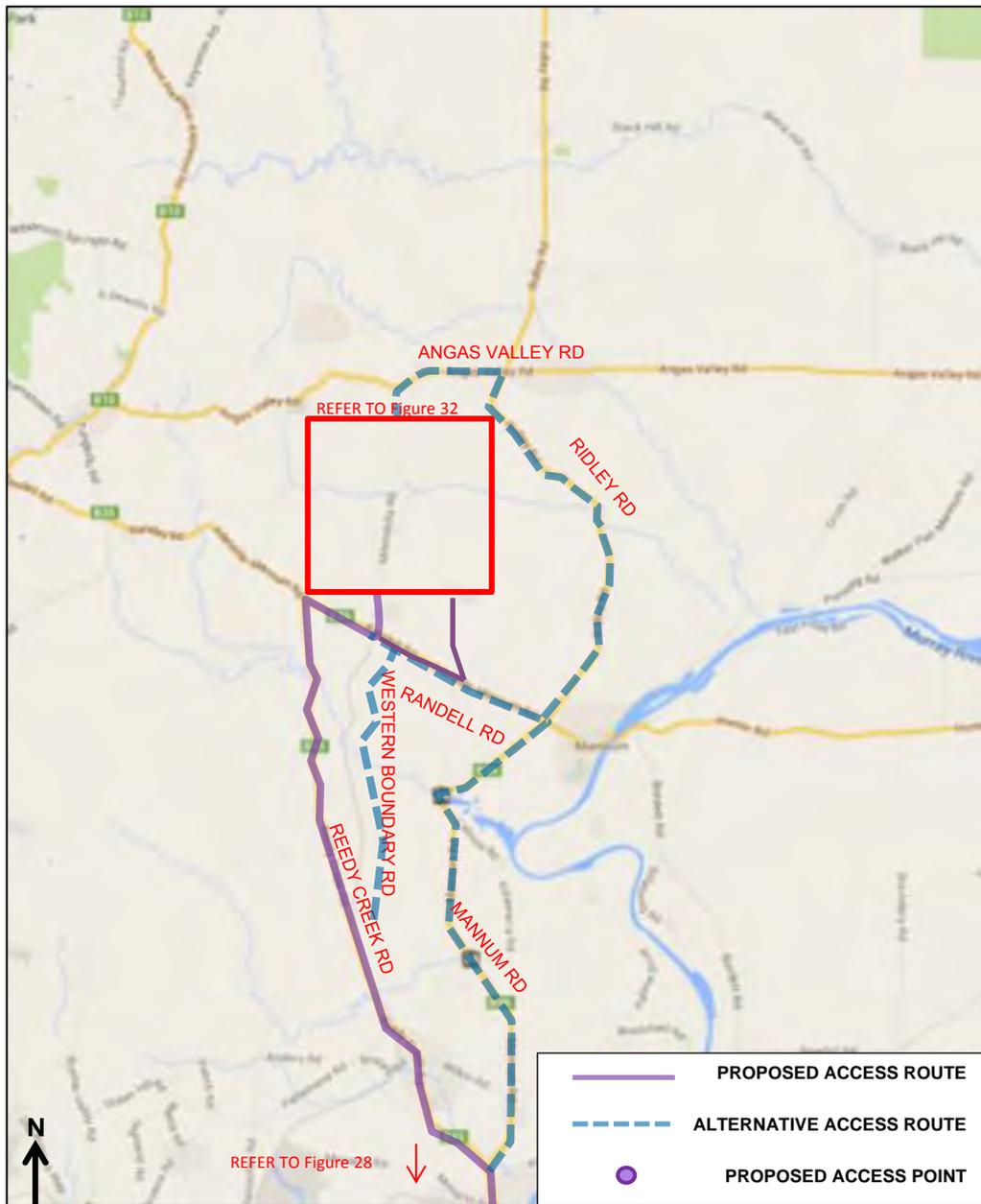


Figure 31 Proposed Route between South Eastern Freeway (M1) and Central Site

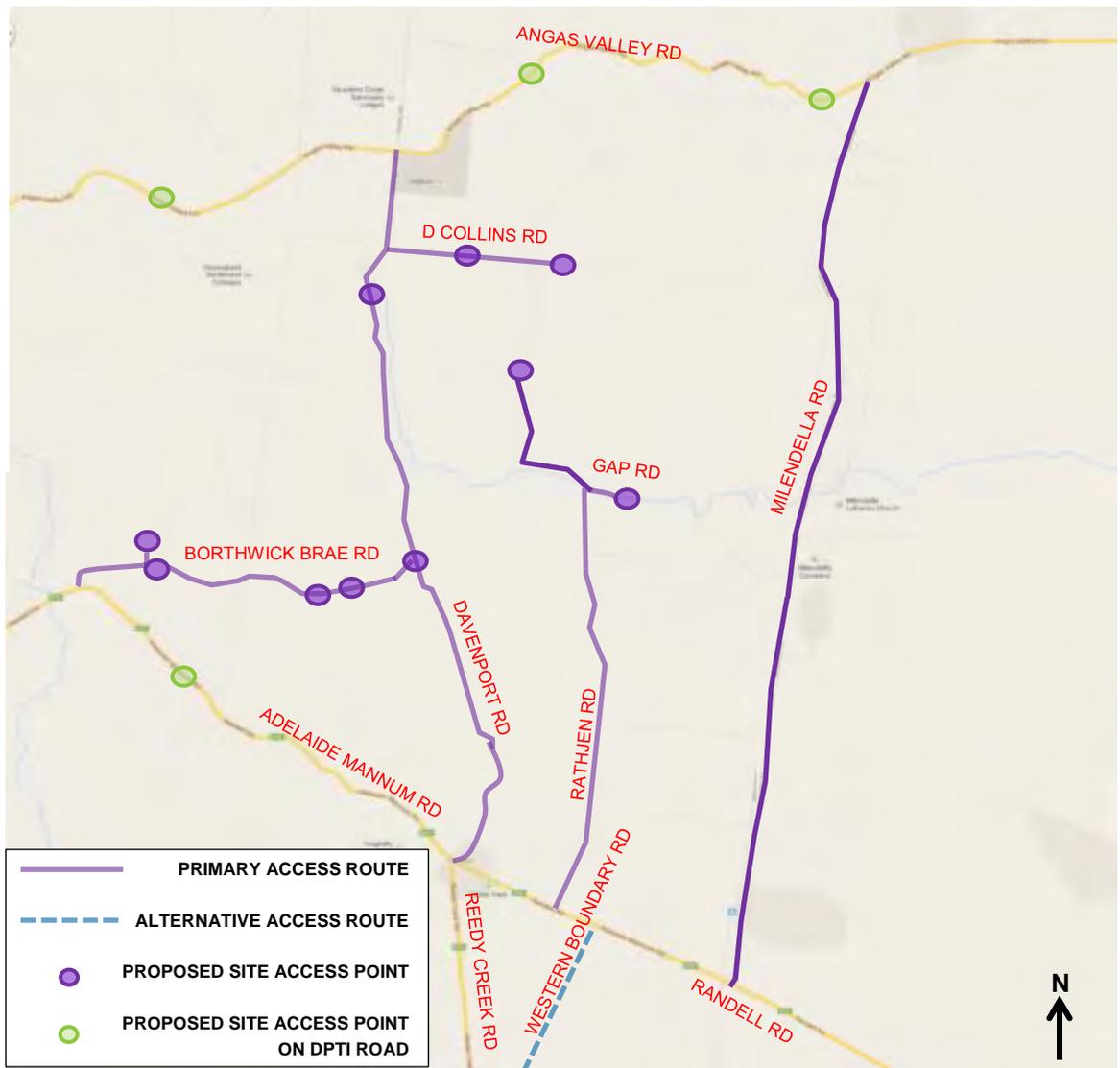


Figure 32 Proposed Route between South Eastern Freeway (M1) and Central Site Access Points

5.3.4 Southern Site Access

Primary Route

To access the Southern Site Access Points, it is proposed that vehicles continue along the following route, as outlined in Figure 33 and Figure 34

- Travel along Reedy Creek Road;

AND/ OR

- Turn left onto Botroff Hill Road and access Southern Site Access Points from Botroff Hill Road; and
- Turn left at Randell Rd;
- Continue along Randell Rd to access Southern Site Access Point located on Randell Rd and/or;
- Continue along Randell Rd, turning left onto Ayers Road and continue as it turns into Henschke Road;
- Access Southern Site Access Point from Henschke Road ;and/or

- Turn left onto Camel Hump Road and access Southern Site Access Points.

Tungkillo Substation/Transmission Line

- John Rollond Rd, Brinkworth Rd, Brinkworth Range Rd, Collins Rd will be accessed via Ayres Road and will be used for the construction of the Transmission line and access to the existing Tungkillo Substation for upgrade and connection works.

It is estimated that this route will take 2 hours for a car travelling at designated speed limits.

Alternative Routes

There has also been a number of alternative access routes identified, as shown in Table 11.

Table 11 Alternative Access Routes to Southern Site

Proposed Route	Alternative Route
Reedy Creek Road	Western Boundary Road and Randell Road
Adelaide-Mannum Road	No alternatives identified
Botroff Hill Road	Reedy Creek Road, Randell Road, Ayers Road, Henschke Road and Hoads Fire Track Reedy Creek Road, Randell Road, Ayers Road, Henschke Road, Brinkworth Road and Pebbly Range Road Reedy Creek Road, Randell Road, Ayers Road, John Holland Road, Brinkworth Road and Hoads Fire Track Reedy Creek Road, Randell Road, Ayers Road, John Holland Road, Brinkworth Road and Pebbly Range Road
Ayers Road	Reedy Creek Road and Botroff Hill Road.
Henschke Road	Reedy Creek Road and Botroff Hill Road. John Rolland Road and Brinkworth Road
Camel Hump Road	Private property access



Figure 33 Proposed Route between South Eastern Freeway (M1) and Southern Site



Figure 34 Proposed Route between South Eastern Freeway (M1) and Southern Site Access Points

5.4 Melbourne to Palmer

It is expected that the majority of the equipment and materials will be transported from the Port of Adelaide, However there may be a small element of equipment and materials that may need to be sourced from interstate, for example the Port of Melbourne.

The key transport routes for heavy vehicles, as well as the principal route for over mass and over dimensional loads between Melbourne and Palmer (as identified by VicRoads) is shown in Figure 35.

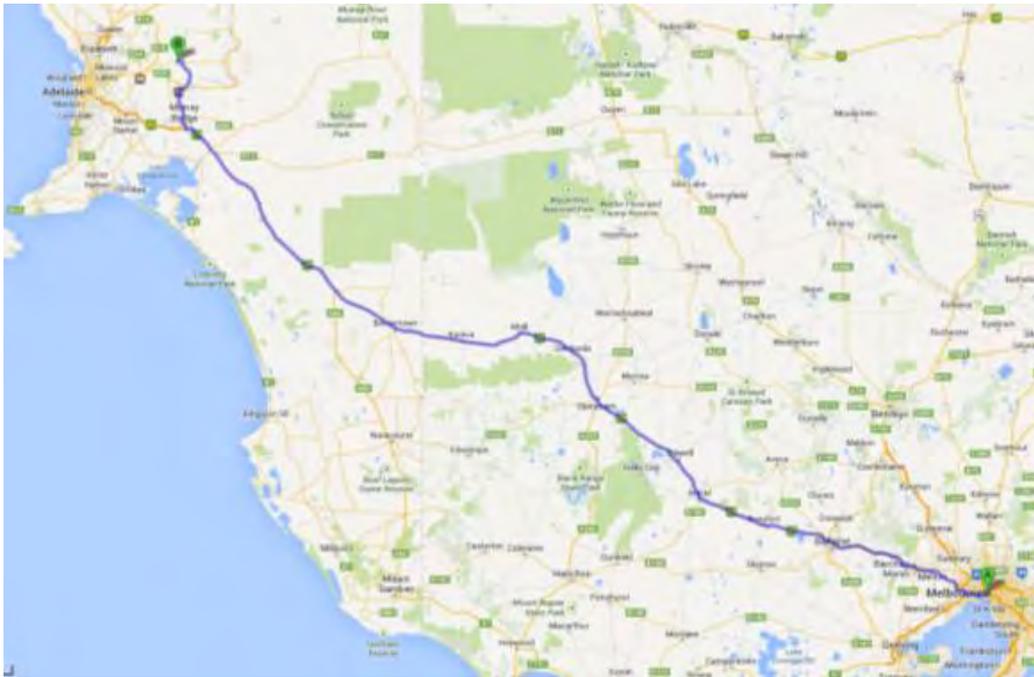


Figure 35 Key Transport Routes between Melbourne and Palmer

If materials are required to be sourced from interstate and will need to access the site from the Dukes Highway (A8) it is recommended that vehicles use the below route:

- South Eastern Freeway (M1) turnoff at Murray Bridge at Swanport Rd;
- Continuing along Swanport Rd as it turns into Mannum Rd;
- Travel along Mannum Rd;
- Continue along routes to individual sites in accordance with Section 5.3.

If it is found that multiple components will need to be sourced from interstate, it is recommended that this route is investigated further to identify any potential constraints.

5.5 On Site Access

The intersection of the proposed site access points with the public road network will be designed, through consultation with DPTI, to achieve the minimum standards of sight distance and adequate road safety. It will be necessary however, during the delivery of over dimensional and / or over mass loads, that traffic be monitored at these locations with appropriate traffic control, slower travel speeds and prior notification to affected properties.

It is understood that there is scope at some locations along the proposed routes to utilise the existing road reserve and/or private properties to improve sight distance and road safety in accordance with standards and guidelines. This may include road realignment or provision of turn bays. In any case, consultation and approval from DPTI and/or Council would be required during this process.

5.6 Access Tracks

Access tracks will be constructed within the proposed wind farm site to enable heavy vehicle access to the wind turbine locations during the construction, operation and decommissioning phases.

The access tracks will be constructed in part by incorporating existing farm tracks where practicable or upgrading local roads to minimise the impacts on landowners and the need to clear existing vegetation. The tracks will be gated to discourage general public traffic accessing the site and will be upgraded, as required, to be at least 10 m in width and re-graded to accommodate the construction activities and associated vehicle types.

6. Traffic Impact Assessment

6.1 Introduction

The proposed wind farm development will generate extra traffic during the construction, operations and decommissioning phases. The traffic generated during the construction and decommissioning phases would likely be similar, however would both vary greatly with that generated during the operations phase.

The construction and decommissioning phases are expected to take between 18 and 24 months and the operations phase is expected to be for at least 30 years.

6.2 Construction Phase Traffic Impacts

6.2.1 Traffic generation

As discussed in Section 4.3.1, during the construction period the traffic impacts will primarily be associated with the following transport activities to and from the site:

- Transportation of the wind turbine components (including nacelle, hub, blades and tower sections) and permanent wind monitoring masts. The transportation of this equipment will involve delivery vehicles that are over dimensional, over mass or both to transport the individual components on account of the size and weight.
- Transportation of the electrical substation equipment. The transportation of the transformers will involve delivery vehicles that are over dimensional, over mass or both on account of the size and weight. Semi-trailers will be employed to deliver other substation equipment including that required for an upgrade for the existing Tungkillio Substation. It is anticipated that access to the substation will be only necessary during the construction stage; with minimal requirements for access to the substation once the proposed turbines are operational;
- Transportation of materials for the construction of access tracks, hard stand areas, permanent maintenance facility, underground cabling and overhead power lines. Semi-trailers and smaller trucks will deliver general construction materials and equipment. Where practicable construction materials will be sourced locally to alleviate the impacts on the road network and facilitate in enhancing the local economy;
- Transportation of concrete for the turbine foundations. Concrete will be sourced from temporary concrete batching plants located onsite. If concrete is to be sourced externally this could add up to 56 extra movements per turbine;
- Transportation of cranes and earthmoving equipment; and
- The daily travel of up to about 200 construction personnel. The estimated maximum trips for construction staff movements to and from the site are 270 trips per day, based on an estimated maximum workforce at any one time of 200, and assuming a vehicle occupancy rate of 1.5 persons per vehicle.

The principal items of material and equipment to be delivered to the site, the estimated quantities of these materials, the types of vehicles expected to access the site and the estimated number of vehicle movements the activity is likely to occur over the construction period is summarised in Table 12. The construction phase is expected to take between 18 and 24 months; however a construction period of 18 months has been assumed, as this will be the worst case scenario in terms of traffic loading.

Table 12 Estimated Total Trips generated by the proposed wind farm site

Material	Estimated Quantity	Vehicle Type	Estimated One-Way Vehicle Trips		
			Total Trips ¹	Average Trips/Month ²	Average Trips ₃ /Day
Concrete Materials ⁴	69 871 cubic metres	Semi-trailers	4689	260	12
Reinforcing Steel	3759 tonnes	Semi-trailer	501	28	1
Road base ⁵	413 710 cubic metres	Semi-trailer	27581	1532	70
Select Fill ⁵	165 484 cubic metres	Semi-trailer	11032	613	28
Miscellaneous Equipment	Nominal	Semi-trailer	800	44	2
Miscellaneous Materials	Nominal	Semi-trailer	147	8	0
Wind Turbine Components					
Tower Sections ⁶ (4 per tower)	456	Over size / over mass vehicle	912	51	2
Nacelles (2 sections) + Hub	342	Over size / over mass vehicle	684	38	2
Blades (3 per turbine)	342	Over size / over mass vehicle	684	38	2
Top controller, switch cabinet, transformer and fasteners.	114	Boom Truck	228	13	1
Substation					
Substation Transformer	1	Over size / over mass vehicle	2	0	0
Switchgear and other substation equipment	Nominal	Semi-trailer	9	1	0
Site Work Activities					
Site Establishment	Nominal	Semi-trailer	55	3	0
Cranes	6	Semi-trailer and mobile wheel based cranes	55	3	0
Employees ⁸	200	Car / 4WD	105,600	5867	267
Construction Equipment	90	Various	165	9	0
Site Rehabilitation	Nominal	Semi-trailer	55	3	0
Total Trips – Traffic Movements					
Over size / oversize vehicles			2282	127	6
Trucks			45318	2518	114
Cars			105600	5867	267
TOTAL			153200	8511	387

1. By definition a trip is a single direction movement, a return trip therefore counts as 2 trips

2. Construction period has been assumed to be about 18 months.
3. Assumed an average of 22 working days per month
4. It has been assumed that concrete materials are to be provided by an outside source (e.g. quarry) and then are to be processed by the on-site concrete batching plant. If materials were able to be sourced on site or nearby than the trip generation would be significantly less
5. It has been assumed that road base materials are to be provided by an outside source. If materials were able to be sourced on site or at a nearby quarry than the trip generation would be significantly less
6. It has been assumed that the wind turbine towers and wind monitoring masts will be 100 m tall
7. It has been assumed that there are a total of six wind monitoring stations (two per site)
8. Based on an estimated maximum workforce at any one time of 200, and assuming a vehicle occupancy rate of 1.5 persons per vehicle.
9. The traffic movements do not include those required for the transmission line and any works at Tungkillo as this is unknown at the time of preparation of this report.

The total one-way vehicle trips estimated for the construction phase of the proposed wind farm are shown to be reasonably significant, comprising of approximately:

- 2 282 over mass and over dimensional trips;
- 45 318 truck trips; and
- 105 600 car trips.

The above listed trips however, will occur over a minimum 18 month period. When broken down to average trips per month and per day the impacts on the road network are shown to be more reasonable. The average daily trips are:

- 6 over mass and over dimensional trips. If these trips are carried out during off-peak hours and are delivered to Palmer from Port Adelaide, the impacts on the road network would be minimised. It should be noted that this number accounts for loaded vehicles accessing the site and unloaded vehicles leaving the site. It is likely that the over mass vehicles will be within mass limits once unloaded and a number of the over dimensional vehicles will be within legal size requirements once unloaded, hence this figure is very conservative;
- 114 truck trips. The average number of daily truck trips on the surrounding road network could be further reduced if materials for concrete and pavement could be sourced on site or from a nearby location. The implementation of a temporary storage area for equipment and vehicles within the temporary construction compound would also further assist in reducing the number of heavy vehicle trips generated; and
- 267 car trips. These trips will primarily be associated with employees arriving to/from work. Carpooling should be encouraged amongst employees.

6.2.2 Trip Distribution

The vehicle trips associated with the construction phase will access the site via three key transport routes as discussed in Section 5 and highlighted in Figure 36.

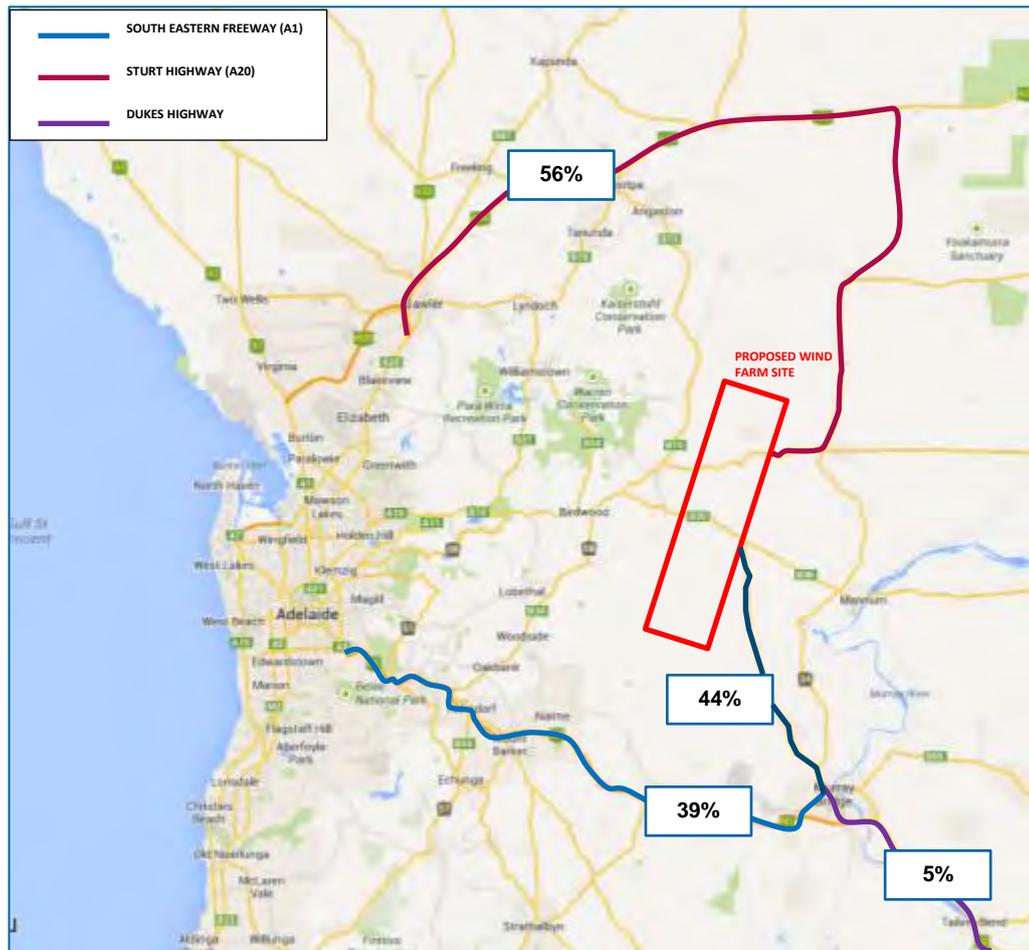


Figure 36 Estimated Trip Distribution for traffic generated by proposed Wind Farm in construction phase

These include:

- Dukes Highway. It is currently assumed that about 10% of over dimensional/mass vehicles and 20% of truck trips would access the site from areas in the south east via this route, such as Melbourne. This results in 6% of total vehicles accessing the site from the Dukes Highway.
- Sturt Highway. It is recommended that all remaining dimensional/mass vehicles (90%) utilise the Sturt Highway Route to avoid height restrictions on the South Eastern Freeway. It is also assumed that 70% of truck trips and 50% of employee trips will also utilise this route. This results in 56% of total vehicles accessing the site from the Sturt Highway.
- South Eastern Freeway. It is assumed that the remaining 10% of truck trips and 50% of employee trips will utilise the South Eastern Freeway Route, resulting in 38% of all trips utilising the South Eastern Freeway to access the sites.

As both the Princes Highway/Dukes Highway and the South Eastern Freeway traffic will access the sites from Murray Bridge, 44% of the total construction traffic will be accessing the sites using the routes specified in Section 5.3 Port Adelaide to Palmer (via South Eastern Freeway).

The use of all three transport routes for construction vehicles would alleviate the overall traffic impacts on the surrounding road network. The majority of the delivery of over dimensional and over mass loads however, will be via the same transport route via Sturt Highway. Consistency with the travel route for over dimensional and over mass vehicles would assist the permit approval process, as well as improve safety for the local community and road users due to familiarity.

6.2.3 Impact Assessment

Based on the existing daily traffic volumes and levels of service for the local regional/collector roads surrounding the proposed wind farm as discussed in 3.3.2 (including Adelaide-Mannum Road and Walker Flat-Mount Pleasant Road), the estimated increase in daily trips during the construction period phase of the proposed wind farm will not impact significantly on the existing level of service.

A comparison of existing traffic volumes against the estimated traffic volumes during the construction period is shown in Table 13.

Table 13 Comparison of Existing Traffic Volumes against Estimated Traffic Generated by the Wind Farm

Impacted Road	Existing Traffic Volume (AADT)	Existing % HV	Traffic generated by construction period (vpd)	Estimated Traffic Volume during Construction Period (AADT)	Estimated % HV during Construction Period
Adelaide-Mannum Road	1900	10.5	131	2028	11.7
Mannum Road	1800	9.5	0	1800	9.5
Randell Road (Between Milendella and Reedy Creek Road)	1000	9	188	1183	11.7
Reedy Creek Road	1200	12	240	1440	14.2
Ridley Road (between Walker Flat-Mt Pleasant Rd and Halfway House Road)	950	16	219	1169	15.4
Walker Flat/Mt Pleasant Road	440	7.5	200	640	15.8

Where AADT refers to Annual Average Daily Traffic.

6.3 Operations Phase Traffic Impacts

6.3.1 Operations and Maintenance

The proposed wind farm is designed for stand-alone remote operation. Generally it will operate with reduced staffing levels for most of its operational life, and therefore the traffic associated with the long-term operation of the wind farm will be nominal. There are two phases of operation post the construction phase. These include:

1. Commissioning and Testing; and
2. Operations and Maintenance.

During the initial commissioning and testing phase of its operation, the proposed wind farm will require attendance by a small number of technical and maintenance staff (up to 30 staff) on a daily basis for a period of 2 to 4 months. Under normal conditions there will be 10-15 personnel on attendance at site each day to undertake site inspections and maintenance (routine and unscheduled).

It is expected that the routine maintenance activities will require the site to be accessed approximately every 3 to 6 months by up to 4 to 6 people. These people will be in addition to the regular maintenance staff. Any unscheduled maintenance or repairs may require attendance at site by additional specialist personnel and equipment.

Based on the above activities the operational traffic level will be low and primarily consist of light commercial vehicles such as light vehicles and four wheel drives. Larger equipment may be required for major unscheduled maintenance events such as the replacement of a gearbox or turbine component (such as, blade or nacelle) that cannot be repaired on-site. These would likely be sourced from Port Adelaide. Vehicle movements associated with the delivery of equipment to and from Port Adelaide will be dependent on the equipment being transported and will likely be via the routes discussed in Section 5.

6.4 Decommissioning Phase Traffic Impacts

At the end of the operations phase of the proposed wind farm a decision will be made whether to erect new turbines on the site or to formally decommission the proposed Palmer wind farm, remove the existing turbines and rehabilitate the site.

Whether new turbines are erected or the site decommissioned and rehabilitated both options will require the removal of the proposed above ground infrastructure. The traffic impacts would likely be similar or somewhat slightly less to the construction phase, as the need to construct the concrete foundations and access tracks will not be required. The traffic generation and associated impacts will need to be assessed at the time of decommissioning, as the traffic conditions on the surrounding road network would likely be altered over a 30 year period.

7. Potential Impacts

7.1 Introduction

The following traffic and transport impacts associated with the proposed wind farm require consideration. These include:

- Suitability of the existing road layout and structural capacity;
- Impact to other road users and local community;
- Traffic safety; and
- On-site traffic management.

The above listed traffic and transport impacts will primarily be associated with the construction phase due to the size and weight of the wind turbine components and substation transformers to be delivered to the proposed wind farm site. Each of the above issues is discussed below, however will need to be assessed in more detail as the project progresses into the design and construction phases.

7.2 Suitability of Existing Road Layout and Structural Capacity

Given the volume and type of traffic likely to be generated by the proposed wind farm, in particular for over dimensional and over mass vehicles, a key issue is whether the layout of the existing road network is deemed satisfactory to provide safe access to the proposed wind farm site.

The major highways / roads that will most likely transport the equipment and materials to the proposed wind farm site from Adelaide and /or Melbourne include Dukes Highway, Princes Highway, South Eastern Freeway and / or Sturt Highway. These highways / roads are currently designated as heavy vehicle transport routes and all experience a high and constant flow of freight transport on account of the weekly movements of goods between Adelaide, Melbourne and Sydney. These major routes are therefore not considered to pose a significant issue.

The main issues to be considered and assessed prior to construction along the defined site access route(s) include:

- The bend radii and road widths at intersections where turn movements will be carried out, curvature sections along the road alignment and bridges for over dimensional vehicles (in particular, for delivery vehicles with a total length greater than 30 m) are satisfactory.
- Overpass clearance checks along the entire route are carried out for overhead power lines, overhead toll gates and gantry signs for over dimensional vehicles (in particular, for delivery vehicles with a total height greater than 5 m).
- The road surface capacity and condition, particularly along the access tracks and local roads surrounding the proposed wind farm site are currently and / or upgraded to a satisfactory condition to accommodate the construction activities. These access tracks and local roads are not designed and constructed for the passage of over mass vehicles, consequently any deterioration or road wear such as potholes or edge spalling will likely be accelerated by the passage of a large number of heavy loads.
- The structural capacity of road infrastructure such as bridges and drainage culverts along the identified site access route(s) are suitable to accommodate the over mass loads.

This is usually undertaken as a heavy vehicle route assessment in association with DPTI. A preliminary desktop assessment and high level site assessment has been carried out to identify the preferred site access routes to and from the proposed wind farm site (as discussed in

Section 7.6) however the above listed issues will need to be addressed in more detail as part of the vehicle route assessment when applying for over mass and over dimensional vehicle permits.

7.3 Impact to Other Road Users and Local Community

The over dimensional and over mass vehicles required for the delivery of the wind turbine components and substation transformers to the proposed wind farm site has the potential to disrupt and restrict normal traffic flow along the route on account of their size and slow speed. This may result in temporary delays, as well as pose a hazard for local road users when passing through metropolitan areas or on single lane roads where there are no opportunities for traffic to overtake.

Residents located in the immediate vicinity of the proposed wind farm site, as well as near the identified site access route(s) will also likely experience an increase in noise levels due to the significant number of slow moving vehicles associated with the construction delivery vehicles.

The road user and local community issues will need to be addressed as part of a specific Traffic Management Plan (TMP) to be developed for the construction phase of works and community consultation program (as detailed further in Section 8).

7.4 Traffic Safety

Traffic safety will be paramount during the construction phase. The capacity of over dimensional and over mass vehicles to delay traffic may lead to other road users becoming frustrated and attempting unsafe overtaking manoeuvres. The significant increase in the number of over dimensional and over mass vehicle movements along a single route will likely compound the risk. Wide loads on single lane roads will also introduce a safety hazard for oncoming vehicles, as well as turning movements of such vehicles. These traffic safety issues would be addressed as part of the permit approval process and a specific TMP will need to be developed for the construction phase of works (as detailed further in Section 8).

In rural towns pedestrian movements and safety will also need to be a key consideration, particularly where the highway passes directly through a town centre. The transport of wind turbine components through town centres will attract attention and may pose an additional risk to the safety of pedestrians as well as other road users. This issue should be minimised, as the identified site access routes to the proposed wind farm site avoid direct access through the Mount Pleasant town centres, however a number of small towns may be affected en route. Heavy vehicles should avoid access routes through town centres during school drop off pick up times and peak periods to reduce the likelihood of potential incidents.

7.5 On-Site Traffic Management

The construction of the proposed wind farm will require that access tracks be constructed to each wind turbine location. These access tracks, as well as crane hardstands, will need to be of sufficient pavement design to facilitate the traffic of heavy and civil works vehicles.

The nature of the proposed wind farm site due to additional access tracks may include disturbance to habitat, potential erosion and the introduction and movement of weeds onto farmland.

Construction related vehicles will also be required to cross landowner boundaries and some may be entering the proposed wind farm site with loads that may carry unwanted plants, seeds or spores. The degree of concern regarding the spreading of weeds will vary with each landowner. The propagation of weed species may be a negative impact of transport on site and, depending upon the concerns of the landowner, may require control or mitigation through the use of wash down areas for vehicles. This issue will be managed through the

implementation of a specific Construction Environmental Management Plan (CEMP) and in a specific TMP to be developed for the operations and maintenance phase of works (as detailed further in Section 8).

During the operational lifetime of the proposed wind farm, traffic levels on the internal access tracks will be very light. Scheduled maintenance activities may occur on average every few months using light commercial vehicles or four wheel drives which will have a negligible impact. Rarely there may be the requirement for medium to large cranes to access the site in the unlikely case of the failure of a large component that cannot be repaired on-site, however this maintenance scenario will still need to be addressed in a specific TMP to be developed for the operations and maintenance phase of works (as detailed further in Section 8).

7.6 Constraints

A number of roads and access tracks selected to be part of the primary routes for wind farm traffic have already been identified as likely to need an upgrade to meet required standards. The following roads have been identified for potential upgrades if utilised as part of the final routes:

- Northern Site
 - Minor Access Tracks to access Northern Site Access Points from Sanderston Road, including Preece Road
- Central Site
 - D Collins Road
 - Gap Road
 - Borthwick Brae Road
- Southern Site
 - Botroff Hill Road
 - Camel Hump Road
 - Section of Henschke Road

7.7 Identified Potential Route Constraints

A high level site visit and consultation with council was undertaken by GHD on the 23rd September 2013 to identify any potential constraints to identify the preferred site access route(s). A number of potential issues were identified, and these are discussed in more detail below.

7.7.1 General

It is recommended that across all routes, current signage is assessed and appropriate signage installed at site access points (such as shown in Figure 37) and elsewhere as necessary.



Figure 37 Recommended Signage

It is also recommended that all intersections on the route be assessed and tracked for the critical construction vehicle to ensure proposed vehicles can safely navigate the routes. The intersections should also be assessed for pavement condition, sight distances, and appropriate signage.

Where the vehicles are proposed to track the intersection of a sealed and unsealed road, it is recommended that the shoulders of the sealed road be upgraded on the approach to the intersection to facilitate heavy vehicle access. The apron bank should also be extended to the tangent point. This is illustrated in Figure 38.

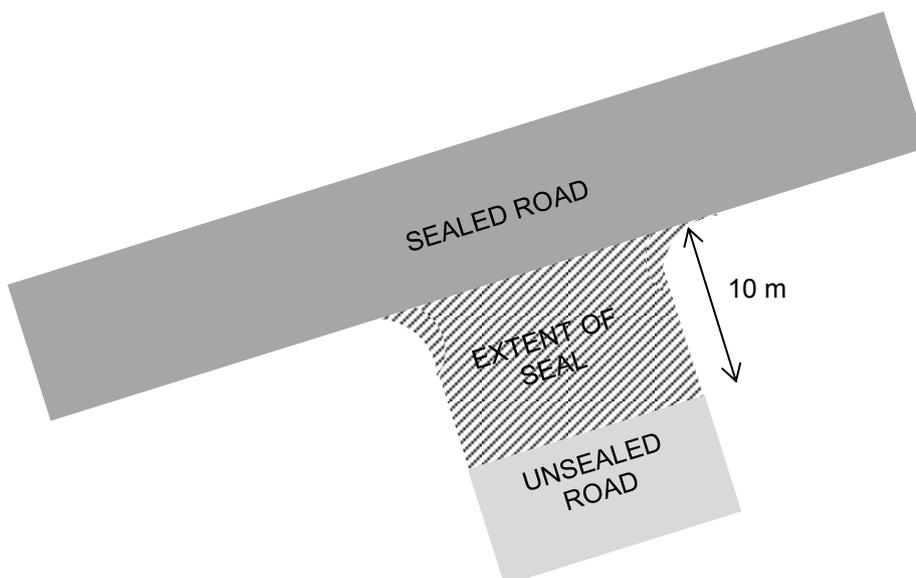


Figure 38 Recommended Upgrades at Proposed Intersections

Vertical clearances along the route (e.g. power lines crossing route) should also be identified for proposed vehicles and the clearance height raised if necessary.

7.7.2 Bundilla Road

Bundilla Road is wide unsealed road (approximately 12 m width) that currently provides access to a turf company located approximately 2 km from the Ridley Road entrance. A school campsite is located on Bundilla Road (Meldanda Campsite) whereby on the day of the site visit, there were a number of school buses observed at the site. The proposed TMP would seek to manage any potential conflicts between existing traffic generated by the turf company or school and proposed development traffic.

7.7.3 Three Chain Road

Three Chain Road is a wide unsealed road. A short northern section of Three Chain Road is proposed to be utilised as a primary route.

It was identified that there were a number of power lines crossing over Three Chain Road (Figure 39). It is recommended that the vertical clearance of the power lines from the pavement is identified and deemed suitable in order for large vehicles to utilise the route.



Figure 39 Low Power line crossing Three Chain Road

7.7.4 Milendella Road

Milendella Road is an approved 25 m B Double Route council owned road, and currently provides access to a Viterra grain storage facility located at the southern end of Milendella Road. The road passes over a number of culverts, as well as a bridge. The bridge, passing over Milendella Creek, is in poor condition, with visible cracking (refer to Figure 40) and it is recommended that the structural integrity of the bridge be assessed prior to the route being approved. The existing guard rail adjacent to the bridge also appears in poor condition and is not compliant with current standards. It is recommended that if Milendella Rd is to be utilised as a route the shoulders should be upgraded, the pavement marking upgraded and correct signage installed along its length.



Figure 40 Milendella Road Bridge Crossing Milendella Creek

7.7.5 Davenport Road

Davenport Road is a council owned unsealed road. The pavement condition is currently poor and it is recommended that if this road was to be utilised as a route, it will require surface treatment and possible widening.

7.7.6 Mannum Road

Mannum Road is a DPTI owned approved 25 m B Double Route. Mannum Road passes over a number of culverts, as well as a bridge crossing over Reedy Creek (Figure 41). Although the bridge appears to be in good condition, it is recommended that the structural integrity of the bridge be assessed prior to the route being approved.

Mannum Road also passes through a well signed floodway (Salt Creek). Information received from council indicates that the floodway is rarely in flood, and when in flood the water is dispersed fairly quickly from the area.



Figure 41 Mannum Road Bridge Crossing Reedy Creek

7.7.7 Adelaide-Mannum Road

Adelaide-Mannum Road is a DPTI owned road that is an approved 25 m B double route from Mannum Road to Milendella Road. The road passes over a number of culverts, as well as a disused Rail Crossing. The road passes through the township of Palmer and through a school zone requiring vehicles to travel at 25 km/hr when children present.

The road section to the west of the township of Palmer is steep and winding and is currently signposted at 100 km/hr. Slow vehicle turnout bays are provided and signage is installed on the descent indicating that trucks should use low gear and reduce speed. It is recommended that if this section of road is to be utilised for access to the proposed wind farm sites, that the speed limit be reduced to 80 km/hr at least during the construction period. The existing edge pavement markings also need upgrading.

7.7.8 Angas Valley Road (Walker Flat – Mt Pleasant Road)

Angas Valley Road is a DPTI owned road that is an approved 25 m B double route from Ridley Road to Milendella Road. The road section to the west of Milendella Road is steep and winding, with the pavement visibly failing in a number of locations.

7.7.9 Reedy Creek Road

Reedy Creek Road is a DPTI owned road that is currently not an approved heavy vehicle route. The road passes over a number of culverts and over two bridges (Preamimma Creek and Reedy Creek) and it appears that the shoulders have recently been upgraded. The road currently has large undulations and the pavement condition appears poor in places.

There are a number of stobie poles and other hazards close to the edge of pavement and “truck tilt” warning signs are located at the northern end of Reedy Creek Road. It is recommended that a super elevation assessment and shoulder clearance assessment be undertaken on the road to ensure that construction traffic can utilise the road safely.

7.7.10 Route Specific Constraints

Adelaide to Palmer via Sturt Highway

It was identified that the route from the Sturt Highway to the Site Access Points (Halfway House Road/Blanchetown Road/Ridley Road) passes through a number of small townships (including Cambrai and Sedan), requiring vehicles to travel at 50 km/h through these townships. There is also a primary school located in Cambrai, with signage indicating vehicles are to slow down to 25 km/h when children present. As the road is currently a DPTI approved B Double route, it is assumed that the traffic generated by the construction period will be approved to travel along this route. However it should be noted that it is recommended that the majority of construction traffic should travel outside of peak school pickup/drop off hours to minimise impact to local students.

Adelaide to Palmer via South Eastern Freeway

This route requires vehicles to travel a long distance through populated areas to reach the base of the South Eastern Freeway. There is the potential that over length vehicles may have trouble negotiating intersections and that the general public may be impacted with delays. It is therefore recommended that if this route is to be utilised by oversize vehicles that an analysis of turning paths at intersections be undertaken prior to approval of route and an assessment undertaken as to the best time of day to travel such that there is minimal impact to other road users.

A constraint along the South Eastern Freeway for over dimensional loads is the height restrictions at the Heyson Tunnel (Figure 42). The height clearance for the Heysen Tunnels is 5.3 metres (this is also the clearance height for the Mt Osmond and Crafers interchanges). It is therefore recommended that vehicles over 5 m height utilise an alternative route.



Figure 42 Key constraint for vehicles travelling along the South Eastern Freeway (Heyson Tunnels)

8. Management / Mitigation Measures

8.1 Introduction

The principal issues associated with traffic and transport will be during the construction phase of the proposed wind farm, in particular with the delivery of the large items of equipment including the wind turbine components, the substation transformers and the movement of construction vehicles and the associated material deliveries.

The potential traffic generated during the operations phase will be nominal compared with existing traffic flows on the surrounding road network.

The following sections discuss the proposed management and mitigation measures for the three key types of traffic generated over the life cycle of the proposed wind farm including:

1. Construction traffic;
2. Operations traffic, and
3. Decommissioning traffic.

8.2 Construction Traffic

The selected transport contractor will develop the specific traffic management measures as part of the process of obtaining approvals from the relevant state and local road authorities including DPTI, VicRoads and councils located along the defined transport route(s) for the transportation of the wind farm equipment, construction vehicles and materials. The proposed management measures to be undertaken by the turbine supplier would likely include the following:

- Engaging licensed and experienced transport contractor(s) who have the required equipment and experience in transport of over dimensional and over mass loads, and have established knowledge and contacts with the relevant road authorities. The transport contractors will generally be responsible, in conjunction with the turbine supplier, for:
 - Obtaining all the required permits for undertaking the transport task, from the responsible authorities;
 - Selecting final route, mode of operation and timetable and identifying any modifications required to existing road infrastructure (such as, temporary removal of street furniture, temporary modifications to roundabouts, intersections and access points) as part of obtaining the required permits;
 - Complying with over dimensional and over mass permit conditions stated by authorities, including measures such as pilot cars and police escorts and staging of deliveries to meet restrictions on travel times along different routes;
 - Phasing of delivery schedules to meet construction requirements, and to ensure deliveries will not overwhelm transport infrastructure, based on the permits obtained from authorities;
 - Conducting any surveys and arranging for any pavement and infrastructure inspections prior to carrying out the transport tasks to ensure all roads along the proposed route are suitable; and
 - Installing suitable warning signs and signage at appropriate locations along the route, to alert other transport users of the transportation activities.
- Developing of a specific Traffic Management Plan (TMP) to coordinate between the transport contractor programs and ensure that equipment is delivered to the required turbine locations on site with minimal impact on the surrounding road network, adjacent

town centres (Mount Pleasant, Palmer) and the local farmers. It is understood that a TMP has been developed between Council and Trustpower which is currently being reviewed by Council at the time of this report. It is anticipated that the TMP will include:

- Designated delivery periods, delivery routes and access points to the site for all materials and equipment supplied for different locations around the site;
- Designated speed limits and load limits specified for heavy vehicle routes;
- Directional and warning signage on the designated access routes to the site;
- Designated reserve areas on the construction site for parking, turning, loading and unloading;
- Appropriate traffic controls and management on site to ensure that vehicles use the designated site access tracks and do not travel off these tracks;
- Appropriate traffic controls and management on site to ensure that vehicles use the designated wash down areas if applicable;
- An inspection and maintenance program for the selected access routes and site tracks, to ensure these are kept in an adequate and safe condition; and
- Controls and management measures to ensure farm stock (sheep and cattle) are not able to escape from the site through access points during construction operations.

It is necessary for this traffic assessment report to be aligned with the recommendations from the TMP which is currently under review by Council. On this basis, the TMP should be further reviewed when available to ensure alignment between the two documents with any conflicts addressed accordingly.

- Developing of a specific Construction Environmental Management Plan (CEMP) to mitigate the impact of transport related activities on-site. The development of the plan would involve close consultation with landowners to ensure their interests are protected. Within the environmental management plan the following key issues would be addressed. These include (but not limited to):
 - Site security;
 - Minimisation of seed and weed transport;
 - Control of stock; and
 - Erosion and sediment control.

For more detailed information refer to the Civil Geotechnical Report.

- Designing and constructing the on-site access tracks (new and upgraded) to ensure that they are safe and suitable for the selected transportation vehicles.
- Developing and implementing a suitable community information and awareness program to ensure that residents along the preferred routes are fully aware of the proposed transportation plans, timings and activities.

8.3 Operations Traffic

As mentioned above, during the normal wind farm operation the potential traffic generated by site staff on account of general operational activities (such as, site inspections and maintenance (routine and unscheduled)) would be nominal in comparison with existing traffic flows and therefore it is not considered that specific traffic management measures are required.

8.4 Decommissioning Traffic

The traffic associated with decommissioning the proposed wind farm will be similar to the construction phase and therefore the majority of mitigation and management measures listed in Section 8.2 will apply to the decommissioning phase as appropriate.

8.5 Summary

The traffic and transport management and mitigation measures that would be implemented during the design, construction and operation phases of the proposed wind farm are summarised in Table 14.

Table 14 Summary of the traffic and transport management and mitigation measures

Project Stage	Potential Impacts	Management / Mitigation Measures
1. Design		
1.1	Inadequate design of the access tracks and local road network upgrades to accommodate heavy vehicle access, in particular over mass and over dimensional loads.	The condition of the local roads and existing access tracks will be assessed prior to start of works. The on-site access tracks and any local road upgrades will be constructed to an appropriate standard to accommodate for safe and stable transport activities.
1.2	There may be issues in obtaining pre approval for over mass and over dimensional permits for delivery of the proposed wind farm components from the relevant local and state road authorities.	A specific TMP will be developed for management of all traffic issues during the construction phase. The selected transport contractor(s) and Trustpower will consult closely with the relevant local and state road authorities during the development of the TMP and route assessment for obtaining over dimensional and / or over mass permits.
2. Construction		
2.1	The proposed transport routes for heavy vehicle movements, in particular for over dimensional and over mass loads associated with the wind farm equipment deliveries may not be suitable.	Turbine supplier to engage an experienced transport contractor(s) who will be responsible for all aspects of equipment transportation to the site. A detailed desktop analysis of the proposed route and consultation with relevant authorities will be undertaken prior to construction to mitigate risk.
2.2	Road deterioration of the access tracks and local roads surrounding the proposed wind farm site may occur due to the large number of heavy vehicle movements, in particular for over dimensional and over mass loads.	Construction contractor to ensure the construction of the on-site access tracks and any local road upgrades are able to accommodate the transport activities during the construction phase. Regular monitoring of road conditions during construction activities will be carried out to ensure access roads and access tracks are maintained in safe and adequate condition, with prior agreements achieved with authorities on relevant responsibilities. Regular monitoring of local roads will be carried out in conjunction with the local council to ensure they are kept in a safe condition.
2.3	Impacts on the local community and surrounding town centres due to the increased movement of traffic along the proposed wind farm site access routes.	As part of the TMP a community consultation program will be carried out advising of the transport activities to ensure local residents and businesses are informed on program, timing and management.
2.4	Delays and increased safety issues to road users (including cars, buses, pedestrians and cyclists) may occur with the increased number of heavy vehicle movements, in particular for over dimensional and over mass loads.	Implementation of traffic controls specified in TMP to manage traffic on and off-site to minimise impacts on local traffic flows, pedestrian movements and impacts on site. A safe and secure delivery area within the construction compound will be provided for the purpose of facilitating the delivery management and coordination of heavy vehicle movements and

Project Stage	Potential Impacts	Management / Mitigation Measures
		<p>accordingly minimise the impacts on the surrounding road network.</p> <p>Delivery of over dimensional and / or over mass loads will be scheduled to off-peak times, as far as practicable.</p>
2.5	Delays and increased safety issues for school bus routes / operations to Mount Pleasant Primary School and Palmer Primary School.	Heavy vehicle access to the proposed wind farm site will be minimised along the school bus route(s) during the scheduled bus operating hours. The affected school(s) will be consulted during the construction phase and notified of any impacts should they occur.
3. Operation		
3.1	Unscheduled wind turbine breakdowns and associated maintenance activities may involve the transport of over dimensional and / or over mass loads.	Develop a pre- prepared and approved TMP for maintenance activities (routine and unscheduled). Implementation of the traffic controls specified in the TMP to manage traffic during maintenance activities.
3.2	Road deterioration may occur along the access tracks and local roads due to operational and maintenance activities.	On-going road monitoring during operations to be undertaken, to ensure access roads and site tracks are maintained in safe and adequate condition, with prior agreements with authorities on relevant responsibilities.

9. Consultation with Key Stakeholders

9.1.1 General

GHD, in conjunction with Trustpower, have consulted with key stakeholders to identify potential issues relating to the access routes and design traffic of the proposed wind farm.

A high level site visit and consultation with the Mid Murray council was undertaken by GHD on the 23rd September 2013 to identify any potential constraints to identify the preferred site access route(s). As a follow up from this discussion GHD consulted with the Mid Murray Council to obtain feedback and comments on the proposed route. For a comprehensive list of concerns raised by the Mid Murray council as a direct result of these consultations, refer to Appendix B.

GHD has also consulted with the Department of Planning, Transport and Infrastructure (DPTI) to obtain feedback and comments on the proposed route. For a comprehensive list of concerns raised by DPTI as a direct result of these consultations, refer to Appendix C.

A number of community information sessions have also been held, allowing Trustpower and GHD to obtain feedback from the community affected by the proposed wind farm. For a comprehensive list of concerns raised by the residents and community members relating to traffic and transport routes, refer to Appendix D.

10. Discussion and Conclusions

The traffic and transport issues arising from the proposed wind farm development will have an effect on the daily activities of the local community surrounding the proposed wind farm site due to potentially increased traffic delays and noise. This will primarily be on the adjacent landowners and the town centre of Palmer.

The primary impact, in terms of road network performance and safety, will be during the 18 to 24 month construction period where a large number of vehicle movements will be generated over a short period of time. The main issue will be with managing the high number of heavy vehicle and over dimensional and over mass vehicle movements required for the delivery of the wind farm equipment and construction materials. The worst case increase in daily traffic generated has been estimated to be about 397 trips, including 124 truck trips, 6 over dimensional and / or over mass trips and 267 car trips. The number of vehicle movements however, will vary on a day-to-day basis depending on the construction activity and works programme.

The key issue to be addressed is that over 25% of vehicle movements associated with the construction of the proposed wind farm will be heavy vehicle movements.

By adopting the identified site access routes, depending on the location of delivery of equipment and materials, and by implementing the management and mitigation measures as discussed in Section 8, the traffic impacts associated with the additional trips generated during the construction phase should be minimised and road safety on the surrounding road network maintained to the highest standard.

Traffic delays can be minimised by providing adequate notification to the local community, restricting over dimensional and / or mass deliveries to off-peak times where practicable and employment of appropriate warning signage and traffic control. The noise disturbance should be relatively minor considering the temporary nature of the traffic, the local population and daily traffic flows on the roads surrounding the site.

Three key site access routes have been identified to and from the proposed wind farm site, including:

- Port Adelaide to Palmer (via Sturt Highway);
- Port Adelaide to Palmer (via South Eastern Freeway); and
- Melbourne to Palmer

A detailed Traffic Management Plan (TMP) and Construction Environmental Management Plan (CEMP) will need to be prepared prior to construction in close consultation with both DPTI and VicRoads state road departments and local council's en-route to ensure that the overall impact and disturbance to infrastructure and other road users is minimal.

No major concerns should arise during the operations phase of the proposed wind farm as the need to access the site is minimal.

In conclusion, taking into account the current road usage near the proposed Palmer Wind Farm site and the expected increase in traffic, particularly during the construction phase, the impacts from traffic and traffic related activities are not considered to be significant. Where impacts are identified these can be mitigated with good management and the implementation of a detailed TMP and CEMP during construction.

11. Glossary / Abbreviations

Table 15 Glossary of Terms

AADT	Annual Average Daily Traffic
DTEI	Department for Transport, Energy and Infrastructure
MVA	Mega Volt Ampere
RTA	Roads and Traffic Authority
TIA	Traffic Impact Assessment
TMP	Traffic Management Plan
VPD	Vehicles Per Day