



Mid-West/Wheatbelt Joint Development Assessment Panel Agenda

Meeting Date and Time: 15 June 2017; 11:00am
Meeting Number: MWWJDAP/18
Meeting Venue: Shire of Northam Council Chambers
395 Fitzgerald Street
Northam

Attendance

DAP Members

Mr David Gray (Presiding Member)
Mr Robert Fenn (Deputy Presiding Member)
Mr Patrick Dick (Specialist Member)
Cr Ken Hooper (Local Government Member, Shire of Merredin)
Cr Mark Crees (Local Government Member, Shire of Merredin)
Cr Ulo Rumjantsev (Local Government Member, Shire of Northam)
Cr Des Hughes (Local Government Member, Shire of Northam)
Cr Ian Stirling (Local Government Member, Shire of Carnamah) – *via teleconference*
Cr Bruce Jack (Local Government Member, Shire of Coorow) – *via teleconference*
Cr Michael Bothe (Local Government Member, Shire of Coorow) – *via teleconference*

Officers in attendance

Mr Peter Zenni (Shire of Merredin)
Mr Paul Bashall (PLANWEST (WA) Pty Ltd on behalf of Shire of Merredin)
Mr Greg Powell (CEO, Shire of Merredin)
Ms Courtney Wynn (Shire of Northam)
Mr Kobus Nieuwoudt (Shire of Northam)
Mr Chadd Hunt (Shire of Northam)
Mr Simon Lancaster (Shire of Chapman Valley on behalf of Shire of Carnamah and Shire of Coorow) – *via teleconference*
Mr Peter Crispin (Shire of Coorow) – *via teleconference*

Local Government Minute Secretary

Ms Jodi White (Shire of Northam)

Applicants and Submitters

Mr Troy Santen (Stellata Energy)
Mr Michael Taylforth (Land Insights)
Mr Michael Willcock (Taylor Burrell Barnett Town Planning and Design)
Mr Tim Sawyer (Carnegie Clean Energy Limited)
Mr Ray Hart (Energy Made Clean)
Mr John Lorenti (Synergy)
Mr Hugh Webster (Synergy)

Members of the Public / Media

Nil



1. Declaration of Opening

The Presiding Member declares the meeting open and acknowledges the past and present traditional owners and custodians of the land on which the meeting is being held.

2. Apologies

Cr Merle Isbister (Local Government Member, Shire of Carnamah)

3. Members on Leave of Absence

Nil

4. Noting of Minutes

Note the Minutes of meeting No. 17 held on 1 May 2017.

5. Declarations of Due Consideration

Any member who is not familiar with the substance of any report or other information provided for consideration at the DAP meeting must declare that fact before the meeting considers the matter.

6. Disclosure of Interests

Member/Officer	Report Item	Nature of Interest
Mr Robert Fenn	8.1 and 8.2	Impartiality Interest

Mr Fenn is an employee of LandCorp who undertakes residential and light industrial land developments at the request of the local authorities to provide land for developments in many Wheatbelt towns including the Shire of Merredin and Shire of Northam. LandCorp have also examined proposals to provide lots and/or delivered land to the market in the adjoining Shires. In addition, LandCorp developed the Avon Industrial Park and has lots for sale in that development.

7. Deputations and Presentations

Nil

8. Form 1 – Responsible Authority Reports – DAP Applications

8.1	Property Location:	Lots 194 Robartson Road and 19444 Bruce Rock-Merredin Road, Merredin
	Application Details:	Solar Farm – 100MW (AC)
	Applicant:	Mr Troy Santen, Stellata Energy Pty Ltd
	Owner:	Ross Anthony Smith
	Responsible Authority:	Shire of Merredin
	DoP File No:	DAP/17/01195
8.2	Property Location:	Lot 6 No.131 Northam-York Road, Muluckine
	Application Details:	Proposed Power Generation
	Applicant:	Carnegie Clean Energy Limited
	Owner:	DK West Investments Pty Ltd
	Responsible Authority:	Shire of Northam
	DoP File No:	DAP/17/01197

9. Form 2 – Responsible Authority Reports – Amending or cancelling DAP development approval

- | | | |
|------------|------------------------|---|
| 9.1 | Property Location: | Lots 10847 and 10848 Rose Thomson Road, Warradarge |
| | Application Details: | Warradarge Wind Farm Transmission Line |
| | Applicant: | Synergy |
| | Owner: | Judeen Nominees Pty Ltd |
| | Responsible Authority: | Shire of Carnamah |
| | DoP File No: | DP/12/00624 |
| 9.2 | Property Location: | Lots 10850 & 10853 Garibaldi Willis Road and Lots 10848 & 10851 Rose Thomson Road, Warradarge |
| | Application Details: | Warradarge Wind Farm |
| | Applicant: | Synergy |
| | Owner: | Judeen Nominees Pty Ltd |
| | Responsible Authority: | Shire of Coorow |
| | DoP File No: | DP/12/00625 |

10. Appeals to the State Administrative Tribunal

Nil

11. General Business / Meeting Closure

In accordance with Section 7.3 of the DAP Standing Orders 2017 only the Presiding Member may publicly comment on the operations or determinations of a DAP and other DAP members should not be approached to make comment.



Minutes of the Mid-West/Wheatbelt Joint Development Assessment Panel

Meeting Date and Time: 1 May 2017; 1:00pm
Meeting Number: MWWJDAP/17
Meeting Venue: Shire of Dandaragan Administration Centre
69 Bashford Street
Jurien Bay

Attendance

DAP Members

Mr David Gray (Presiding Member)
Mr Robert Fenn (Deputy Presiding Member)
Mr Patrick Dick (Specialist Member)
Cr Judy Kulisa (Local Government Member, Shire of Dandaragan)

Officers in attendance

Mr David Chidlow (Shire of Dandaragan)
Mr Ian Rennie (Shire of Dandaragan)

Local Government Minute Secretary

Ms Trevena Taylor (Shire of Dandaragan)

Applicant and Submitters

Ms Christine Brown
Mr Kevin McLean
Mr Norm Yukich
Mr Neil Ferguson (Westpork Pty Ltd)
Mr Richard Evison (Westpork Pty Ltd)
Mr Larry Smith (Larry Smith Planning)
Mr Noel Davies (Aurora Environmental)
Ms Caitlin Dorrington (Aurora Environmental)

Members of the Public / Media

There were 3 members of the public in attendance.

1. Declaration of Opening

The Presiding Member, Mr David Gray declared the meeting open at 1:00pm on 1 May 2017 and acknowledged the past and present traditional owners and custodians of the land on which the meeting was being held.

Mr David Gray
Presiding Member, Mid-West/Wheatbelt JDAP



The Presiding Member announced the meeting would be run in accordance with the *Development Assessment Panel Standing Orders 2012* under the *Planning and Development (Development Assessment Panels) Regulations 2011*.

The Presiding Member advised that the meeting is being audio recorded in accordance with Section 5.16 of the Standing Orders 2012; No Recording of Meeting, which states: 'A person must not use any electronic, visual or audio recording device or instrument to record the proceedings of the DAP meeting unless the Presiding Member has given permission to do so.' The Presiding Member granted permission for the minute taker to record proceedings for the purpose of the minutes only.

2. Apologies

Nil

3. Members on Leave of Absence

Nil

4. Noting of Minutes

Minutes of the Mid-West/Wheatbelt JDAP meeting No. 16 held on 19 April 2017 were noted by DAP members.

5. Declaration of Due Consideration

All members declared that they had duly considered the documents.

6. Disclosure of Interests

Panel member, Mr Robert Fenn, declared an impartiality interest in item 8.1. Mr Fenn is an employee of LandCorp who has undertaken residential and industrial development in Jurien Bay, for the Shire of Dandaragan. LandCorp has also delivered land to the market or is undertaking feasibility studies for developments in the surrounding Shires of Coorow and Moora.

In accordance with section 4.6.1 and 4.6.2 of the Standing Orders 2012, the Presiding Member determined that the member listed above, who had disclosed an impartiality interest, was permitted to participate in discussion and voting on the items.

7. Deputations and Presentations

7.1 Ms Christine Brown addressed the DAP against the application at Item 8.1. Ms Brown answered questions from the panel.

7.2 Mr Kevin McLean addressed the DAP against the application at Item 8.1. Mr Richard Evison (Westpork) answered questions from the panel.

7.3 Mr Norm Yukich addressed the DAP against the application at Item 8.1.



- 7.4 Mr Neil Ferguson (Westpork Pty Ltd) addressed the DAP for the application at Item 8.1. Mr Ferguson, Mr Davies, Mr Evison, Mr McLean, Ms Brown and Mr Chidlow answered questions from the panel.

8. Form 1 – Responsible Authority Reports – DAP Application

- 8.1 Property Location: Lot 3616 Agaton Road, Dandaragan
Application Details: Piggery
Applicant: Mr Neil Ferguson Westpork Pty Ltd
Owner: Mr Neil Ferguson Westpork Pty Ltd
Responsible Authority: Shire of Dandaragan
DoP File No: DAP/17/01180

REPORT RECOMMENDATION / PRIMARY MOTION

Moved by: Mr Patrick Dick

Seconded by: Cr Judy Kulisa

That the Midwest/Wheatbelt JDAP resolves to:

1. **Approve** DAP Application reference 2017/01 and accompanying plans proposed Moora Piggery Supplementary report April 2017 Figures 2, 4a, 4b and Plan 2: Module Site Layout, Plans 3A > 3D: Gilt Development Shed, Plans 4A > 4D: Boar Stud Shed, Plans 5A > 5D: Mating Shed, Plans 6A > 6D : Dry Sow Shed 1, Plans 7A > 7D: Dry Sow Shed 2, Plans 8A > 8D: Dry Sow Shed 3, Plans 9A > 9D: Farrowing Shed, Plans 10A > 10D: Nursery Shed 1, Plans 11A > 11D: Nursery Shed 2, Plans 12A > 12D: Finisher Shed, Plans 13A > 13D: Load Out Shed, Plans 14A & 14B: Effluent Ponds, Plans 15A & 15B: Fan Separator & Tank and Plans 16A & 16B: Office & Staff Amenities Block in accordance with Clause 68 Planning and Development (Local Planning Schemes) Regulations 2015 Schedule 2 — Deemed provisions for Local Planning Schemes of the Shire of Dandaragan Local Planning Scheme No.7, subject to the following conditions as follows:

Conditions

1. This decision constitutes planning approval only and is valid for a period of 3 years from the date of approval. If the subject development is not substantially commenced within the 3 year period, the approval shall lapse and be of no further effect.
2. The land use and development shall be in accordance with the approved plans and specifications (including any amendments as detailed in the Moora Piggery Supplementary Report 2017) unless otherwise conditioned by this approval.
3. The use when established shall at all times comply with the definition of Animal Husbandry – Intensive (Piggery) contained within the Shire of Dandaragan Local Planning Scheme No.7.
4. This approval is for Module 2 (Moora 2) and Module 3 (Moora 3) and any ancillary works with a capacity to house approximately 68,000 pigs. Separate future application will be required if a third Module with the capacity for a further 34,000 pigs is proposed.

Mr David Gray
Presiding Member, Mid-West/Wheatbelt JDAP



5. The endorsed plans shall not be modified or altered without the prior written approval of either the Shire of Dandaragan or Midwest/Wheatbelt JDAP in accordance with Regulation 17 of the Planning and Development (Development Assessment Panels) Regulations 2011.
6. The development at all times shall comply with the Nutrient Management Plan prepared by Aurora Environmental that was submitted with the application to the satisfaction of the Shire of Dandaragan.
7. The development at all times shall comply with the Works Approval Application prepared by Aurora Environmental that was submitted with the application to the satisfaction of the Shire of Dandaragan. This is not limited to, but specific mention is made to the management and mitigation strategies and contingency measures applicable to;
 - a) construction management;
 - b) wastewater effluent management;
 - c) solid waste management;
 - d) odour management;
 - e) noise management;
 - f) fire management; and
 - g) environmental monitoring and reporting.
8. The development at all times shall comply with the Bushfire Attack Level (BAL) Assessment prepared by Smith Fire Consulting that was submitted with the application to the satisfaction of the Shire of Dandaragan.
9. The development at all times shall comply with the Traffic Impact Assessment prepared by Shawmac Traffic Engineers that was submitted with the application to the satisfaction of the Shire of Dandaragan.
10. The piggeries will be operated to comply with the Environmental Protection (Noise) Regulations 1997. Routine observations and inspections will be required to be undertaken in regard to noise. Onsite management will be informed of the results of inspections and observations and will implement contingency actions to ensure compliance with Environmental Protection (Noise) Regulations 1997.
11. Crossovers, access and egress to the subject site from Agaton Road and any road works shall be located and constructed to the satisfaction of the Shire of Dandaragan and include all necessary drainage and signage. Costs applicable to the construction of the access point/s onto the site and any related issues shall be borne by the proponent.
12. A road condition survey is to be completed by the applicant and submitted to the Shire detailing any maintenance work required to public roads as a result of transport activity to the satisfaction of the Shire of Dandaragan.
13. Prior to commencement of site works, the Applicant/Landowner is to enter into discussions with the Shire of Dandaragan to assess the impact of the additional (heavy) traffic on Agaton Road and proposed strategies (if appropriate) to deal with the increased traffic. Furthermore, should any road upgrading and/or maintenance be required as a result of the increased traffic, then a contribution towards the cost of undertaking those works to the satisfaction of the Shire of Dandaragan will be at the expense of the Applicant/Landowner.

Mr David Gray
Presiding Member, Mid-West/Wheatbelt JDAP



14. All internal roadway surfaces within the site are to be constructed of a suitable material such as paving, road base, limestone or coarse gravel and compacted to limit dust generation, to the satisfaction of the Shire of Dandaragan.
15. Notices indicating the type of operation, hours of operation and potential impacts of the piggery operation are to be displayed adjacent to the Agaton Road frontage of the site to the satisfaction of the Shire of Dandaragan. The notices must state that development approval for the construction of the Development on the site has been granted.
16. The use and development must be conducted so that it has minimum impact on the amenity of the area by reason of:
 - a) transportation of materials, goods and commodities to and from the premises;
 - b) appearance of any buildings, works and materials; and
 - c) the emission of odour, noise, vibration, dust, wastewater, waste products or reflected light.
17. The applicant is to provide landscape screening to be maintained to the satisfaction of the Shire of Dandaragan.
18. Prior to the commencement of the development, landscape plan detailing screening vegetation that is to be planted shall be submitted to the Shire and approved by the Shire of Dandaragan.
19. In addition to the disposal of carcasses strategy detailed in the submitted reports, the applicant is required to carry out the following procedures: i. large carcasses should be split to minimise bloating; ii. the pit bases should be at least 2 m above the water table at all times; iii. pits should be situated on low permeability soils and / or low risk sites; iv. carcasses need to be well covered with soil, or other suitable material, each day to avoid scavenging by feral animals and to prevent odour; v. further clay should be compacted over filled pits; vi. earth should be mounded over filled pits to promote shedding of stormwater; and vii. the mounds should be grassed over, but trees should not be planted at the site as the roots allow water to move through the pit.
20. The anaerobic ponds are at all times to be covered with an impermeable cover in order to reduce odour escaping to the environment, excluding when maintenance is carried out.
21. The piggery is to be operated in accordance with guidance document "AUSTRALIAN PORK LIMITED - Minimising Odour from Piggeries 2015".
22. That operating hours will be applied with noise limitations and requirements being taken into consideration.

Advice Notes

1. Further to this approval, the Applicant may be required to submit working drawings and specifications to comply with the requirements of the Building Act 2011 and the Health Act 1911 which are to be approved by the Shire's Manager Building Services and/or Manager Environmental Health prior to issuing a Building Licence.

Mr David Gray
Presiding Member, Mid-West/Wheatbelt JDAP



2. The Department of Health advises that any form of pest control using pesticides must comply with the Health (Pesticides) Regulations 2011.
3. It is advised that the proposal should at all times comply with the Biosecurity & Agriculture (Stable Fly) Management Plan 2016 in order to minimize the effects of stable flies on the community.
4. It is advised that the proposal should at all times comply with the provisions of the Food Act 2008 and related regulations, codes and guidelines.
5. The applicant be advised this is planning approval only and not a building permit. A building permit must be obtained for this development.
6. DAFWA recommends that future soil testing for monitoring is done at fixed depths (for example, 0 to 10cm, 10 to 50cm, 50 to 100cm and 100 to 200cm) to two metres to understand both the nutrient content of soils and if there is any movement of phosphorus and other nutrients down the soil profile to indicate if there is leaching to greater depths.
7. The Department of Water recommend that monitoring wells are installed to assess potential risk to the surficial unconfined aquifer from leachates associated with carcass burial pits. These should be constructed to a depth of 25m below ground level and located down (hydraulic) gradient from the pig carcass disposal sites.

AMENDING MOTION

Moved by: Mr Patrick Dick

Seconded by: Mr Robert Fenn

To amend the preamble to read as follows:

That the Mid-West/Wheatbelt JDAP resolves to:

Approve DAP application reference DAP/17/01180 for a Piggery at Lot 3616 Agaton Road, Dandaragan as detailed in accompanying indexed plans;

- Plan 1: Site Plan (modified by Supplementary Report Plan 2) – Stamped 18/04/2017
- Plan 2: Module Site Layout - Stamped 06/02/2017
- Plans 3A>3D: Gilt Development Shed - Stamped 06/02/2017
- Plans 4A>4D: Boar Stud Shed - Stamped 06/02/2017
- Plans 5A>5D: Mating Shed - Stamped 06/02/2017
- Plans 6A>6D: Dry Sow Shed 1 - Stamped 06/02/2017
- Plans 7A>7D: Dry Sow Shed 2 - Stamped 06/02/2017
- Plans 8A>8D: Dry Sow Shed 3 - Stamped 06/02/2017
- Plans 9A>9D: Farrowing Shed - Stamped 06/02/2017
- Plans 10A>10D: Nursery Shed 1 - Stamped 06/02/2017
- Plans 11A>11D: Nursery Shed 2 - Stamped 06/02/2017
- Plans 12A>12D: Finisher Shed - Stamped 06/02/2017
- Plans 13A>13D: Load Out Shed - Stamped 06/02/2017
- Plans 14A & 14B: Effluent Ponds (modified by Supplementary Report Plans 4A & 4B) - Stamped 18/04/2017
- Plans 15A & 15B: Fan Separator and Tank - Stamped 06/02/2017

Mr David Gray
Presiding Member, Mid-West/Wheatbelt JDAP



- *Plans 16A & 16B: Office and Amenities Block and - Stamped 06/02/2017*
- *The information contained in the Proposed Moora Piggery for Westpork Pty Ltd Report (December 2016) and modified by the Proposed Moora Piggery Supplementary Report (April 2017) - Stamped 18/04/2017 in accordance with the Shire of Dandaragan Local Planning Scheme No.7, subject to the following conditions:*

REASON: To clarify the description of the development and comply with the DAPs Practice Note on the wording of the preamble.

The Amending Motion was put and CARRIED UNANIMOUSLY.

AMENDING MOTION

Moved by: Mr Robert Fenn

Seconded by: Cr Judy Kulisa

To amend Condition 2 to read as follows:

The land use and development shall be in accordance with the approved plans and the Applicant's report (including any amendments as detailed in the Proposed Moora Piggery Supplementary Report (April 2017) unless otherwise conditioned by this approval.

REASON: To substitute the word “specifications” with “the Applicant’s report” for clarity.

The Amending Motion was put and CARRIED UNANIMOUSLY.

AMENDING MOTION

Moved by: Mr Robert Fenn

Seconded by: Mr Patrick Dick

To delete Condition 3.

REASON: This Condition serves no planning purpose.

The Amending Motion was put and CARRIED UNANIMOUSLY.

AMENDING MOTION

Moved by: Mr Robert Fenn

Seconded by: Cr Judy Kulisa

To amend Condition 4 (now Condition 3) to read as follows:

A maximum of 68,000 pigs shall be housed on site within Modules 2 (Moora 2) and Module 3 (Moora 3) at any time.

REASON: To clarify the Condition’s intent.

The Amending Motion was put and CARRIED UNANIMOUSLY.

Mr David Gray
Presiding Member, Mid-West/Wheatbelt JDAP



AMENDING MOTION

Moved by: Mr Robert Fenn

Seconded by: Cr Judy Kulisa

To delete Condition 5.

REASON: Moved to Advice Note as this is a requirement under the DAP regulations.

The Amending Motion was put and **CARRIED UNANIMOUSLY.**

AMENDING MOTION

Moved by: Mr Robert Fenn

Seconded by: Mr Patrick Dick

To amend Condition 6 (now Condition 4) to read as follows:

No solid effluent waste is to be applied to the soils upon Lot 3616 Agaton Road unless in accordance with a Nutrient Management Plan approved by the Shire of Dandaragan, inclusive of any on-going soil and groundwater monitoring required by the Shire of Dandaragan.

REASON: To acknowledge that the Nutrient Management Plan may need to be modified over time and the application of wastes may need to be suspended if monitoring identifies excessive nutrient levels in the soil or groundwater.

The Amending Motion was put and **CARRIED UNANIMOUSLY.**

AMENDING MOTION

Moved by: Mr Robert Fenn

Seconded by: Cr Judy Kulisa

To amend Condition 7 (now Condition 5) to read as follows:

The development at all times shall comply with the commitments and standards defined in the Works Approval Application prepared by Aurora Environmental to the satisfaction of the Shire of Dandaragan. This is not limited to, but specific mention is made to the management and mitigation strategies and contingency measures applicable to:

- a) wastewater effluent management;*
- b) solid waste management;*
- c) odour management;*
- d) noise management;*
- e) fire management; and*
- f) environmental monitoring and reporting.*

REASON: To clarify the Condition's intent and to delete reference to management of construction, which is addressed in Condition 23 (now Condition 15).

The Amending Motion was put and **CARRIED UNANIMOUSLY.**

Mr David Gray
Presiding Member, Mid-West/Wheatbelt JDAP



AMENDING MOTION

Moved by: Mr Robert Fenn

Seconded by: Cr Judy Kulisa

To amend Condition 8 (now Condition 6) to read as follows:

The vegetation, crops and pasture on Lot 3616 Agaton Road shall be maintained at all times to the satisfaction of the Shire of Dandaragan in a condition that ensures the structures on the site are not exposed to a Bushfire Attack Level (BAL) rating exceeding BAL 12.5.

REASON: To provide clarity on the bushfire risk standards that are required to be maintained on the Site to ensure building construction standards are not compromised.

The Amending Motion was put and **CARRIED UNANIMOUSLY.**

AMENDING MOTION

Moved by: Mr Robert Fenn

Seconded by: Cr Judy Kulisa

To delete Condition 9.

REASON: This is adequately covered by Condition 13 (now Condition 9) and the new Advice Note 9 (now Advice Note 7).

The Amending Motion was put and **CARRIED UNANIMOUSLY.**

AMENDING MOTION

Moved by: Mr David Gray

Seconded by: Mr Patrick Dick

To delete Condition 10.

REASON: The requirement is covered under separate legislation.

The Amending Motion was put and **CARRIED UNANIMOUSLY.**

AMENDING MOTION

Moved by: Mr Robert Fenn

Seconded by: Cr Judy Kulisa

To amend Condition 11 (now Condition 7) to read as follows:

Crossovers, access and egress to the subject site from Agaton Road and any internal road works, loading areas and car parking shall be located and constructed to an all-weather standard that limits dust generation to the satisfaction of the Shire of Dandaragan and include all necessary drainage and signage. Costs applicable to the construction of the access point/s onto the site and any related internal civil works shall be borne by the applicant.

Mr David Gray
Presiding Member, Mid-West/Wheatbelt JDAP



REASON: To confirm the standard of construction and that the access points and the internal civil works is required to be undertaken by the Applicant.

The Amending Motion was put and CARRIED UNANIMOUSLY.

AMENDING MOTION

Moved by: Mr Robert Fenn

Seconded by: Cr Judy Kulisa

To amend Condition 12 (now Condition 8) to read as follows:

A road condition survey is to be completed by the applicant and submitted to the Shire detailing any maintenance work required to public roads as a result of transport activities associated with the construction and operation of the piggery to the satisfaction of the Shire of Dandaragan and the Applicant shall undertake, at the Applicant's cost, any maintenance identified by the survey to retain the road network in a safe condition.

REASON: The development should limit its impact on road conditions in the locality.

The Amending Motion was put and CARRIED UNANIMOUSLY.

AMENDING MOTION

Moved by: Mr Robert Fenn

Seconded by: Mr David Gray

To amend Condition 13 (now Condition 9) to read as follows:

Prior to commencement of site works, the Applicant shall to the reasonable satisfaction of the Shire of Dandaragan quantify the impact of the additional (heavy vehicle) traffic on Agaton Road and any road upgrading and/or maintenance that is required as a result of the increased traffic, then contribute towards the cost of that upgrading and/or maintenance to the satisfaction of the Shire of Dandaragan.

REASON: To acknowledge there will be traffic impacts on Agaton Road and that the Applicant is required to contribute towards road upgrading.

The Amending Motion was put and CARRIED UNANIMOUSLY.

AMENDING MOTION

Moved by: Mr Robert Fenn

Seconded by: Mr Patrick Dick

To delete Condition 14.

REASON: This is adequately covered in the amended Condition 11 (now Condition 7).

Mr David Gray
Presiding Member, Mid-West/Wheatbelt JDAP



The Amending Motion was put and CARRIED UNANIMOUSLY.

AMENDING MOTION

Moved by: Mr Robert Fenn **Seconded by:** Mr Patrick Dick

To delete Condition 15.

REASON: This Condition serves no planning purpose.

The Amending Motion was put and CARRIED UNANIMOUSLY.

AMENDING MOTION

Moved by: Mr Robert Fenn **Seconded by:** Cr Judy Kulisa

To amend Condition 17 (now Condition 11) to read as follows:

The applicant is to provide details of the landscape screening shown on Plan 2 of Proposed Moora Piggery Supplementary Report (April 2017), plus provide additional landscape screening immediately to the west and east (and for the full length) of the wastewater treatment systems for Modules 2 (Moora 2) and Module 3 (Moora 3) to the Shire of Dandaragan; the approved landscape screening is to be planted by the Applicant, all plantings are to be brought to maturity and then maintained for the duration of the land use to the satisfaction of the Shire of Dandaragan.

REASON: Australian Pork Ltd guidelines recommend screening plantings near wastewater treatment systems to improve visual amenity and to reduce odour transmission on prevailing winds.

The Amending Motion was put and CARRIED UNANIMOUSLY.

AMENDING MOTION

Moved by: Mr Robert Fenn **Seconded by:** Mr David Gray

To delete Condition 18.

REASON: This Condition has been incorporated into the amended Condition 17 (now Condition 11).

The Amending Motion was put and CARRIED UNANIMOUSLY.

AMENDING MOTION

Moved by: Mr Robert Fenn **Seconded by:** Mr David Gray

To delete Condition 22.

Mr David Gray
Presiding Member, Mid-West/Wheatbelt JDAP



REASON: This is adequately covered by Condition 10 (now Advice Note 8).

The Amending Motion was put and CARRIED UNANIMOUSLY.

AMENDING MOTION

Moved by: Mr Robert Fenn

Seconded by: Mr Patrick Dick

To include a new Condition 23 (now Condition 15) to read as follows:

Prior to the issue of a Building Permit, or any development being undertaken on-site, the Applicant shall submit to the Shire of Dandaragan a Construction Management Plan and secure approval for:

- a) the location, construction designs, drainage and surfacing standards for the site access;*
- b) the delivery and storage of construction materials and equipment to the site;*
- c) the management of the fire risk on the site during the construction period;*
- d) the parking arrangements and provision of temporary amenities for contractors and subcontractors;*
- e) the management and storage of stormwater from site works, material lay down areas, internal roads, buildings and car parking areas in a manner to prevent site erosion within Lot 3616;*
- f) the extent of earthworks proposed on-site, the method of stabilising those earthworks and any on-going management required to prevent wind or water borne erosion;*
- g) a road condition survey detailing any maintenance work required to public roads as a result of transport activities associated with the construction of the piggery;*
- h) other matters likely to be impact on surrounding properties; and*
- i) the management of construction waste.*

The Construction Management Plan shall be implemented at all times during the construction phase.

REASON: The information provided by the Applicant fails to address site and external impacts during the construction phase of the project.

The Amending Motion was put and CARRIED UNANIMOUSLY.

AMENDING MOTION

Moved by: Robert Fenn

Seconded by: Mr David Gray

To amend Advice Note 1 to read as follows:

Further to this approval, the Applicant may be required to submit working drawings and specifications to comply with the requirements of the Building Act 2011, the Food Act 2008 and the Health Act 1911 which are to be approved by the Shire's Manager Building Services and/or Manager Environmental Health prior to issuing a Building Licence.

Mr David Gray
Presiding Member, Mid-West/Wheatbelt JDAP



REASON: To include reference to the Food Act 2008.

The Amending Motion was put and CARRIED UNANIMOUSLY.

AMENDING MOTION

Moved by: Mr Robert Fenn

Seconded by: Mr David Gray

To amend Advice Note 3 to read as follows:

Management of the approved development should at all times comply with the Biosecurity and Agriculture (Stable Fly) Management Plan 2016 in order to minimize the effects of stable flies on the community.

REASON: Stable flies result from poor on-site management, not the proposal.

The Amending Motion was put and CARRIED UNANIMOUSLY.

AMENDING MOTION

Moved by: Mr Robert Fenn

Seconded by: Mr David Gray

To delete Advice Note 4.

REASON: This has been included in Advice Note 1.

The Amending Motion was put and CARRIED UNANIMOUSLY.

AMENDING MOTION

Moved by: Mr Robert Fenn

Seconded by: Mr David Gray

To delete Advice Note 5.

REASON: This is a duplicate of Advice Note 1.

The Amending Motion was put and CARRIED UNANIMOUSLY.

AMENDING MOTION

Moved by: Mr Robert Fenn

Seconded by: Mr David Gray

To include a new Advice Note 8 (now Advice Note 6) to read as follows:

The endorsed plans shall not be modified or altered without the prior written approval of either the Shire of Dandaragan or Mid-West/Wheatbelt JDAP in accordance with Regulation 17 of the Planning and Development (Development Assessment Panels) Regulations 2011.

Mr David Gray
Presiding Member, Mid-West/Wheatbelt JDAP



REASON: Previously Condition 5.

The Amending Motion was put and CARRIED UNANIMOUSLY.

AMENDING MOTION

Moved by: Mr Robert Fenn

Seconded by: Mr David Gray

To include a new Advice Note 9 (now Advice Note 7) to read as follows:

The Landscape Screening shall be a minimum of 20m wide, comprise a combination of shrubs and trees to provide coverage from the ground up, comprise different species of mixed heights to promote air mixing and comprise plant species that are indigenous to the locality and need minimal upkeep and will thrive on the site.

REASON: To clarify the expectation on the planning of the landscape screening.

The Amending Motion was put and CARRIED UNANIMOUSLY.

AMENDING MOTION

Moved by: Mr David Gray

Seconded by: Mr Robert Fenn

To include a new Advice Note 10 (now Advice Note 8) to read as follows:

The piggeries will be operated to comply with the Environmental Protection (Noise) Regulations 1997. Routine observations and inspections will be required to be undertaken in regard to noise. Onsite management will be informed of the results of inspections and observations and will implement contingency actions to ensure compliance with Environmental Protection (Noise) Regulations 1997.

REASON: Previously proposed as Condition 10. To confirm that noise emissions are to comply with other legislation.

The Amending Motion was put and CARRIED UNANIMOUSLY.

PRIMARY MOTION (AS AMENDED)

That the Mid-West/Wheatbelt JDAP resolves to:

Approve DAP application reference DAP/17/01180 for a Piggery at Lot 3616 Agaton Road, Dandaragan as detailed in accompanying indexed plans;

- Plan 1: Site Plan (modified by Supplementary Report Plan 2) – Stamped 18/04/2017
- Plan 2: Module Site Layout - Stamped 06/02/2017
- Plans 3A>3D: Gilt Development Shed - Stamped 06/02/2017
- Plans 4A>4D: Boar Stud Shed - Stamped 06/02/2017

Mr David Gray

Presiding Member, Mid-West/Wheatbelt JDAP



- Plans 5A>5D: Mating Shed - Stamped 06/02/2017
- Plans 6A>6D: Dry Sow Shed 1 - Stamped 06/02/2017
- Plans 7A>7D: Dry Sow Shed 2 - Stamped 06/02/2017
- Plans 8A>8D: Dry Sow Shed 3 - Stamped 06/02/2017
- Plans 9A>9D: Farrowing Shed - Stamped 06/02/2017
- Plans 10A>10D: Nursery Shed 1 - Stamped 06/02/2017
- Plans 11A>11D: Nursery Shed 2 - Stamped 06/02/2017
- Plans 12A>12D: Finisher Shed - Stamped 06/02/2017
- Plans 13A>13D: Load Out Shed - Stamped 06/02/2017
- Plans 14A & 14B: Effluent Ponds (modified by Supplementary Report Plans 4A & 4B) - Stamped 18/04/2017
- Plans 15A & 15B: Fan Separator and Tank - Stamped 06/02/2017
- Plans 16A & 16B: Office and Amenities Block - Stamped 06/02/2017 and
- The information contained in the Proposed Moora Piggery for Westpork Pty Ltd Report (December 2016) and modified by the Proposed Moora Piggery Supplementary Report (April 2017) - Stamped 18/04/2017

in accordance with the Shire of Dandaragan Local Planning Scheme No.7, subject to the following conditions:

Conditions

1. This decision constitutes planning approval only and is valid for a period of 3 years from the date of approval. If the subject development is not substantially commenced within the 3 year period, the approval shall lapse and be of no further effect.
2. The land use and development shall be in accordance with the approved plans and the Applicant's report (including any amendments as detailed in the Proposed Moora Piggery Supplementary Report (April 2017) unless otherwise conditioned by this approval.
3. A maximum of 68,000 pigs shall be housed on site within Modules 2 (Moora 2) and Module 3 (Moora 3) at any time.
4. No solid effluent waste is to be applied to the soils upon Lot 3616 Agaton Road unless in accordance with a Nutrient Management Plan approved by the Shire of Dandaragan, inclusive of any on-going soil and groundwater monitoring required by the Shire of Dandaragan.
5. The development at all times shall comply with the commitments and standards defined in the Works Approval Application prepared by Aurora Environmental to the satisfaction of the Shire of Dandaragan. This is not limited to, but specific mention is made to the management and mitigation strategies and contingency measures applicable to:
 - a) wastewater effluent management;
 - b) solid waste management;
 - c) odour management;
 - d) noise management;
 - e) fire management; and
 - f) environmental monitoring and reporting.
6. The vegetation, crops and pasture on Lot 3616 Agaton Road shall be maintained at all times to the satisfaction of the Shire of Dandaragan in a



condition that ensures the structures on the site are not exposed to a Bushfire Attack Level (BAL) rating exceeding BAL 12.5.

7. Crossovers, access and egress to the subject site from Agaton Road and any internal road works, loading areas and car parking shall be located and constructed to an all-weather standard that limits dust generation to the satisfaction of the Shire of Dandaragan and include all necessary drainage and signage. Costs applicable to the construction of the access point/s onto the site and any related internal civil works shall be borne by the applicant.
8. A road condition survey is to be completed by the applicant and submitted to the Shire detailing any maintenance work required to public roads as a result of transport activities associated with the construction and operation of the piggery to the satisfaction of the Shire of Dandaragan and the Applicant shall undertake, at the Applicant's cost, any maintenance identified by the survey to retain the road network in a safe condition.
9. Prior to commencement of site works, the Applicant shall to the reasonable satisfaction of the Shire of Dandaragan quantify the impact of the additional (heavy vehicle) traffic on Agaton Road and any road upgrading and/or maintenance that is required as a result of the increased traffic, then contribute towards the cost of that upgrading and/or maintenance to the satisfaction of the Shire of Dandaragan.
10. The use and development must be conducted so that it has minimal impact on the amenity of the area by reason of:
 - a) transportation of material, goods and commodities to and from the premises;
 - b) appearance of any buildings, works and materials; and
 - c) the emission of odour, noise, vibration, dust, wastewater, waste products or reflective light.
11. The applicant is to provide details of the landscape screening shown on Plan 2 of Proposed Moora Piggery Supplementary Report (April 2017), plus provide additional landscape screening immediately to the west and east (and for the full length) of the wastewater treatment systems for Modules 2 (Moora 2) and Module 3 (Moora 3) to the Shire of Dandaragan; the approved landscape screening is to be planted by the Applicant, all plantings are to be brought to maturity and then maintained for the duration of the land use to the satisfaction of the Shire of Dandaragan.
12. In addition to the disposal of carcasses strategy detailed in the submitted reports, the applicant is required to carry out the following procedures:
 - i. large carcasses should be split to minimise bloating;
 - ii. the pit bases should be at least 2m above the water table at all times;
 - iii. pits should be situated on low permeability soils and/or low risk sites;
 - iv. carcasses need to be well covered with soil, or other suitable material, each day to avoid scavenging by feral animals and to prevent odour;
 - v. further clay should be compacted over filled pits;
 - vi. earth should be mounded over filled pits to promote shedding of stormwater; and
 - vii. the mounds should be grassed over, but trees should not be planted at the site as the roots allow water to move through the pits.



13. The anaerobic ponds are at all times to be covered with an impermeable cover in order to reduce odour escaping to the environment, excluding when maintenance is being carried out.
14. The piggery is to be operated in accordance with guidance document "AUSTRALIAN PORK LIMITED – Minimising Odour from Piggeries 2015".
15. Prior to the issue of a Building Permit, or any development being undertaken on-site, the Applicant shall submit to the Shire of Dandaragan a Construction Management Plan and secure approval for:
 - a) the location, construction designs, drainage and surfacing standards for the site access;
 - b) the delivery and storage of construction materials and equipment to the site;
 - c) the management of the fire risk on the site during the construction period;
 - d) the parking arrangements and provision of temporary amenities for contractors and subcontractors;
 - e) the management and storage of stormwater from site works, material lay down areas, internal roads, buildings and car parking areas in a manner to prevent site erosion within Lot 3616;
 - f) the extent of earthworks proposed on-site, the method of stabilising those earthworks and any on-going management required to prevent wind or water borne erosion;
 - g) a road condition survey detailing any maintenance work required to public roads as a result of transport activities associated with the construction of the piggery;
 - h) other matters likely to be impact on surrounding properties; and
 - i) the management of construction waste.

The Construction Management Plan shall be implemented at all times during the construction phase.

Advice Notes

1. Further to this approval, the Applicant may be required to submit working drawings and specifications to comply with the requirements of the Building Act 2011, the Food Act 2008 and the Health Act 1911 which are to be approved by the Shire's Manager Building Services and/or Manager Environmental Health prior to issuing a Building Licence.
2. The Department of Health advises that any form of pest control using pesticides must comply with the Health (Pesticides) Regulations 2011.
3. Management of the approved development should at all times comply with the Biosecurity and Agriculture (Stable Fly) Management Plan 2016 in order to minimize the effects of stable flies on the community.
4. DAFWA recommends that future soil testing for monitoring is done at fixed depths (for example, 0 to 10cm, 50 to 100cm and 100 to 200cm) to two metres to understand both the nutrient content of soils and if there is any movement of phosphorus and other nutrients down the soil profile to indicate if there is leaching to greater depths.

Mr David Gray
Presiding Member, Mid-West/Wheatbelt JDAP



5. The Department of Water recommend that monitoring wells are installed to assess potential risk to be superficial unconfined aquifer from leachates associated with carcass burial pits. These should be constructed to a depth of 25m below ground level and located down (hydraulic) gradient from the pig carcass disposal sites.
6. The endorsed plans shall not be modified or altered without the prior written approval of either the Shire of Dandaragan or Mid-West/Wheatbelt JDAP in accordance with Regulation 17 of the Planning and Development (Development Assessment Panels) Regulations 2011.
7. The Landscape Screening shall be a minimum of 20m wide, comprise a combination of shrubs and trees to provide coverage from the ground up, comprise different species of mixed heights to promote air mixing and comprise plant species that are indigenous to the locality and need minimal upkeep and will thrive on the site.
8. The piggeries will be operated to comply with the Environmental Protection (Noise) Regulations 1997. Routine observations and inspections will be required to be undertaken in regard to noise. Onsite management will be informed of the results of inspections and observations and will implement contingency actions to ensure compliance with Environmental Protection (Noise) Regulations 1997.

REASON: In accordance with details contained in the Responsible Authority Report and Amending Motions.

The Primary Motion (as amended) was put and CARRIED UNANIMOUSLY.

9. **Form 2 – Responsible Authority Reports – Amending or cancelling DAP development approval**

Nil

10. **Appeals to the State Administrative Tribunal**

Nil

11. **General Business / Meeting Close**

The Presiding Member reminded the meeting that in accordance with Standing Order 7.3 only the Presiding Member may publicly comment on the operations or determinations of a DAP and other DAP members should not be approached to make comment.

There being no further business, the Presiding Member declared the meeting closed at 2.50pm.

Mr David Gray
Presiding Member, Mid-West/Wheatbelt JDAP



Form 1 – Responsible Authority Report (Regulation 12)

Property Location:	Lots 194 Robartson Road and 19444 Bruce Rock-Merredin Road, Merredin
Development Description:	Solar Farm – 100MW (AC)
DAP Name:	Mid-West/Wheatbelt JDAP
Applicant:	Mr Troy Santen, Stellata Energy Pty Ltd
Owner:	Ross Anthony Smith
Value of Development:	\$160 million
LG Reference:	A9516, MDPA008(2017)
Responsible Authority:	Shire of Merredin
Authorising Officer:	Greg Powell, CEO
Department of Planning File No:	DAP/17/01195
Report Due Date:	5 June 2017
Application Receipt Date:	7 March 2017
Application Process Days:	90 days
Attachment(s):	1: DAP DA form 2. Development Approval Application Report 3. Shawmac – Traffic Impact Statement 4: Council Minutes 21/3/2017 and 2/5/2017 5: Schedule of Submissions and copies of responses received from statutory or public authorities

Officer Recommendation:

That the Mid-West/Wheatbelt JDAP resolves to:

1. **Accept** that the DAP Application reference DAP/17/01195 is appropriate for consideration as a 'solar farm' land use and is compatible with the objectives of the zoning table in accordance with the Local Planning Scheme No 6 of the Shire of Merredin;
2. **Approve** the DAP Application reference DAP/17/01195 and accompanying Development Approval Application Report (Attachment 2) in accordance with Clause 68 of the *Planning and Development (Local Planning Schemes) Regulations 2015* and the provisions of the Shire of Merredin's Local Planning Scheme No 6, subject to the following conditions:

Conditions

1. receipt of the necessary clearing permits from the Department of Environment Regulation (DER);
2. clarification and protection (if appropriate) of the 'wetland' identified by the DER to the satisfaction of the DER;
3. the submission and approval of a more detailed plan showing the proposed interim and longer term facilities including the building/structure setbacks, carparking facility and the administration facilities;
4. the preparation of a Drainage Management Plan for the development to the satisfaction of Council;

5. the design and location of on-site effluent systems for the construction phase as well as the longer term to be in accordance with Council requirements;
6. the preparation of a Bushfire Management Plan to the satisfaction of the Department of Fire and Emergency Services to ensure that sites are appropriately classified and the necessary risk mitigation measures are in place;
7. the removal of all construction infrastructure once the facility has been completed to the satisfaction of Council;
8. Council approval of any crossovers required by the development; and
9. receipt of technical advice and evidence that the solar panels will not cause any harm to the nearest residences.

Footnotes

1. The applicant is advised that granting of development approval does not constitute a building permit and that an application for relevant building permits must be submitted to the Shire of Merredin and be approved before any work requiring a building permit can commence on site.
2. Effluent disposal facilities will require an application for the installation or construction of an apparatus for the treatment of sewage to be submitted to the Shire of Merredin.
3. The applicant is advised that as the proposed work is near energised electrical installations and powerlines, the person in control of the work site must ensure that no person, plant or material enters the 'Danger Zone' of an overhead powerline or other electrical network assets. The 'Danger Zone' is set out in Western Australian Occupational Safety and Health Regulation 1996 - specifically Reg 3.64. Any information provided by Western Power should not be used in isolation and reference to the Occupational Safety and Health Act 1984 and Occupational Safety and Health Regulations 1996 is required. These documents outline WorkSafe WA requirements for working near electricity.
4. The applicant is advised of the need for annual bushfire compliance.
5. No structure or effluent disposal system is to be constructed across the boundary of the two lots.

Details: outline of development approval application

Insert Zoning	MRS:	n/a
	LPS:	General Farming
Insert Use Class:		Use not listed
Insert Strategy Policy:		n/a
Insert Development Scheme:		n/a
Insert Lot Size:		531.87 hectares (2 lots)
Insert Existing Land Use:		Rural
Value of development		\$160 million

Existing Land Use

The land is currently used for cropping and occasional grazing purposes and is almost completely cleared of vegetation.

Most areas surrounding the subject land are all used for similar purposes except the Reserve abutting the northern boundary of the site. This is a Reserve for Conservation (Reserve 19476) administered by the DPaW (Department of Parks and Wildlife). On the west boundary of the subject land is the Western Power substation and power station. Proximity to this facility minimises the solar farm's connection to the grid.

Location

The site is located about 4 kilometres southwest of the edge of the Merredin townsite as shown in **Figure 1**. The land is composed of two lots totalling 531.87 hectares.

FIGURE 1 – AERIAL VIEW OF SITE



Source: Landgate, Planwest

Brief Description of Proposed Development

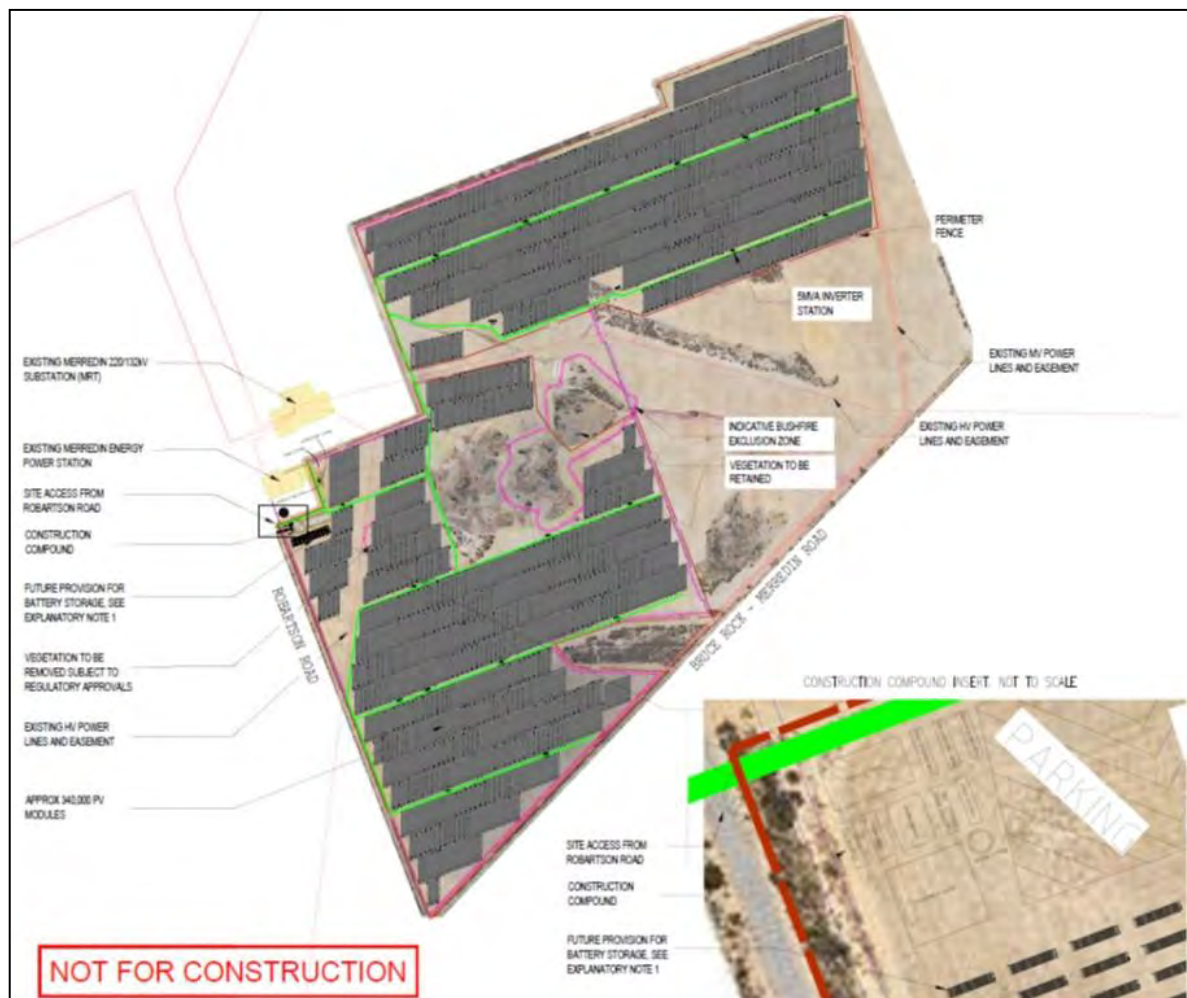
The proposed solar farm will have a generation capacity of approximately 120MW (AC) via the use of between 360,000 and 400,000 tracking solar panels and associated infrastructure, including • Photo Voltaic Modules • Piles and Framework • Inverters (and associated housings) • Transformers (and associated housings) • Substations (including circuit breakers and metering) • Underground cabling • Overhead wires • Perimeter Fence • CCTV (at entrance and adjacent to substations) • Battery Storage • Spares Storage building • Maintenance compound.

The Development Approval application will consist of the 120MW (DC) of generation and up to 50 MWh of battery storage. It will cover the entirety of Lot 194 Robartson Road, and the north-western corner of Lot 19444 Bruce Rock-Merredin Road as shown on the Indicative Layout Plan (**Figure 2**).

Construction will possibly be in up to two phases. The generation equipment will all be constructed in one campaign, with the battery storage in a subsequent stage.

Once fully operational, the landowner will have access to most the site for sheep grazing. This will assist in maintaining the ongoing agricultural use of the site and will also assist in keeping grass levels low for bushfire management purposes.

FIGURE 2 – SITE LAYOUT



Source: Land Insights, 2017

Part of the initial development includes some temporary development on site that will be required during the construction phase of the project. This includes the development of a construction compound and two or three satellite site offices. The satellite site offices spread across the site are likely to include meeting room, lunch room, toilets and ablution facilities.

Proposed Land Use

The proposed land use will be for a Solar Farm

Existing Zoning

General Farming.

Background:

The land is currently used for cropping and occasional grazing purposes and is almost completely cleared of vegetation. **Figure 3** shows an aerial view of the property showing the few remaining areas of vegetation.

FIGURE 3 – AERIAL VIEW OF SITE



Source: Landgate, Planwest

Most of the areas surrounding the subject land are all used for similar purposes except the Reserve abutting the northern boundary of the site. This is a Reserve for Conservation (Reserve 19476) administered by the DPaW (Department of Parks and Wildlife). On the west boundary of the subject land is the Western Power substation and power station. Proximity to this facility minimises the solar farm's connection to the grid.

Legislation and Policy:

Shire of Merredin Local Planning Scheme No 6 provides the statutory framework for determining such applications.

Legislation

Planning and Development Act 2005

- Part 5 of the Act provides a statutory head of power for the Shire of Merredin to prepare, adopt and implement a local planning scheme.
- Part 14 of the Act provides a right of review by the State Administrative Tribunal If an applicant or owner is aggrieved by the determination of their development application. An application for review must be made within 28 days of the determination.

Planning and Development Regulations 2009

- Part 7 of the Regulations enables local government to charge specified fees for planning services, including development approval applications.
- Fees have been charged (and paid) in accordance with the Regulations.

Planning and Development (Development Assessment Panels) Regulations 2011

- The value of the development exceeds \$10 million and is therefore a 'mandatory' DAP application where the Mid-West/Wheatbelt Joint Development Assessment Panel becomes the determining authority.
- The DAP Secretariat acknowledged receipt of the application (Ref: DP/17/01195) on 21 March 2017.

Shire of Merredin Local Planning Scheme No. 6 (Scheme 6)

- The subject property is zoned General Agriculture under the provisions of Scheme 6.
- The proposed use of the land for the purposes of a Solar Farm Facility is not specifically listed in the zoning table or defined in the Scheme.
- The application has been processed in accordance with the Deemed provisions of the *Planning and Development (Local Planning Schemes) Regulations 2015*.
- A Report was presented to Council at its Ordinary Meeting held on 21 March 2017 to consider the provisions of clause 4.4.2 of Scheme 6.
- It was resolved, as recommended by the Officer, to assess the application in accordance with the provisions of clause 4.4.2(b), that is, the use may be consistent with the zone objectives. A copy of the Report is provided as part of Attachment 3.
- The Planning Assessment section of this Report provides a detailed assessment of the relevant provisions of Scheme 6.

State Government Policies

State Planning Policy No. 1 – State Planning Framework (SPP 1)

SPP 1 sets out the general principles for land use planning and development in the State and aims to provide a framework for the sustainable use and development of land. The Framework is supported by five principles, which are:

Environment: To protect and enhance the key natural and cultural assets of the State and deliver to all West Australians a high quality of life which is based on environmentally sustainable principles.

Community: To respond to social changes and facilitate the creation of vibrant, safe and self-reliant communities.

Economy: To actively assist in the creation of regional wealth, support the development of new industries and encourage economic activity in accordance with sustainable development principles.

Infrastructure: To facilitate strategic development by making provision for efficient and equitable transport and service utilities.

Regional Development: To assist the development of regional Western Australia by taking account of the special assets and accommodating the individual requirements of each region.

State Planning Policy No. 2.5 – Land Use Planning in Rural Areas (SPP 2.5)

SPP 2.5 provides guidance for economic opportunities for rural communities and to protect the State's primary industries (agriculture and natural resource assets). The Policy provides the framework for the Commission to promote rural areas in schemes as highly flexible zones that cater for a wide range of rural land uses supporting primary production and value adding, small-scale tourism, environmental protection and biodiversity conservation; together with considering the differing needs of each region.

State Planning Policy 3.7 – Planning in Bushfire Prone Areas (SPP 3.7)

Parts of the site are identified as bushfire prone and therefore the provisions of this policy are applicable to the development proposal. A Bushfire Attack Level (BAL) report has been prepared.

State Sustainability Strategy (2003)

The Strategy establishes a sustainability framework containing principles, visions, and goals. It seeks to ensure that sustainability is considered and incorporated into decisions and actions for the future of Western Australia at all levels.

Wheatbelt Regional Planning and Infrastructure Framework

The Framework provides an overview of regional planning issues and a basis for ongoing planning and development.

The Wheatbelt will have a diverse social and economic base, be a leader in innovation and create new opportunities that confirm it as a key contributor to the State's prosperity.

The Framework acknowledges that the Wheatbelt region offers an abundant source of renewable energy due to its climatic and geographic conditions that are conducive to alternative energy generation such as wind, solar, geothermal and biomass generation. Renewable energy offers the capacity to reduce reliance on centrally distributed energy.

In its decision-making, the Western Australian Planning Commission will aim to support development of the energy sector to meet regional and State energy needs;

Local Policies***Merredin Local Planning Strategy***

The Strategy was adopted in 2007 and provides a framework for strategic planning in the Shire. The Strategy aims to protect agricultural land, promote sustainability and encourage diversity, including tourism uses to reduce reliance on agriculture as the primary industry but makes no reference to renewable energy projects.

Merredin Strategic Community Plan

The Merredin Strategic Community Plan was adopted in 2015 and captures the community's vision for the future and outlines Council's strategic directions and priorities for the next ten years. The following Key Priority areas align with the proposed solar farm development;

SP.D1.3 Promote new commercial and industrial development through appropriate zoning of land, provision of suitable infrastructure and efficient and effective business approval processes

SP.E1.2 Work with relevant agencies to actively encourage the adoption of efficient energy and water usage

Consultation:**Public Consultation**

At the Council meeting of 21 March 2017, the Council agreed to advertise the proposed development for 21 days to gain comments from residents, ratepayers and agencies that have comments on the proposal.

During the advertising period between 29 March 2017 and 19 April 2017 there were four submissions received. The Department of Fire and Emergency Services (DFES) requested an extension to this period and its submission was received on 25 April 2017 (the 5th submission). The proposal was advertised in the West Australian and The

Phoenix with neighbours and agencies being notified in writing of the proposal. These agencies included Main Roads WA, DER, DPaW, Western Power, DFES and Department of Health.

Issue Raised	Officer Recommendation	Recommended Action
Stormwater run-off	That condition be imposed on the DA requiring a drainage management plan to the satisfaction of the Council.	Condition to be imposed requiring a Drainage Management Plan to the Council's satisfaction
Reflection concerns	2. The panels track the sun and are unlikely to reflect, however clarification will be requested.	Evidence that the solar panels will not cause injury through reflection.
Traffic movements	Traffic is only likely to be increased during construction.	No action required.
Clearing permits	Applicant advises that DER prefers to have planning approvals in place before assessing clearing permits, however condition will be imposed.	Condition requiring DER clearing permit approval required.
Wetland protection	The Wetland has yet to be located, however <i>if</i> it is found to be in need of protection this will be included in the responsible authority report to JDAP.	The location and significance of the wetland needs to be confirmed by DER.
Danger zone issues	The applicant should be made aware that the proposed works are near energised electrical installations and powerlines (a Danger Zone). No person shall enter the Danger Zone. All work shall comply with 'WorkSafe' standards.	These issues to added as a footnote to the approval.
Bushfire Management Plan	It is evident that there are several issues that DFES has with the BMP. None of these issues have been flagged by DFES as being unresolvable. Although DFES recommends deferral of the application it is suggested that these issues can be resolved as a condition of the DA approval. If these issues are unresolvable the applicant has the option of an appeal to the State Administrative Tribunal (SAT).	That a condition be imposed on the approval for the preparation of a Bushfire Management Plan be prepared to the satisfaction of DFES.

Consultation with other Agencies or Consultants

During the adverting period between 29 March 2017 and 19 April 2017 the following agencies were contacted in writing; Main Roads WA, DER, DPaW, Western Power, DFES and Department of Health.

Planning Assessment:

Local Planning Scheme No 6

The property is zoned 'General Agriculture' and is currently used for broad-hectare farming activities. The proposed solar farm and associated infrastructure have been assessed as a 'use not listed'.

The option of designating the use as a 'service utility' was considered however the definition includes 'any work or undertaking constructed or maintained by a service authority or the Council'. This was not considered strictly appropriate for the current proposal.

The following table outlines the areas of the Scheme that may relate to the proposed development.

Item	Requirement	Proposal	Compliance
4.2.11 - Objectives of the General Farming zone	The objectives are; 4.2.11.1 To provide for a range of rural pursuits that are compatible with the capability of the land and retain the rural character and amenity of the locality. 4.2.11.2 To protect land from urban uses that may jeopardise the future use of that land for other planned purposes that are compatible with the zoning. 4.2.11.3 To support sustainable farming practices and the retention of remnant vegetation. 4.2.11.4 To prevent any development that may affect the viability of a holding. 4.2.11.5 To encourage small scale, low impact tourist accommodation in rural locations. 4.2.11.6 To encourage a diversification of rural activities that will reduce the dependency of the rural sector on traditional crops. 4.2.11.7 To support the creation of homestead lots in accordance with adopted Local Planning Policy. 4.2.11.8 To support mining activities where an environmental management plan has been prepared and is acceptable to the Council and the Environmental Protection Authority. 4.2.11.9 To preclude the disposal of used tyres or any other material that may be detrimental to the quality of the land.	Renewable energy not mentioned in the zone objectives.	A Solar Farm can be permitted as a use not listed.
4.4.2 - Uses not listed in the Zoning Table	If a person proposes to carry out on land any use that is not specifically mentioned in the Zoning Table and	Solar Farm or renewable energy facility not listed in	A Solar Farm can be permitted as a use not listed, provided the

Item	Requirement	Proposal	Compliance
	cannot reasonably be determined as falling within the type, class or genus of activity of any other use category the local government may – (a) determine that the use is consistent with the objectives of the particular zone and is therefore permitted; (b) determine that the use may be consistent with the objectives of the particular zone and thereafter follow the advertising procedures of clause 9.4 in considering an application for planning approval; or (c) determine that the use is not consistent with the objectives of the particular zone and is therefore not permitted.	the zoning table	Council determines that the use may be consistent with the objectives of the particular zone and thereafter follow the advertising procedures of clause 9.4 (now Part 8 of Deemed provisions) in considering an application for planning approval
5.7.1 - Development Requirements	5.7.1 Development Requirements Where requirements for a particular use are not set out in this Scheme, the development shall conform to the provisions for the predominant use of the zone in which it is situated, as determined by the local government. Where such provisions are inappropriate, development shall conform to such requirements as the local government shall determine. For the purposes of this Clause, the predominant uses in zones and local reserves shall be deemed to be as outlined in their respective objectives.	The Scheme does not set out development requirements for a Solar Farm.	The Solar Farm complies with the development requirements for general farming.
5.7.4 - Car Parking	Car parking requirements for each use are set out in Table II - Development Table and the relevant Local Planning Policy.	No detail is shown for car parking.	The Council is keen to support the proposed development and considers the design and location of parking a detail that can be the subject of a more detailed plan.
5.7.5 - Landscaping	Landscaping requirements for each use are set out in Table II - Development Table and the relevant Local Planning Policy.	No detail is shown for landscaping.	The Council is keen to support the proposed development and considers the design and location of landscaping a detail that can be the subject of a more detailed plan.
5.14 - General Farming Zone Development	Notwithstanding the right to develop a single house on an existing lot, residential development in the General Farming zone shall comply with the specific requirements of	The Solar Farm complies with (a) acceptable environmental risks,	(a) Clearing permits are to be conditional on the approval. (b) the Council considers that there

Item	Requirement	Proposal	Compliance
	<p>the Council, however these shall not be less than those specified for the Residential Design Code R2. The erection of more than one (1) single house per lot will generally not be supported, except where it can be demonstrated that the additional houses are for workers accommodation.</p> <p>All proposals for development in the General Farming zone must have regard to both on-site and off-site impacts and, where necessary, should be accompanied by information identifying –</p> <p>(a) environmental values and any environmental risks;</p> <p>(b) the potential for land use conflict;</p> <p>(c) the potential impacts and restrictions on allowed uses on adjacent or nearby locations;</p> <p>(d) the separation distances and/or buffers relating to a potentially incompatible land use which need to be provided on-site and the appropriate conditions relating to subdivision and development.</p>	<p>(b) land use conflicts,</p> <p>(c) and potential impacts on adjacent or nearby locations.</p> <p>(d) There are no specific buffer or separation distances required for a Solar Farm.</p>	<p>are no land use conflicts. The land will continue to be grazed with sheep to manage the vegetation cover.</p> <p>(c) after construction, there will minimal maintenance and monitoring access to the site.</p> <p>(d) The design of the solar panels dictate that they track the direction of the sun thus avoiding any reflection issues.</p>
Part 7 - Heritage Protection	There are no areas of heritage significance.		Development complies.
Part 8 - Development of Land	Now Part 8 of Deemed Provisions.		Complies
Part 9 - Applications for Planning Approval	Now Part 7 of Deemed Provisions.		Complies
Part 10 - Procedures for Dealing with Applications	Now Part 9 of Deemed Provisions.		Complies
Schedule 1 – Dictionary of Defined Words and Expressions	Use not defined	Wind farm is the only renewable energy defined.	Complies with 'uses not listed' provisions.
Schedule 6 – Form of Application for Planning Approval	Now Part 11 of Deemed Provisions.		Complies

Summary

The proposed development of renewable energy production is encouraged and supported in the state strategies and policies. Although the local planning strategy is silent on the matter, the Council supports the development of sustainable alternative energy sources.

Officer Comments

The Council has recommended approval of the application with a resolution carried 8/0 in favour. Rather than delaying a determination of the DA the Council prefers to be supportive of the proposal, albeit subject to conditions.

The approval was subject to several conditions imposed for the following reasons;

Condition 1 requires clearing permits from DER. Previously the DER has preferred to issue permits based on a development that has been supported. Where permits are not forthcoming the applicant will need to adjust the development proposals accordingly.

Condition 2 requires clarification of the presence of a wetland on the property. The DER has identified that there is one, however advice indicates that this may be a farm dam. If the DER require this feature to be protected the applicant may need to adjust the development proposal.

Condition 3 requires a more detailed plan of building and structure locations, and car parking facilities. The Council is less concerned about the precise location of these facilities however will need to see more detailed drawings to ensure they are to its satisfaction. This applies to temporary and well as longer term facilities as the standards required by the Council may vary.

Condition 4 requires the submission of a Drainage Management Plan. This is in response to a submission as well as the potential for the development to alter the drainage pattern in the area.

Condition 5 requires details of the on-site effluent systems. Whilst the Council is less concerned about the precise location of these facilities it will need to ensure that they are located and designed in accordance with its requirements for the short-term as well as the more permanent facilities.

Condition 6 requires the Bushfire Management Plan to be modified to comply with DFES requirements. Resulting from a submission received from DFES, it is evident that there are several issues that DFES has with the BMP. None of these issues have been flagged by DFES as being unresolvable. Although DFES recommends deferral of the application it is suggested that these issues can be resolved as a condition of the DA approval. If these issues cannot be resolved to the satisfaction of DFES the applicant has the option of an appeal to SAT. Otherwise the approval becomes null and void.

Condition 7 requires the removal of all construction material once the works are completed.

Condition 8 requires the Council's approval for crossovers to public streets.

Condition 9 requires some technical evidence that the solar panels will not any harm to nearby residents.

The recommended approval adds several footnotes for advice to the applicant. Although these issues are obligatory the Council prefers that the reminders are added.

Footnote 1 reminds the applicant that building licenses are required in addition to the DA prior to any works commencing.

Footnote 2 reminds the applicant that the effluent disposal facilities will require an application.

Footnote 3 results from a submission from Western Power about the existing Danger zone and the need to comply with *Occupational Safety and Health Act 1984* and *Occupational Safety and Health Regulations 1996*. Although compliance with these Acts and Regulations is obligatory, the Council prefers the reminder.

Footnote 4 advises of the need for annual bushfire compliance.

Footnote 5 reminds the applicant that no structure or effluent disposal system can be constructed across a boundary (between the two lots).

Council Recommendation:

That the JDAP Secretariat be advised that the Merredin Council recommends that the Development Approval application for a solar farm facility at Lot 194 Robartson Road, Merredin and Lot 19444 Bruce Rock-Merredin Road, Merredin be approved subject to the following conditions:

1. receipt of the necessary clearing permits from the Department of Environment Regulation (DER);
2. clarification and protection (if appropriate) of the 'wetland' identified by the DER to the satisfaction of the DER;
3. the submission and approval of a more detailed plan showing the proposed interim and longer term facilities including the building/structure setbacks, carparking facility and the administration facilities;
4. the preparation of a Drainage Management Plan for the development to the satisfaction of Council;
5. the design and location of on-site effluent systems for the construction phase as well as the longer term to be in accordance with Council requirements;
6. the preparation of a Bushfire Management Plan to the satisfaction of the Department of Fire and Emergency Services to ensure that sites are appropriately classified and the necessary risk mitigation measures are in place;
7. the removal of all construction infrastructure once the facility has been completed to the satisfaction of Council;
8. Council approval of any crossovers required by the development; and
9. receipt of technical advice and evidence that the solar panels will not cause any harm to the nearest residences.

Footnotes

1. The applicant is advised that granting of development approval does not constitute a building permit and that an application for relevant building permits must be submitted to the Shire of Merredin and be approved before any work requiring a building permit can commence on site.
2. Effluent disposal facilities will require an application for the installation or construction of an apparatus for the treatment of sewage to be submitted to the Shire of Merredin.
3. The applicant is advised that as the proposed work is near energised electrical installations and powerlines, the person in control of the work site must ensure

that no person, plant or material enters the 'Danger Zone' of an overhead powerline or other electrical network assets. The 'Danger Zone' is set out in Western Australian Occupational Safety and Health Regulation 1996 - specifically Reg 3.64. Any information provided by Western Power should not be used in isolation and reference to the Occupational Safety and Health Act 1984 and Occupational Safety and Health Regulations 1996 is required. These documents outline WorkSafe WA requirements for working near electricity.

4. The applicant is advised of the need for annual bushfire compliance.
5. No structure or effluent disposal system is to be constructed across the boundary of the two lots.

Conclusion:

The Council supports the proposed development as it;

- Is considered to be in accordance with the aims, objectives and provisions of the relevant statutory and strategic instruments.
- Is in close proximity to both Merredin townsite and the Western Power substation providing an ideal location for the facility.
- Has no adverse environmental effect and no adverse impact by way of traffic, visual amenity or noise.
- Is a positive environmental initiative representing an important contribution to renewable energy generation in the Wheatbelt region.
- Consolidates the Council's position in support of renewable energy facilities to complement the Collgar Wind Farm.



DAP FORM 1

Notice of Development Application to be Determined by a Development Assessment Panel

Planning and Development Act 2005

Planning and Development (Development Assessment Panel) Regulations 2011 – regulations 7, 10, 21

Application Details

To	Name of local government and/or Western Australian Planning Commission Shire of Merredin	
Planning Scheme(s)	Name of planning scheme(s) that applies to the prescribed land Town Planning Scheme No. 6	
Land	Lot number, street name, town/suburb Lot 194 Robartson Road, Merredin Lot 19444 Bruce Rock - Merredin Road, Merredin	
Certificate of Title (provide copy)	Volume Number 2798; 2721	Folio 467; 743
	Location Number	Plan / Diagram Number 72480; 229758
Details of development application made to responsible authority	Summary of Proposal Solar Farm - 100MW	
Development Use	Residential / Commercial / Industrial / Rural / Mixed Use / Other Rural	
Estimated cost of development (GST Inc)	\$ \$160m	

Part A - Acknowledgement by Applicant and Landowner

Mandatory Application	<input checked="" type="checkbox"/> I give notice that I understand that this is a mandatory Development Assessment Panel application (regulation 5)
Optional Application	<input type="checkbox"/> I give notice that I have elected to have the development application that accompanies this form determined by a Development Assessment Panel (regulation 6)
Delegated Application	<input type="checkbox"/> I give notice that I understand that this is an application of a class delegated to a Development Assessment Panel for determination (regulation 19)

Applicant Details (to be completed and signed by applicant)

By completing this notice, I declare that all the information provided in this application is true and correct. I understand that the information provided in this notice, and attached forming part of the development application will be made available to the public on the Development Assessment Panel and local government websites.

Name	Troy Santen	
Company	Stellata Energy	
Address	Street number/PO Box number, street name, suburb, state, postcode C/o Land Insights; PO Box 289 Mt Lawley WA 6929	
Contact Details	Email admin@landinsights.com.au	Phone 0892718506
Signature		Date

Landowner Details (to be completed and signed if landowner is different from applicant)

By completing this notice, I give consent to the making of this application by any authorised applicant on my behalf.

Name	Ross Anthony Smith	
Address	Street number/PO Box number, street name, suburb, state, postcode PO Box 197, Merredin WA, 6415	
Contact Details	Email farmerross64@gmail.com	Phone 0458 100 856
Signature		Date 07 / 03 / 2017

Part B - Acknowledgement by Local Government

Responsible Authority	<input checked="" type="checkbox"/> Local Government <input type="checkbox"/> Western Australian Planning Commission <input type="checkbox"/> Dual – Local Government and Western Australian Planning Commission <input type="checkbox"/> Building Management and Works (Department of Finance) – <i>Public School Applications</i>	
Fees for applications (DAP Regulations - Schedule 1)	\$ Amount that has been paid by the applicant \$ Amount to be paid by local government (<i>delegated applications only - regulation 22</i>)	
Statutory Timeframe (regulation 12)	<input type="checkbox"/> 60 days (advertising not required) <input checked="" type="checkbox"/> 90 days (advertising required or other scheme provision)	
LG Reference Number		
Name of planning officer (Report Writer)		
Position/Title		
Contact Details	Email	Phone
Planning Officer's Signature		Date

Please refer to the Development Assessment Panel's "Guidance Note: Lodging a DAP Application" for further information.

Proposed Merredin Solar Farm – Phase 1

Robertson Road and Bruce Rock-Merredin Road

DEVELOPMENT APPLICATION REPORT

Prepared for

STELLATA ENERGY

Prepared by:

Land Insights

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Document details:

File: 1012

Revision 3 DRAFT

Date: February 2017

Document History:

Date	Document Name	Document Manager	Summary of Document Revision	Client Delivered
Feb-17	1012-01 (DA) Ver1a_MT.docx	MT	Preliminary Draft for Review	
Feb-17	1012-01 (DA) Ver2_MT.docx	MT	Construction details added.	28/02/17
Mar-17	1012-01 (DA) Ver3_MT.docx	MT	Client review	01/03/17
Mar-17	1012-01 (DA) Ver4_MT.docx	MT	Final	

Important Note:

"The information contained in this report has been prepared with care by the author(s), or it has been supplied to the author(s) by apparently reliable sources. In either case, the author(s) have no reason to doubt its completeness or accuracy. However, neither the author(s) company nor its employees guarantee the information, nor does it or is it intended to form part of any contract. Accordingly, all interested parties should make their own inquiries to verify the information, as well as any additional or supporting information supplied, and it is the responsibility of interested parties to satisfy themselves in all respects.

This report is for the use only of the party to whom it is addressed.

Land Insights disclaims responsibility to any third party acting upon or using the whole or part of its contents."

Executive Summary

APPLICANT:	Stellata Energy Pty Ltd C/O Land Insights PO Box 289 Mount Lawley WA 6929 Ph: 9271 8506 Email: admin@landinsights.com.au
OWNER:	Ross Anthony Smith
CERTIFICATE OF TITLE:	Lot 194: Volume: 2721 / Folio: 746 Lot 19444: Volume: 2721 / Folio: 743
LOCAL GOVERNMENT:	Shire of Merredin
DATE:	February 2017

Land Insights provide town planning services to Stellata Energy Pty. Ltd. and as such we lodge this Development Application on their behalf. The application proposes the establishment of a 120MW solar farm across Lots 194 Robartson Road and adjoining Lot 19444 Bruce Rock – Merredin Road, Merredin.

The proposed solar farm will have a generation capacity of 120MW via the use of between 360 000 and 400 000 tracking solar panels and associated infrastructure, including:

- Photo Voltaic Modules
- Piles and Framework
- Inverters (and associated housings)
- Transformers (and associated housings)
- Substations (including circuit breakers and metering)
- Underground cabling
- Overhead wires
- Perimeter Fence
- CCTV (at entrance and adjacent to substations)
- Battery Storage
- Spares Storage building
- Maintenance compound.

Once operational, the site will be suitable for grazing sheep, and will thus retain an agricultural use.

Supporting the Development Application are a Fire Management Plan and Traffic Impact Statement, both attached.

Table of Contents

1	INTRODUCTION.....	3
1.1	BACKGROUND AND PURPOSE	3
1.2	ABOUT STELLATA ENERGY	3
1.3	LAND DESCRIPTION	3
2	THE PROPOSAL	5
2.1	OVERVIEW	5
2.2	COMPONENTS	5
2.3	CONSTRUCTION	7
2.4	OPERATIONS.....	7
2.5	ACCESS	8
2.6	STAFFING	8
2.7	COMMUNITY AND ECONOMIC BENEFITS.....	8
2.8	LAND USE CLASSIFICATION	8
3	PLANNING FRAMEWORK	10
3.1	STATE PLANNING	10
3.2	LOCAL PLANNING	13
3.3	OTHER CONSIDERATIONS	15
4	SITE CONDITIONS AND MANAGEMENT	16
4.1	TOPOGRAPHY AND LANDSCAPE.....	16
4.2	SOILS	16
4.3	VEGETATION	18
4.4	WATER RESOURCES.....	19
4.5	HERITAGE	19
4.6	SEPARATION DISTANCES	19
4.7	ENVIRONMENTAL IMPACT ASSESSMENT AND MANAGEMENT	20
4.8	BUSHFIRE	23
4.9	TRAFFIC AND TRANSPORT	23
5	RECOMMENDATIONS.....	24

Appendices

- Appendix A – Location and Site Layout Plan
- Appendix B – Certificate of Title
- Appendix C – Aboriginal Heritage Database Results
- Appendix D – Fire Management Plan
- Appendix E – Traffic Impact Statement
- Appendix F – Site Oblique Photos (February 2017)

1 Introduction

1.1 Background and purpose

Land Insights act for Stellata Energy, and submit this application on their behalf. The application seeks Development Approval for the construction and operation of a solar PV energy facility on Lot 194 Robertson Road, Merredin and Lot 19444 Bruce Rock-Merredin Road, Merredin ("the site").

The solar farm is being developed by Stellata Energy. It proposes to comprise an 120MW_{dc} facility, located on existing agricultural land to the south-west of the Merredin townsite.

The site is predominantly cleared of vegetation, will have minimal visual impact on neighbouring properties and is located next to the Western Power Terminal, making this site highly suitable as a solar farm.

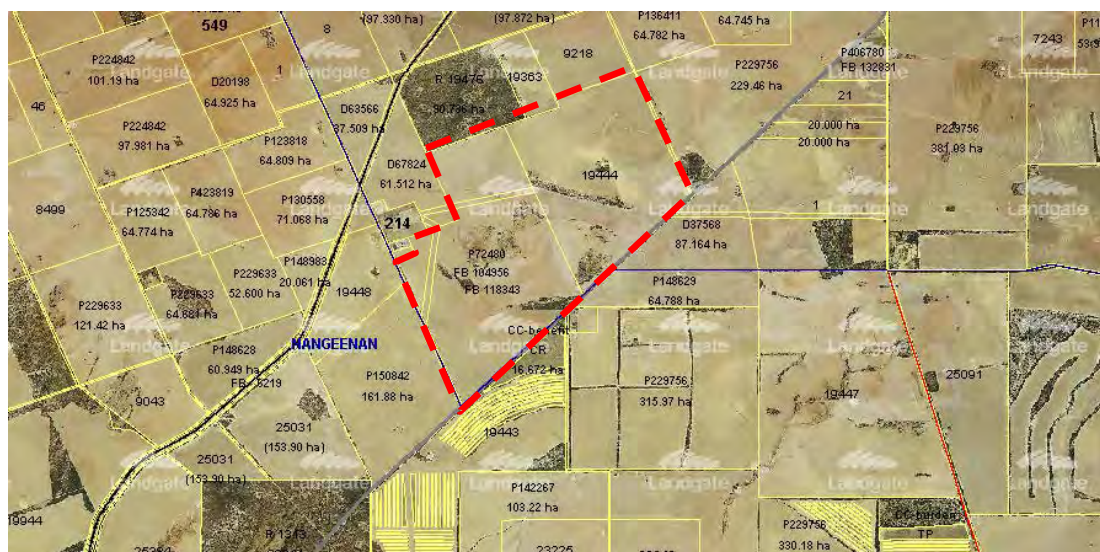
1.2 About Stellata Energy

Stellata Energy is an Australian Company whose team has successfully developed over 350MW of solar installations to date, predominantly in Europe. Stellata Energy (or nominee) will develop, own and operate the solar farm.

1.3 Land Description

Location

The site is Lot 194 Robertson Road, Merredin and Lot 19444 Bruce Rock-Merredin Road, Merredin, located approximately 6 kilometres south-west of Merredin. The site is surrounded predominantly by other agricultural properties, with the Merredin Nature Reserve abutting a portion of the northern boundary. A site location plan is provided below and in Attachment 1 Site context is provided below.



Existing Use

The site is currently used as a rural farming property, predominantly for cropping and occasional grazing.

Two easements cross through Lot 194 and one easement crosses through Lot 19444. These are for Western Power 220kV overhead powerlines which exist on the site.

Surrounding Use

The surrounding land is predominantly used for agriculture with the exception of the adjoining property on the northern boundary which is a local nature reserve (R19476 Merredin Nature Reserve), and the adjoining properties to the north-west which include a diesel power station (Lot 193 on P72480 owned by Merredin Energy Pty Ltd) and Merredin Terminal (Lot 4 on D67823 owned by Electricity Networks Corporation).

Tenure

Tenure details are included in the table below and a copy of the certificate of titles is attached (Attachment B).

Lot Number	Volume	Folio	Plan	Registered Proprietor
194	2721	746	72480	Ross Anthony Smith
19444	2721	743	229756	Ross Anthony Smith

2 The proposal

2.1 Overview

The proposed solar farm will have a generation capacity of approximately 120MW (AC) via the use of between 360,000 and 400,000 tracking solar panels and associated infrastructure, including:

- Photo Voltaic Modules
- Piles and Framework
- Inverters (and associated housings)
- Transformers (and associated housings)
- Substations (including circuit breakers and metering)
- Underground cabling
- Overhead wires
- Perimeter Fence
- CCTV (at entrance and adjacent to substations)
- Battery Storage
- Spares Storage building
- Maintenance compound.

An indicative layout is shown on the plan at Appendix A. It should be noted that the development may not include the full area of the total lot area and some land may be outside of the developer's lease. Any land outside the developer's lease will retain its existing use.

This planning application is for Stage 1 of the Merredin Solar Farm only. Stage 1 will consist of the 120MW (DC) of generation and up to 50 MWh of Battery storage. It will cover the entirety of Lot 194 Robertson Road, and the north-western corner of Lot 19444 Bruce Rock-Merredin Road as indicated on the Indicative Layout Plan (Appendix A).

Construction will possibly be in up to two phases. The generation equipment will all be constructed in one campaign, with the battery storage to possibly be delayed until a subsequent stage.

Once fully operational, the landowner will have access to most the site for sheep grazing. This will assist in maintaining the ongoing agricultural use of the site and will also assist in keeping grass levels low for bushfire management purposes.

2.2 Components

Generation components

It is proposed to install between 360,000 to 400,000 PV modules across the site. The modules will track the movement of the sun to an extent of +/- 60 degrees. Each module will be comprised of either monosilicon or polysilicon and will convert daylight into direct current electricity.

Approximately 44-48 Inverters will be interspersed throughout the panels. Each Inverter container will also contain a transformer and will convert the low voltage DC into high voltage AC power. The Inverters will then be connected to the main transformer near to the point of connection to the Western Power compound.

Indicative panel configuration is shown in the photos below (note these are not of the site, but provide a representation).



Cabling

The proposed solar farm will connect via a 132kV cable back into existing Western Power infrastructure (Merredin Terminal) abutting the north-western boundary of the site.

Within the site, the DC cabling will be buried except for string cables which will be ducted within the framework. From the inverters throughout the site and the onsite substation, the AC cabling will be buried within ducts, or may be via overhead lines depending on detail design requirements.

2.3 Construction

Construction of the facility will commence once all approvals are in place. The site will be constructed relatively quickly, taking approximately 6 months from site set-out and installation of welfare facilities.

Up to 200 people will be employed during the peak construction period, occurring approximately half way through the construction phase. Stellata will appoint a contractor to construct and install the facility. The contractor will be responsible for all items relevant to construction and for adherence to all approvals and relevant standards.

Some temporary development on site will be required during the construction phase of the project. This includes the development of a construction compound and two or three satellite site offices.

Indicative equipment within the main compound will include

- 24x12 metre main office
- Several 12x3 metre toilet blocks
- several 12x6 metre crib rooms
- First Aid office
- 12x6 metre office kitchen
- meeting rooms
- 2-3 water tanks, approximately 5000L
- Visitor car park
- Construction/Worker car park
- Undercover area with tables for rest breaks

The satellite site offices spread across the site are likely to include meeting room, lunch room, toilets and ablution facilities.

2.4 Operations

The facility will be largely autonomous once operational. Local contractors/employees will be responsible for ongoing management of the site.

Once the proposed solar farm is operational, it will be unmanned, with only limited numbers of trips to site for the purposes of maintenance, repairs and security inspections. It would be estimated that regular trips via car or van would be required for routine maintenance, fire management, panel washing and grass cutting.

It is anticipated that inverters will be serviced or replaced between 2 – 5 times over the operational life and transformers are likely to be replaced at least once. This work will be undertaken on site as required.

2.5 Access

Access to the site will be from Robertson Road. A small parking and construction area will be constructed adjacent to the proposed access, adjacent to the Merredin Power facility. This construction area will be used for personnel and trucks during the construction of the generation facilities and will be later used to locate the batteries.

A Traffic Impact Statement has been prepared for the site by Shawmac Consulting Engineers. The report found that the road and access are suitable for the development proposed. A copy of the report is at Attachment E.

2.6 Staffing

As outlined above, construction staffing will peak at up to 200 people with ramp up and ramp down manning levels. The construction crew will be contractors (based in Merredin or surrounds if possible).

Once operational, it is anticipated that the facility will employ a small number of locally based personnel. There will be times when manning will be increased for changeout of equipment. Main duties will be maintenance of the infrastructure and ensuring fire management requirements are met.

2.7 Community and economic benefits

The project cost for developing the solar farm is approximately A\$160 million. Contract negotiations with Western Power are ongoing.

Construction and operation of the solar farm will aim to source as much local, regional, or Western Australian labour hire and materials as practicable. The construction period is expected to provide up to 200 jobs. There will be specific flow-on economic benefits and local employment for Merredin, including the requirement for housing during the construction period and a higher population in the area requiring goods and services during the construction period which will maximise benefits to the local community.

2.8 Land use classification

Solar Farm is not a use listed under the Shire of Merredin Town Planning Scheme No. 6. Clause 4.4.2 of the scheme addresses this issue, in so far that

If a person proposes to carry out on land any use that is not specifically mentioned in the Zoning Table and cannot reasonably be determined as falling within the type, class or genus of activity of any other use category the local government may –
(a) determine that the use is consistent with the objectives of the particular zone and is therefore permitted;

- (b) determine that the use may be consistent with the objectives of the particular zone and thereafter follow the advertising procedures of clause 9.4 in considering an application for planning approval; or*
- (c) determine that the use is not consistent with the objectives of the particular zone and is therefore not permitted.*

In this instance, we request that the Shire and Joint Development Assessment Panel consider that the use is either consistent, or may be consistent, with the objectives of the General Farming zone and therefore allow the application to be considered. The rationale for determining the consistency with the General Farming zone are outlined broadly in this Development Application report, and more specifically in Section 3 of this document.

3 Planning framework

3.1 State Planning

State Planning Policy 2.5 – Rural Planning

State Planning Policy 2.5 – Rural Planning (SPP 2.5) was revised in December 2016. The purpose of the policy is to protect and preserve WA's rural land assets due to the importance of their economic, natural resource, food production, environmental and landscape values and to ensure broad compatibility between land uses is essential to delivering this outcome. In terms of the proposed solar farm development, it is important to demonstrate compliance with SPP 2.5 and compatibility with surrounding rural land uses.

The objectives of SPP 2.5 are addressed in the table below.

Objective	Comment
<i>(a) Support existing, expanded and future primary production through the protection of rural land, particularly priority agricultural land and land required for animal premises and/or the production of food.</i>	The site is not identified as priority agricultural land in the Local Planning Strategy or other documents. Once the solar farm is operational, the site can still be used for sheep grazing in a similar manner to what current occurs on site.
<i>(b) provide investment security for existing, expanded and future primary production and promote economic growth and regional development on rural land for rural land uses.</i>	The proposed solar farm will promote economic growth and regional development through the development of a new land use and through the protection of energy for the region.
<i>(c) outside of the Perth and Peel planning regions, secure significant basic raw material resources and provide for their extraction.</i>	Extraction of basic raw materials is not proposed.
<i>(d) provide a planning framework that comprehensively considers rural land and land uses, and facilitates consistent and timely decision-making.</i>	The local planning framework is addressed in the section below.
<i>(e) avoid and minimise land use conflicts.</i>	Surrounding land uses, separation distances and mitigation of land use conflict is discussed further below. It is not considered that the proposed solar farm will result in significant land use conflicts.
<i>(f) promote sustainable settlement in, and adjacent to, existing urban areas.</i>	N/A – The proposal is not for urban settlement.
<i>(g) protect and sustainably manage environmental, landscape and water resource assets.</i>	Environmental, landscape and water resources are discussed in the section above. It is not considered that the proposed solar farm will result in significant environmental impacts.

Section 5.5 recognises the effect that regional variation, economic opportunities and regional development can have on rural planning. The first policy listed in this section is to:

continue to promote rural zones in schemes as flexible zones that cater for a wide range of land uses that may support primary production, regional facilities, environmental protection and cultural pursuits.

The proposed solar farm development can be considered as a regional facility and the Shire and WAPC could be supportive of this land use within the rural zone.

Section 5.12 provides further information with regards to preventing and managing impacts in land use planning. These are addressed in the table below. The purpose of this section is to assist decision-makers when determining the broad suitability of land uses and the ability to manage offsite impacts prior to determining whether the use of a buffer is necessary.

Action	Comment
Avoiding land use conflicts.	It is not expected that the proposed solar farm will have significant off-site impacts. The nearest residence is located approximately 150m to the south of the site, however a buffer of vegetation approximately 100m in width exists between the site and the house. The next closest residence is approximately 1 kilometre away. During construction, there may be some potential for noise and dust, however this is addressed in the Environmental Management Plan below. Once the solar farm is developed it will have virtually no noise, odour or dust impacts and no impacts from reflection or glare. Visual amenity and landscape is also addressed in the Environmental Management Plan.
Planning approach for sensitive land uses in rural zones potentially affected by a rural land use.	The nearest residence is located approximately 150m to the south of the site, however a buffer of vegetation approximately 100m in width exists between the site and the house. The next closest residence is approximately 1 kilometre away.
Determining a buffer.	A preferred buffer or separation distance has not been accurately determined by the Environmental Protection Authority, however as the potential off-site impacts are minimal it is not expected that a large buffer is required. The only potential impact to sensitive land uses will be impact to visual amenity. The nearest residence is located approximately 150m to the south of the site, however a buffer of vegetation approximately 100m in width exists between the site and the house to provide a visual buffer. The next closest residence is approximately 1 kilometre away. The solar farm will not be impacted by rural uses adjacent, and likewise will not impact on these existing uses.
Planning approach for buffers.	As above.
Planning approach for managing land use transitions.	Land use transition to urban, residential, industrial or commercial settlement is not proposed.

Planning Bulletin 67 – Guidelines for Wind Farm Development

To date, the WAPC does not have a Planning Bulletin or any other planning document to guide development of solar energy farms. Planning Bulletin 67 provides guidelines for the development of wind farms which is relatable considering wind farms are generally developed on rural land with some similar issues to be considered during the planning process, however it must be recognised that issues associated with wind farms can be seen as having potentially more impact – e.g. height, noise, flicker, safety and visual matters. Some of the general planning principles can be applied to this development.

The Bulletin states that the *State Sustainability Strategy* reflects on the imperative of ensuring land use and development are consistent with the efficient use of energy and minimisation of greenhouse gas emissions. It recognises that wind energy is a renewable energy technology, which fits closely with the ideals of the strategy and it would be safe to say that solar energy also fits within this strategy.

Key issues identified in the Bulletin are discussed below, and adapted to apply to solar farms instead of a wind farm development.

Key Issues	Comment
Land use and planning controls	<p>There is no definition for 'solar farms' in the Model Scheme Text. In rural, non-urban and similar zones, local government should consider solar farm proposals under the provisions of the <i>Model Scheme Text</i>; that is, the use is considered as a discretionary use for which the approval of local government is required and the public advertising procedures apply.</p> <p>A definition for 'solar farms' can also be included in the Local Planning Scheme.</p>
Public health and safety	<p>There are no public health and safety implications of the proposal.</p> <p>Public access to the site during construction should be prohibited. Traffic management is addressed in the attached report.</p>
Construction issues including provision of infrastructure and utilities to these facilities	<p>All materials should be designed and constructed in accordance with the manufacturer's specifications. Site clearance works, earth moving, cutting, filling and stockpiling of topsoil should be kept to a minimum wherever possible.</p> <p>Infrastructure, such as a substation maintenance building and service roads required for the operation of the solar farm development, should be designed with care, having regard to any environmental and landscape impacts. This infrastructure will need the same consideration, in terms of siting and design, as the solar panels.</p> <p>When a site is decommissioned, the demolition work will need to be managed and the site should be reinstated to its original use and condition, or other agreed use</p>
Landscape and visual impact	<p>Visual impact is based on several factors which affect the perceived visual quality. The degree to which a solar farm development will impact on the landscape will depend upon:</p> <ul style="list-style-type: none"> • Siting, layout and design of the infrastructure, signage and ancillary facilities. • Visibility of the development, having regard to the location, distance from which the development is visible, skyline and view sheds. • Significance and sensitivity of the landscape, having regard to topography, the extent and type of vegetation, natural features, land use patterns, built form character and community values. <p>Methods to reduce impacts on visual amenity include:</p> <ul style="list-style-type: none"> • Siting the solar farm, ancillary buildings, access roads and transmission infrastructure to complement the natural landform contours and landform backdrop, including ridgelines. • Ensuring the choice of materials and colour for the development complements the skyline and the backdrop of the view sheds. • Minimising removal of vegetation and using advanced planting of vegetation screens as visual buffers where appropriate. • Ensuring good quality vegetation and landform rehabilitation, onsite and off-site, where appropriate. • Avoiding clutter, such as advertisements and apparatus
Noise	<p>Noise relating to the solar farm will only occur during construction, with piling being the most audible activity. No noise will be audible from the site perimeter during operation.</p>

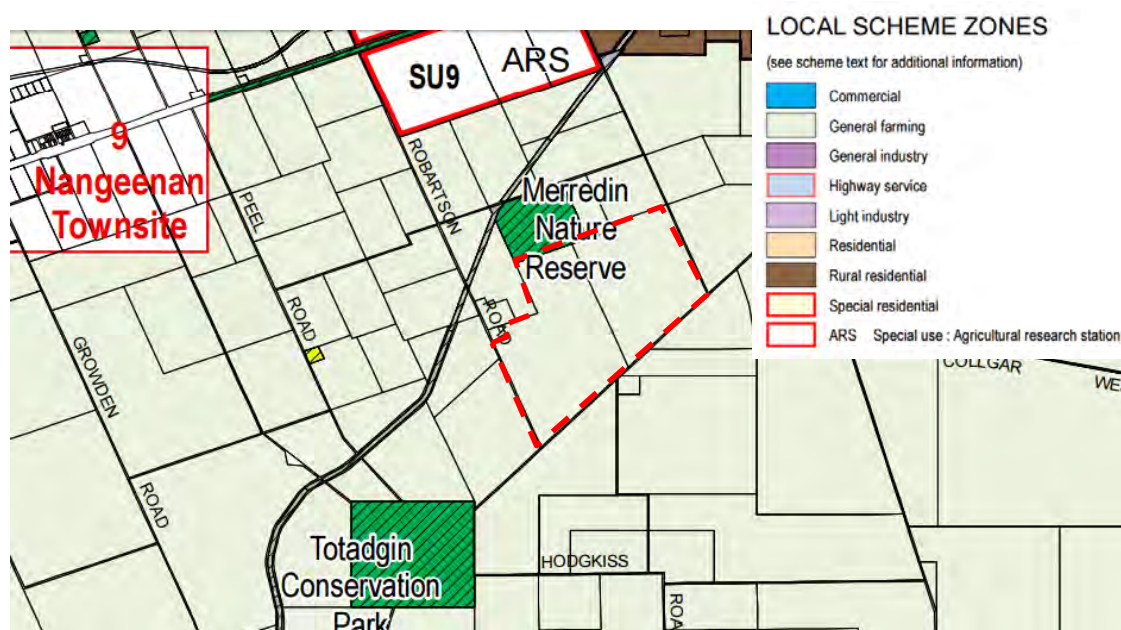
Key Issues	Comment
Other amenity issues, such as reflection/glint/glare	Other amenity issues which can affect sensitive land uses include glint or glare, however this impact will be minimal as solar panels are specifically designed to absorb light instead of reflecting light.
Potential environmental issues such as vegetation clearing, disturbance to habitat and fauna, soil drainage, erosion	<p>The types, locations and significance of flora and fauna, particularly endangered or threatened species in the development area can be mapped once the extent of clearing is known. Field surveys will help avoid highly sensitive areas of vegetation, including remnant native vegetation and enable roads and services to be placed appropriately.</p> <p>During construction, disturbance and vegetation clearance can be avoided or minimised, through careful siting and consideration of issues such as erosion, drainage run-off, habitat or food source destruction, dieback, weed hygiene, introduction of feral animals and contractor guidelines.</p>

Other factors to be considered include socio-economic considerations and impact on items of Aboriginal significance (refer sections 2.8 and 4.5 of this document).

3.2 Local Planning

Shire of Merredin Town Planning Scheme No. 6

The site is zoned *General Farming* in the Shire of Merredin Town Planning Scheme No. 6 (refer to figure below).



The objectives of this zone and how the development application relates to these objectives are discussed in the following table.

Objective	Comment
<i>To provide for a range of rural pursuits that are compatible with the capability of the land and retain the rural character and amenity of the locality.</i>	The proposed development is considered an acceptable use within the General Farming zone. Many similar applications have been approved in rural areas, where the relevant Local Government has determined that the use is compatible with rural land use. Once the solar farm is operational, the site can still be used for grazing purposes. The virtual silence of the facility once operational will assist in maintaining the amenity of the locality.
<i>To protect land from urban uses that may jeopardise the future use of that land for other planned purposes that are compatible with the zoning.</i>	The proposed development is not an urban use.
<i>To support sustainable farming practices and the retention of remnant vegetation.</i>	The proposed development is not a farming land use however the site will continue to be used for sheep grazing meaning that the land use will not shift away from agricultural use. Remnant vegetation will be retained where possible.
<i>To prevent any development that may affect the viability of a holding.</i>	The proposed development will not affect the future rural viability of the site.
<i>To encourage small scale, low impact tourist accommodation in rural locations.</i>	The proposed development is not a tourist land use.
<i>To encourage a diversification of rural activities that will reduce the dependency of the rural sector on traditional crops.</i>	The proposed development is not a rural land use.
<i>To support the creation of homestead lots in accordance with adopted Local Planning Policy.</i>	The proposed development does not include homestead lots.
<i>To support mining activities where an environmental management plan has been prepared and is acceptable to the Council and the Environmental Protection Authority.</i>	No mining activities are proposed.
<i>To preclude the disposal of used tyres or any other material that may be detrimental to the quality of the land.</i>	No tyres will be disposed on site. Appropriate waste management will take place, however it is expected that waste from the development will be minimal.

Clause 5.14 of TPS6 - General Farming Zone Development, states:

All proposals for development in the General Farming zone must have regard to both onsite and off-site impacts and, where necessary, should be accompanied by information identifying –

- (a) environmental values and any environmental risks;*
- (b) the potential for land use conflict;*
- (c) the potential impacts and restrictions on allowed uses on adjacent or nearby locations;*
- (d) the separation distances and/or buffers relating to a potentially incompatible land use which need to be provided on-site and the appropriate conditions relating to subdivision and development.*

These matters are addressed in this document and, once operational, the solar farm will have minimum onsite or offsite impact or potential for land use conflict. As stated earlier, the site can still be used for grazing purposes.

Solar farms are a relatively new development venture in Western Australia. Previous proposals for solar farms have been influenced based on guidance sourced from the Western Australian Planning Commission's (WAPC) Planning Bulletin No 67- Guidelines for Wind Farm Development. Section 5.1 states:

"Rural, non-rural and similar zones, local governments should consider wind farm proposals under the provisions of Clause 4.4.2(b) of the Model Scheme text." as a use not listed.

In this instance, in accordance with Clause 4.4.2 (b) of the Scheme, Council may;

b) Determine that the use may be consistent with the objectives of the particular zone and thereafter follow the advertising procedures of clause 9.4 in considering an application for planning approval."

Shire of Merredin Local Planning Strategy

The site is located within the *General Agriculture Zone* in the Shire of Merredin Local Planning Strategy. No objectives are provided for this zone. With regards to rural land in the Shire the Strategy states that *rural land should be protected from proposals that might compromise agricultural viability such as ad-hoc subdivision and incompatible use or development.*

3.3 Other considerations

Paris Climate Agreement

At the Paris climate conference (COP21) in December 2015, 195 countries adopted the first ever universal, legally binding global climate deal.

The agreement sets out a global action plan to put the world on track to avoid dangerous climate change by limiting global warming to well below 2°C. The agreement is due to enter force in 2020. Australia has signed the Paris Agreement on Climate Change, joining more than 170 countries in their commitment to cutting greenhouse gas emissions. The Australian government would seek to ratify the Paris Agreement on climate change by the end of the year. It has set a 2030 emissions reduction target of 26 to 28 per cent below 2005 levels.

Renewable Energy Target

The Australian Government has a target for large-scale generation of 33 GWh in 2020, meaning that 23.5% of Australia's electricity generation in 2020 will be from renewable sources. The program provides incentives for the establishment of expansion of renewable energy power stations, including solar farms. A key element of the program is the need for significant investment in new renewable energy generation capacity to meet the ultimate 2020 target. This current proposal complies with the policy and represents a significant investment in renewable energy generation.

4 Site conditions and management

4.1 Topography and landscape

The site is gently sloping, a high point is located at the southern end of the site at 340 metres Australian Height Datum (AHD) and slopes down at the northern end of the property at approximately 310 metres AHD.

A detailed topographic survey of the site was prepared using UAV. This data fed into the site design and layout.

Visual Assessment

The site is relatively isolated, surrounded primarily by large rural/agricultural properties. There are some residences nearby, and the site is also located on the Bruce Rock – Merredin Road. The site is approximately 6km from the Merredin townsite. Oblique aerial photos captured by drone are provided at Appendix F to provide context of the site itself.

For the purposes of visual assessment, consideration has been given to visibility from the major roads in the area (namely Great Eastern Highway) and from the Merredin townsite. Consideration has also been given to the non-reflective nature of the proposed panels (i.e. that they are specifically designed to collect solar radiation rather than reflect it).

Visual analysis was undertaken using existing contour data, proposed heights of the solar panels, an average height of a person viewing the facility as being 1.75m, and a maximum horizontal viewing distance of 10 kilometres. The assessment has concluded that the site will likely not be visible from the Merredin townsite at all. There may be some glimpses of small areas of the facility from the western approach to Merredin along Great Eastern Highway, but this is likely to be minimal.

Vegetation already existing around the perimeter of the site, particularly along the roads, which provides some visual screening.

4.2 Soils

Soil-landscape units, soil types and soil qualities are mapped by DAFWA and can be accessed on their online data system at <http://maps.agric.wa.gov.au/nrm-info/>.

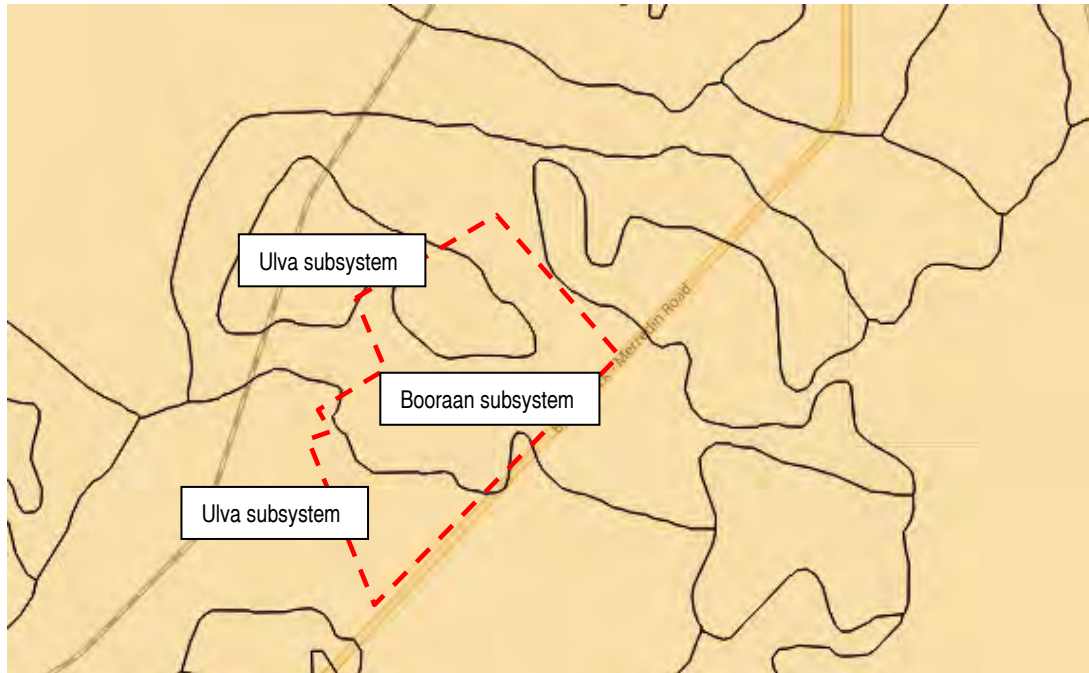
The soil-landscape unit across the site is identified as *258Ta – Tandegin System* which is described as *sandplain dominated interfluves with weakly indurated lateritised crests and upper slopes and long colluvial yellow sandplain upper to lower slopes. Unlateritised surfaces dominated by sodic and alkaline duplex soils.*

Two soil-landscape sub-systems are identified across the site:

- Booraan subsystem (258 TaBR) – *Hillslopes predominantly containing hardsetting, grey to brownish sandy loam over clay soils*

- Ulva subsystem (258 TaUL) – Yellow sandplain and gravel plain of the Eastern wheatbelt. This unit contains small areas of pale sand.

Please refer to the plan below.



Soil qualities are provided in the table below.

Soil subsystem	Soil salinity	Subsurface Compaction	Water erosion	Wind erosion	Land Instability	Site drainage	Waterlogging	Flood risk
Booraan subsystem	<3% has moderate to extreme risk	<3% has high susceptibility	<3% very high to extreme hazard	3-10% high to extreme hazard	<3% moderate to high hazard	<3% very poor to poor potential	3-10% has moderate to very high risk	<3% moderate to high hazard
Ulva subsystem	<3% has moderate to extreme risk	>70% has high susceptibility	<3% very high to extreme hazard	50-70% high to extreme hazard	3-10% moderate to high hazard	<3% very poor to poor potential	<3% moderate to very high risk	<3% moderate to high hazard
	Low risk	Low to high	Low hazard	Low to high hazard	Low hazard	Low potential	Low risk	Low hazard

As can be seen from the above, the land qualities across the site are relatively good, with low risk of salinity, low susceptibility of subsurface compaction, low water erosion hazard, low land instability and low flood risk and waterlogging risk. The wind erosion hazard is low across most the site, with some areas identified as having higher risk. The site drainage potential is poor to very poor across the site.

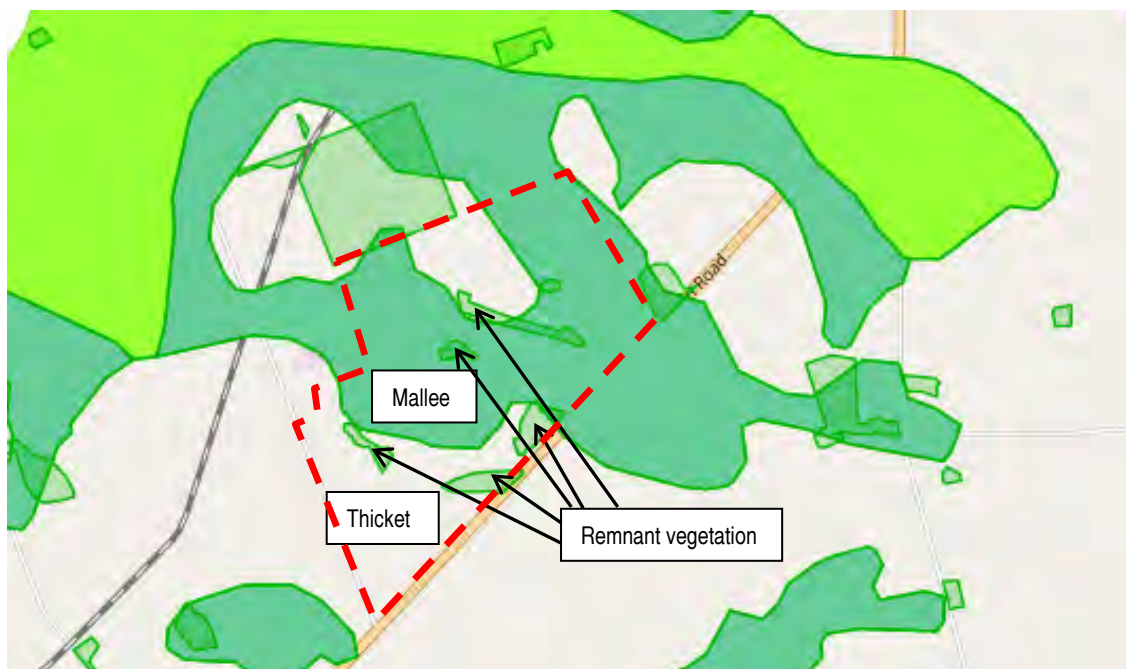
4.3 Vegetation

The site is predominantly cleared of remnant vegetation and has been used for farming activities for many years. Two patches of vegetation are located at the southern and central area of the site, and rocky outcrop with some scattered vegetation is located in the central portion of the site.

The Pre-European vegetation has previously been mapped by the Department of Environment Protection. No Environmentally Sensitive Areas are located on the site. It identifies two different vegetation types as follows:

- *Thicket* – predominantly across the southern end
- *Mallee* – predominantly across the northern end.

Please refer to the plan below which shows Pre-European vegetation types and existing vegetation.



Source: DAFWA

The site adjoins the Merredin Nature Reserve which is located along the northern boundary (R19476). This is an A Class reserve for *Conservation, Fauna and Protection of Flora* and has management orders with the Department of Parks and Wildlife. The Totodgin Conservation Park (R1313) is located approximately 1 kilometre to the south-west. This is another A Class reserve for *Conservation* and has management orders with the Department of Parks and Wildlife.

The proposal aims to avoid, reduce and mitigate impact to vegetation where possible. Existing vegetation has been mapped and the solar farm has been designed to avoid vegetation where possible. As a result, the patch of vegetation at the southern side of Lot 194 and the vegetation associated with the rocky outcrop will be retained. A small amount of clearing is proposed on Lot 194 where vegetation

interrupts the solar farm design. It is proposed that the small area of vegetation on the western side of the site is cleared, as well as 5 or 6 scattered trees in the centre of the site. Vegetation is also proposed to be cleared on Lot 19444. Any vegetation clearing will likely be subject to a future Clearing Permit submitted to the Department of Environment Regulation.

4.4 Water resources

Groundwater

There is limited information on groundwater resources in the vicinity, however the facility will not involve deep excavation or dewatering.

Surface Water

There are a few minor drainage channels which run through the site which direct water from the rocky outcrops towards low-lying areas. The largest drainage channel flows from east to west through the south-west corner of Lot 19444 and through the northern end of Lot 194. The water from this drainage line is captured in a small dam on Lot 194. Over flow water from the dam flows in a north-west direction into the adjoining property to the north-west (Lot 5 on D67824). Another drainage channel flows north from the rocky outcrop on lot 194 into Lot 5. Two drainage channels flow south from the rocky outcrop.

The drainage lines are not vegetated and are simply channels which offer the path of least resistance to water flow. Historic clearing and modification of the property for agriculture has most likely resulted in the alteration of natural watercourses and the formation of the existing drainage channels. They do not have any environmental value apart from their role in erosion control and movement of water throughout the landscape.

The site is located within the *Swan Avon – Yilgarn* surface water catchment area.

No Public Drinking Water Source Areas are located across the site.

4.5 Heritage

No Registered or Other Heritage Sites have been identified on the site on the Department of Aboriginal Affairs heritage database (refer to Appendix C). One survey has been conducted across the broader area which is described as *surveys between Kalgoorlie and Perth to clear a route for Fibre Optic Cable Installation*. If any heritage sites are identified during construction, there are provisions for dealing with this under the *Aboriginal Heritage Act 1972*.

No European heritage sites are listed by the State Heritage Office. The Shire of Merredin does not currently have a Local Municipal Inventory.

4.6 Separation Distances

The site is relatively large and has good separation distances to sensitive land uses in the area. The nearest homestead is located approximately 150 metres to the south-east of the property (on the opposite side of Bruce Rock-Merredin Road). The proposed solar farm is separated from this homestead approximately 100 metres of vegetation which provides an adequate visual buffer.

The next closest residence is located approximately 1.0 kilometre to the east of Lot 19444, with another two dwellings approximately 1.75 kilometres away. Another dwelling is located approximately 2.5 kilometres to the north-west of Lot 194.

4.7 Environmental Impact Assessment and Management

In Western Australia, the *Environmental Protection Act 1986* (the Act) is the principal instrument for environmental protection and governs the environmental approvals process. All proposed projects and schemes that may have a significant impact on the environment are required to be assessed under Part IV of the Act. As is explained in the Environmental Impact Assessment below, the proposed solar farm is not considered to have a significant environmental impact.

The outcomes of an Environmental Impact Assessment (EIA) is described below, as well as the proposals to avoid, mitigate and reduce environmental impacts through the Environmental Management Plan (EMP). Based on the outcomes of the EIA, it is considered that there are no significant environmental impacts as a result of the proposed development. The site is largely cleared farmland, has significant separation distances from nearby residences and minimal operational impacts (such as dust, noise and reflection).

Nevertheless, an Environmental Management Plan is presented below, outlining each environmental feature, the potential impact and the environmental management proposals against each one. The EMP has been prepared in accordance with the sequence of considerations designed to help manage adverse environmental impacts which includes avoidance, minimisation, rectification, reduction and environmental offsets. In this situation, avoidance of impact has been the priority, followed by minimisation of impact. As can be seen from the assessment below, most potential environmental impacts have been avoided through careful site planning and management and minimisation of impact can also be achieved where impact cannot be avoided.

Feature	Potential Impact	Environmental Impact Assessment	Environmental Management
Landscape and Visual Impact	Potential for impact on visual amenity for nearby sensitive land uses (houses) and the surrounding rural area.	<p>The solar farm will be distributed across most Lot 194 and 19444. The site has an undulating topography which means that the site will be able to be seen from some areas from a distance.</p> <p>The nearest closest residence is located approximately 150m to the south of the site.</p>	<p>The nearest closest residence to the south is approximately 150m from the site, however there is currently approximately 100m of vegetation providing a buffer between the site and the house, which provides a substantial visual buffer.</p> <p>A vegetation buffer will be maintained around the perimeter of the site.</p>
Soil management	Potential for erosion and degradation of soil qualities.	Construction of the solar farm will result in some soil disturbance through movement of machinery across the land and digging/backfilling of trenches for the cabling, also	Soil disturbance and erosion can be managed during the construction phase using water to suppress the creation of dust (and wind erosion).

Feature	Potential Impact	Environmental Impact Assessment	Environmental Management
		<p>small civil works will be required for the substation and inverter/transformer station foundations. There may be some potential for soil erosion as the soil becomes disturbed, however the soil types on the property have low potential for wind and water erosion and instability which will help manage this issue.</p> <p>Following construction, the site will naturally continue to grow pasture which will help bind the soil and decrease erosion.</p>	<p>Following construction, the likelihood of soil disturbance will be low. The growth of pasture across the site will help manage soil erosion.</p>
Vegetation and habitat	<p>Removal and degradation of native vegetation and habitat for native fauna.</p> <p>Potential impact to threatened species including Threatened and Priority Flora, Threatened and Priority Fauna and Threatened Ecological Communities.</p>	<p>The site is already largely cleared of native vegetation.</p> <p>Most vegetation has been earmarked for retention, however clearing of some areas of vegetation might be proposed as part of the development. Vegetation along the property boundaries will be retained. Much of the vegetation earmarked for removal is mallee thicket with no large trees. A few (possibly 5 or 6) large trees are earmarked for removal in the centre of Lot 194. These trees are in parkland cleared, paddock area. The vegetation proposed for clearing has been historically disturbed through past clearing and agricultural use which has significantly reduced the environmental values of these areas.</p> <p>Therefore, it is concluded that the proposed development will not have a significant impact to native flora and fauna.</p>	<p>This site was selected for the development because it is largely cleared of native vegetation. Areas of native vegetation have been identified for retention.</p> <p>A few areas of native vegetation might be removed to facilitate development, however the design of the solar farm will aim to reduce disturbance to vegetation where possible.</p> <p>Nearby conservation areas (one adjoining the site to the north and another a short distance to the south-west) will provide habitat for native fauna in the area. Vegetation along the property boundaries will be retained to provide ecological linkages across the landscape.</p> <p>A clearing permit will be applied for with the DER in accordance with the <i>Environmental Protection (Clearing of Native Vegetation) Regulations 2004</i>.</p>
Water resources and drainage	Modification and degradation of surface and groundwater features and modification to drainage flow (either increase or decrease in	There are no concerns about flooding on the property (flood risk and waterlogging risk is low) and natural flow of water will continue in the existing arrangements, utilising the	The solar panels will be placed to avoid the existing drainage channels where possible. If required, some minor modifications to the drainage lines may be required, however as they are already severely disturbed this is

Feature	Potential Impact	Environmental Impact Assessment	Environmental Management
	flow) which can have impacts downstream.	<p>existing drainage lines across the site.</p> <p>The solar panels will not disturb the existing drainage lines across the site.</p> <p>The drainage channels are severely disturbed and do not have any native vegetation associated with them. Any minor modifications to the drainage lines will not have a significant environmental impact.</p>	not considered to be a significant issue and may help improve the flow of water across the site.
Separation distances	Small separation distances can affect nearby sensitive land uses (such as residential dwellings).	<p>The nearest closest residence is located 150m to the south and is separated by a decent vegetation buffer. The next closest residence is 1km away. This is considered to be sufficient separation distance.</p> <p>As can be seen below, the potential impacts associated with noise, dust, visual amenity, odour and reflection will be minimal and, as such, impacts to nearby sensitive land uses will be low.</p>	<p>The vegetation between the proposed solar farm and the nearest closest residence located to the south should be maintained to provide a visual buffer.</p> <p>Vegetation around the perimeter of the property will be maintained to provide a visual buffer from the road.</p> <p>Impacts typically associated with noise, dust, odour, reflection and visual amenity will be negligible.</p>
Dust	The potential for the creation of dust from the operation which may reach adjoining properties and sensitive land uses.	<p>Some dust may be created during the construction phase as holes are dug and machinery moves across the site.</p> <p>However, as the site is relatively large, it is expected that the likelihood of dust leaving the boundary of the property is low.</p> <p>Once the site is fully constructed there will be minimal to no dust creation.</p>	<p>Dust can be managed using water. A watercart can wet the soil if dust levels are high.</p> <p>Once the site is operational grass will naturally grow in between solar panels which will assist with reduction to soil erosion and dust suppression.</p> <p>The nearest closest residence is located 150m to the south and is separated by a decent vegetation buffer. The next closest residence is 1km away.</p>
Noise	The potential for the creation of noise from the operation which may reach adjoining properties and sensitive land uses.	<p>Some noise will be emitted during construction, largely from piling rigs, machinery and vehicles.</p> <p>Once the site is fully constructed, there will be no</p>	The nature of a solar farm installation ensures that there is no excess noise generated from the installation itself.

Feature	Potential Impact	Environmental Impact Assessment	Environmental Management
		audible noise from the boundary of the site.	
Odour	The potential for the creation of odours which may reach adjoining properties.	<p>There will be no odour generated from the solar farm. Temporary toilet facilities (portaloos) will be located on site during the construction phase, however they will be removed after this.</p> <p>Some agricultural activities will be continued including grazing which will have similar odour impacts as surrounding farmland.</p>	Onsite temporary toilet facilities will be maintained as per the standard required. They will only be located on site for a short time (during the construction phase) and will be removed afterwards,
Reflection	The potential for visual impact due to glare and reflection of sunlight as it falls on the solar panels.	Solar panels are designed to absorb light, and accordingly reflect only reflect a small amount of the sunlight that falls on them compared to most other everyday objects.	The potential for reflection of light is low and therefore does not require management.

Environmental benefits

Solar energy has an additional overall environmental benefit by reducing reliance on fossil fuel power generation, the environmental impacts of which include the creation of greenhouse gases and other air pollution emissions such as sulphur dioxide, nitrogen oxides, carbon monoxide, volatile organic compounds. It also has the added benefit of creating economic and employment opportunities for the local area. In addition, the site will no longer be used for crop production, meaning that less fertilisers and pesticides will be used and circulated into the environment. This will have positive environmental benefits to nearby waterways and local flora and fauna.

4.8 Bushfire

A Bushfire Attack Level (BAL) assessment was undertaken for the proposed development and a Bushfire Management Plan is attached (Attachment D). Bushfire risk can be managed appropriately.

4.9 Traffic and Transport

A Traffic Impact Assessment (TIA) was undertaken for the proposed development and is attached (Attachment E).

5 Recommendations

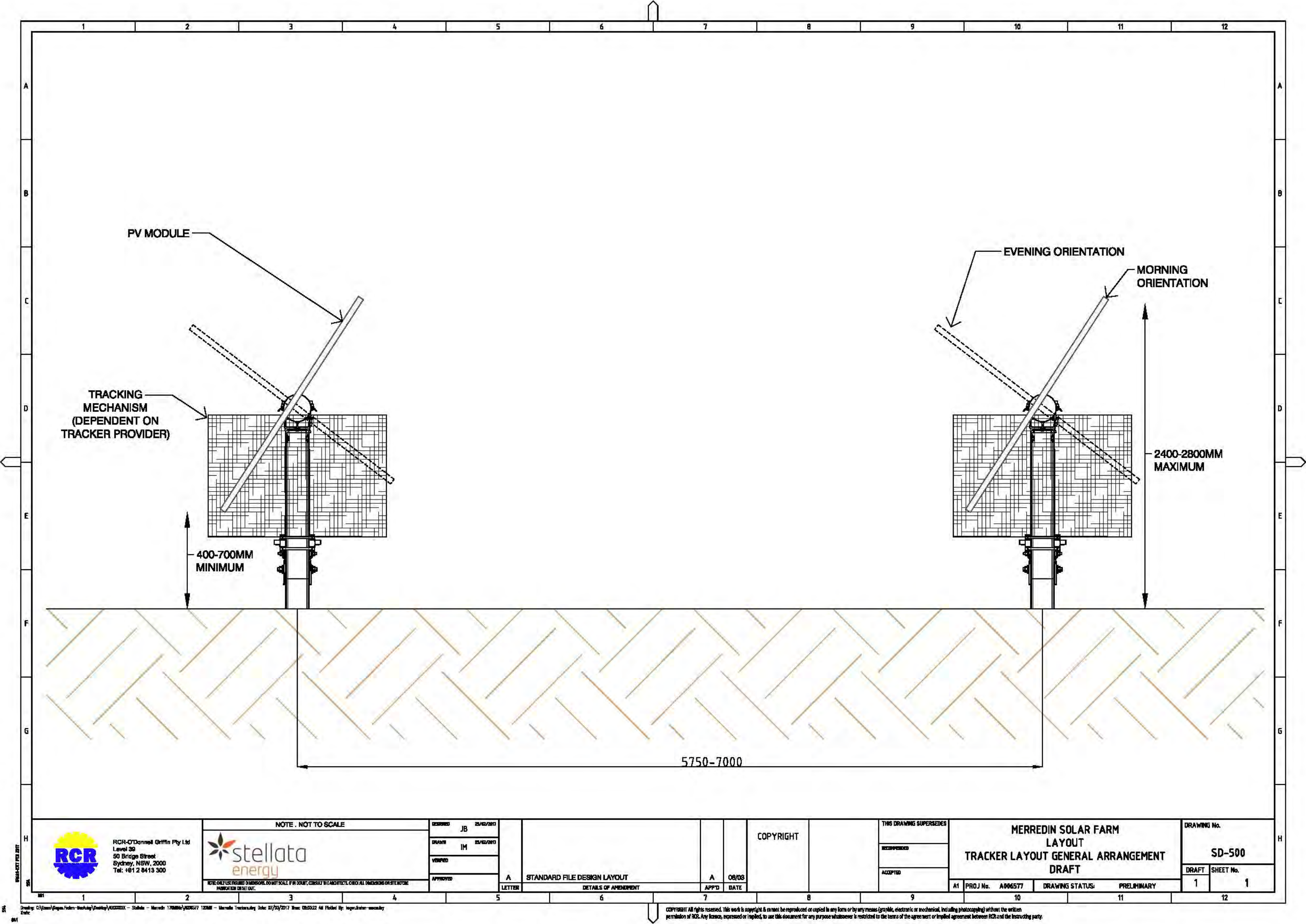
The report accompanies a Development Application for the establishment of a Solar Farm within the Shire of Merredin.

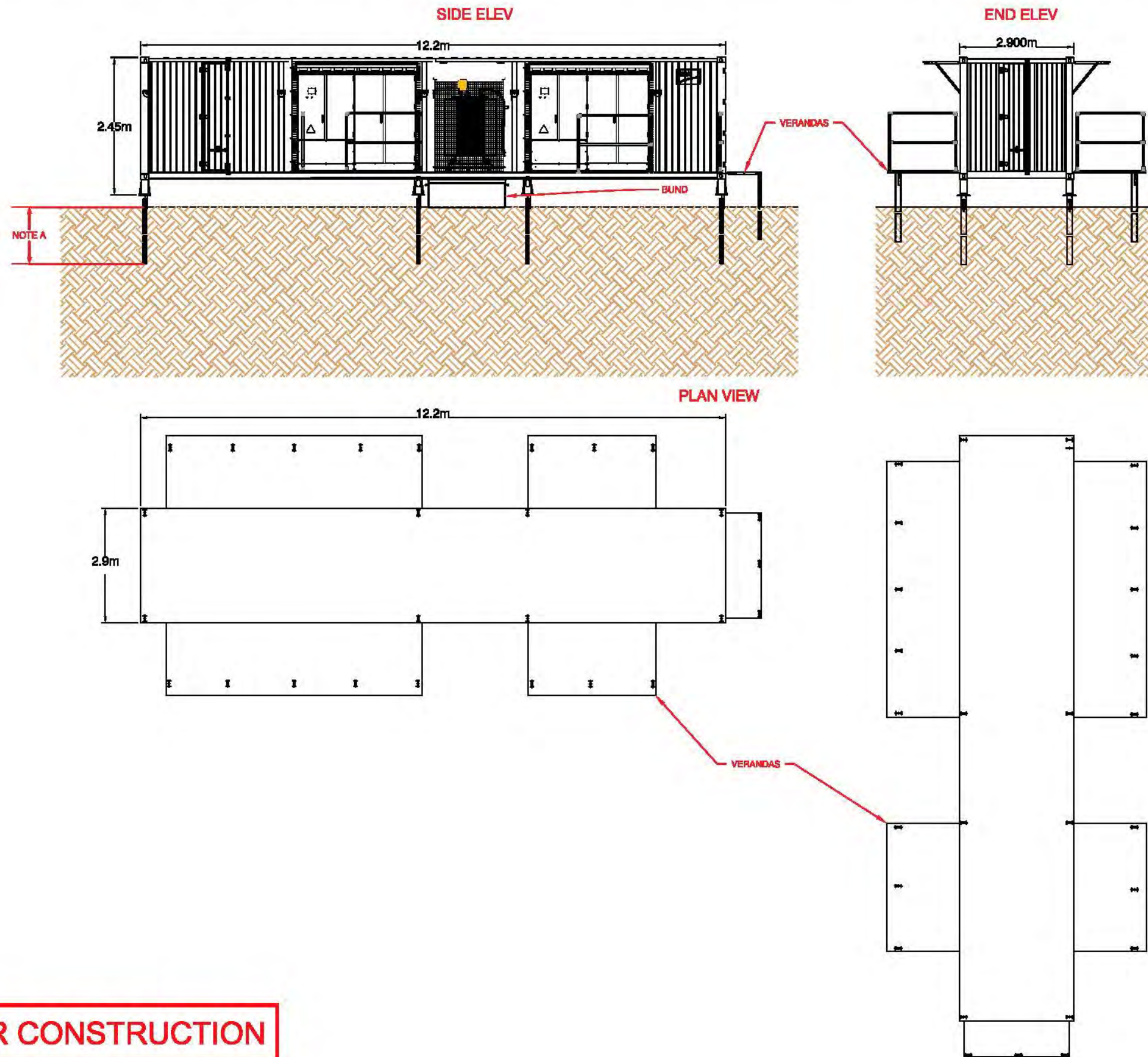
As demonstrated by the assessment contained within this report, the proposed development achieves compliance to relevant policies and requirements of both the local and State planning frameworks. As such, while the use of Solar Farm is not specifically listed in the Shire of Merredin Local Planning Scheme, it is considered a land use activity that is consistent with the objectives of the Shire's General Farming Zone.

It is therefore requested that the Shire of Merredin and the Wheatbelt Joint Development Assessment Panel favourably consider and subsequently grant Development Approval for the Solar Farm, subject to reasonable and relevant conditions.

Location and Site Layout Plan







NOTES

- A. Screw pile dependent on local engineer report
- B. Side ELEV. is missing side verandae for image clarity
- C. End ELEV. is missing end veranda for image clarity

W/H/D : 12.192 m / 2.896 m / 2.438 m < 26 t

NOT FOR CONSTRUCTION



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NOTE: ONLY USE SPECIFIED DIMENSIONS. DO NOT SCALE. IF IN DOUBT, CONSULT THE ARCHITECT. CHECK ALL DIMENSIONS ON SITE BEFORE FABRICATION OR SET OUT.

DESIGNED	JB	25/02/2017
DRAWN	IM	25/02/2017
CHECKED		
APPROVED		

A STANDARD FILE DESIGN LAYOUT

LETTER DETAILS OF AMENDMENT

A 01/03

APPD DATE

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THIS DRAWING SUPERSEDES
RECOMMENDED
ACCEPTED

MERREDIN SOLAR FARM
SMA 5MW PSC SCREW PILE
GENERAL ARRANGEMENT
DRAFT

DRAWING No.

SD-500

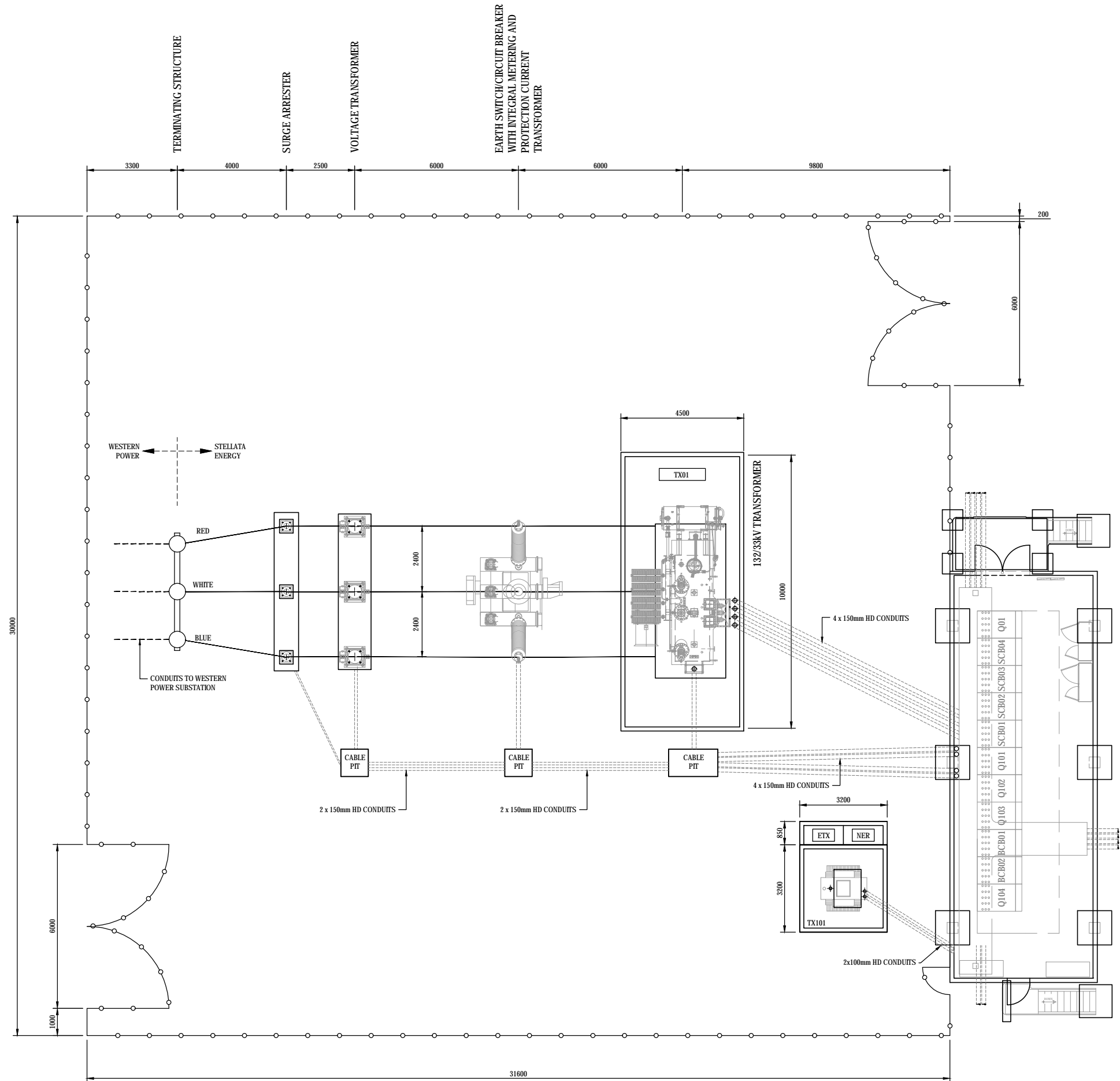
DRAFT SHEET No.

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A1 PROJ No. A006577

DRAWING STATUS: PRELIMINARY



LAYOUT PLAN

- NOTES
1. ALL CONDUITS PENETRATING THROUGH BUND FLOORS TO BE 150mm OD AND TO EXTEND HIGHER THAN THE BUND WALL.
 2. CABLE CULVERTS ARE XX.

PRELIMINARY ISSUE
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FILE NAME: 7590-E-003.dwg PLOT DATE: 5/10/2016 9:12:59 AM BY: Greg Pearce

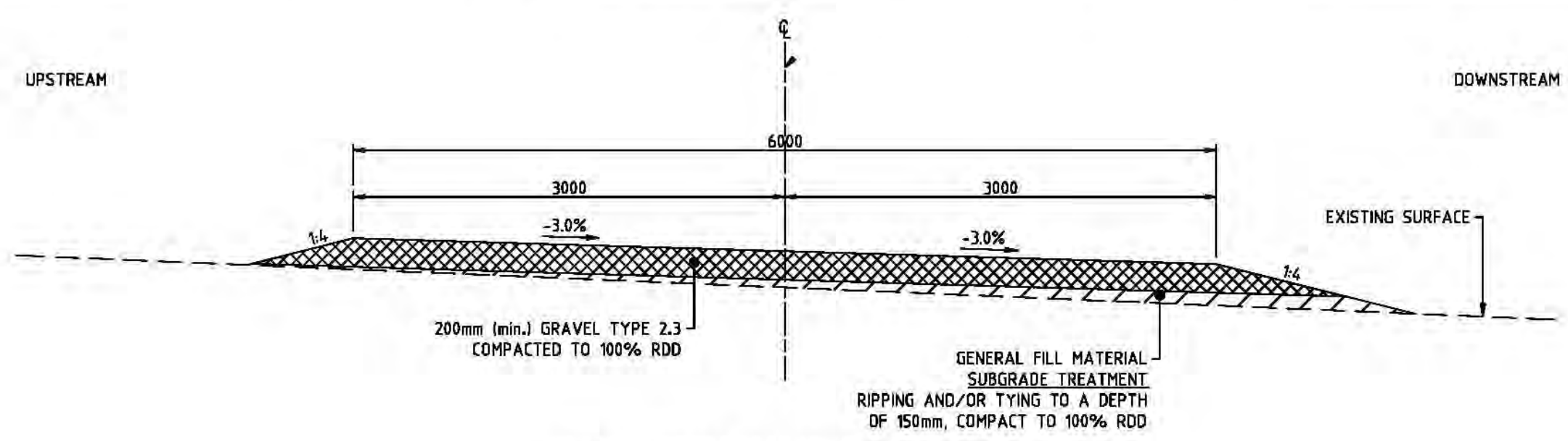
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7590-E-002	OVERALL SITE - PROTECTION SINGLE LINE DIAGRAM							B	05.10.16	EARTHING TRANSFORMER ADDED	GP	JL	GM
7590-E-001	OVERALL SITE - SINGLE LINE DIAGRAM							A	05.08.16	ISSUED FOR REVIEW	GP	JL	GM



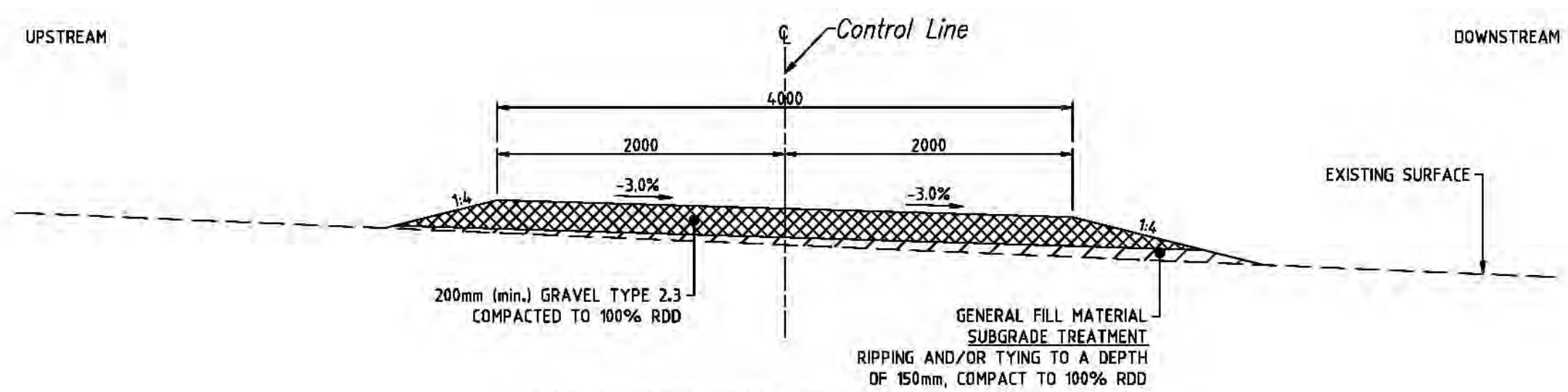
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DRAWN	GP	DATE	AUG 2016
CHECKED	JL	DATE	AUG 2016
DESIGNED	PME	DATE	AUG 2016
JOB	7590		
CAD FILE:	7590		

CLIENT	STELLATA ENERGY		
PROJECT	MERREDIN SOLAR PARK		
TITLE	132kV SWITCHYARD GENERAL ARRANGEMENT		
SHEET	A1	SCALE	1:80
DRG No.	7590-E-003	REV	B



TYPICAL CROSS SECTION (ACCESS TRACK)
SCALE 1:25



TYPICAL CROSS SECTION (MAINTENANCE TRACK)
SCALE 1:25



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DESIGNED	CW	10/10/2016
DRAWN	IM	10/10/2016
CHECKED		
APPROVED		

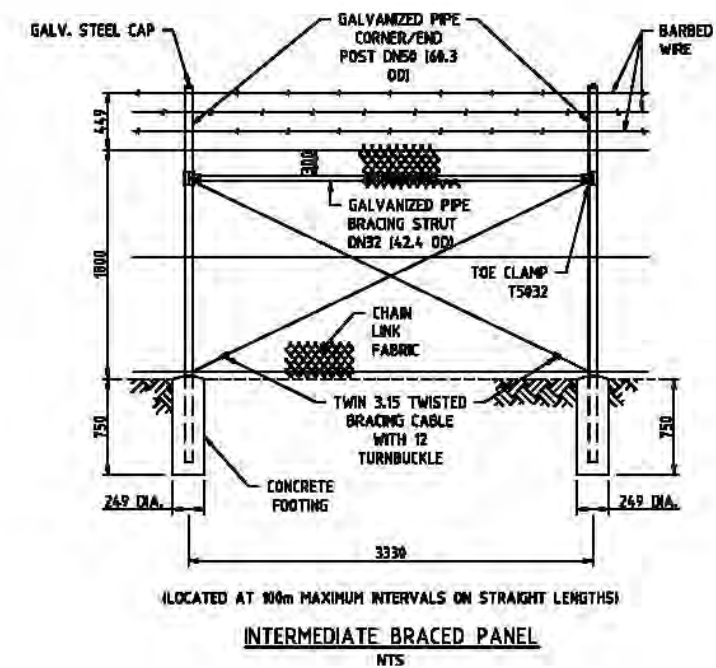
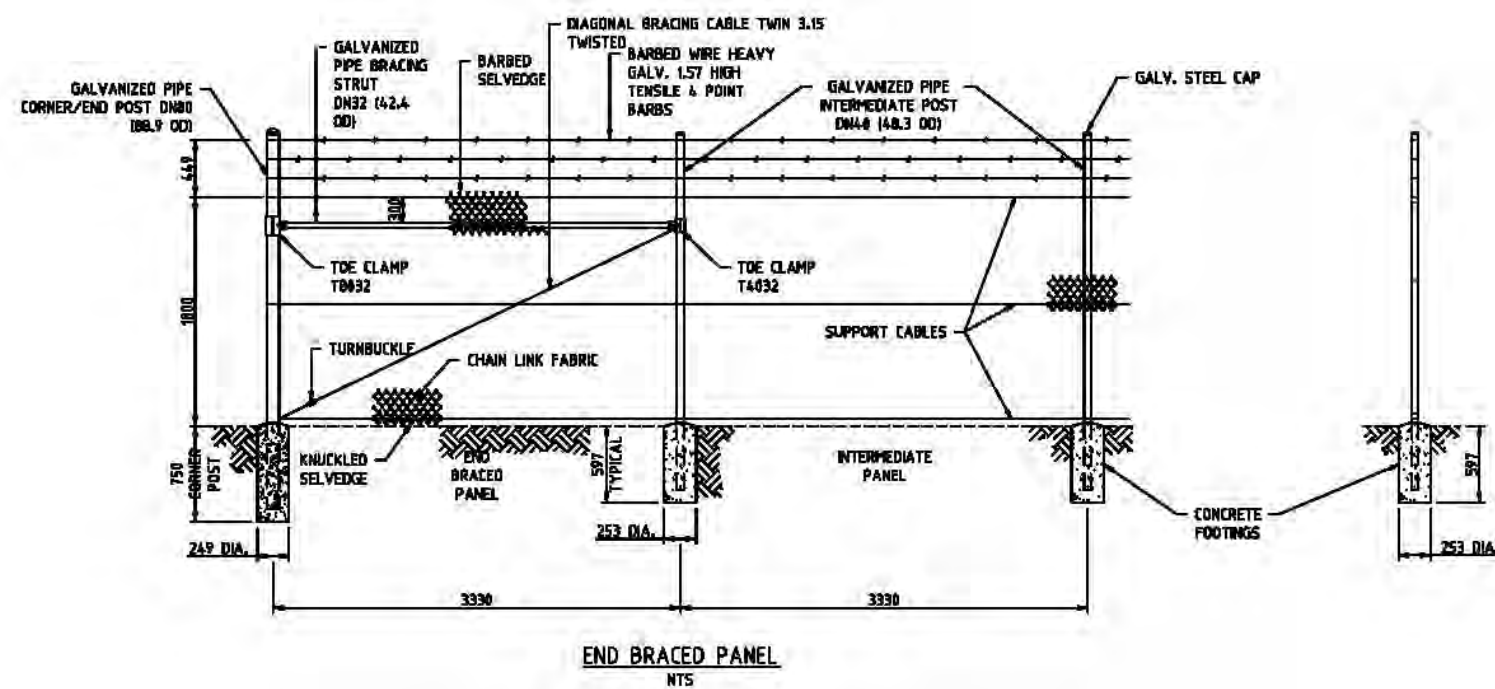
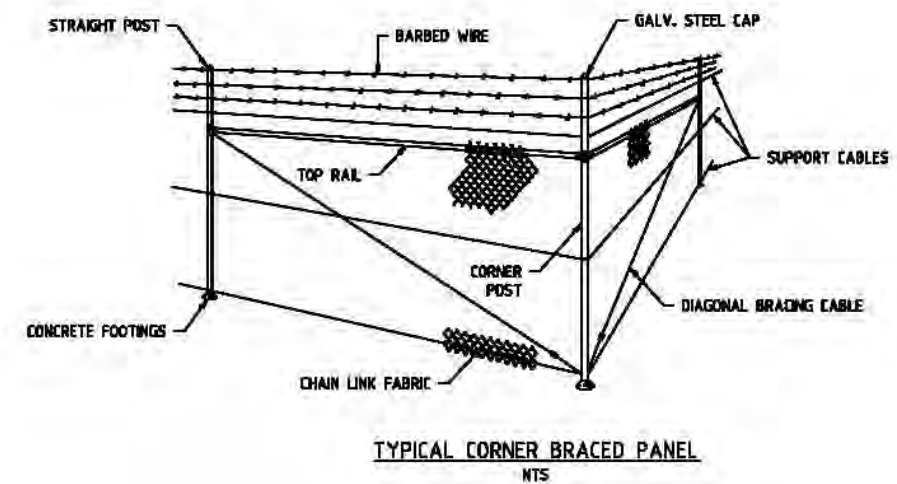
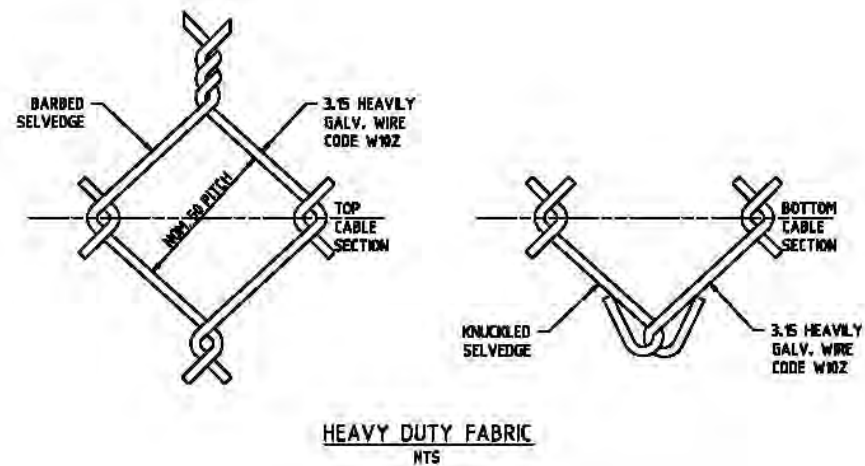
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**MERREDIN SOLAR FARM
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FENCE LAYOUT GENERAL ARRANGEMENT
DRAFT**

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1	1

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Certificate of Title

WESTERN



AUSTRALIA

REGISTER NUMBER 194/DP72480	
DUPLICATE EDITION 2	DATE DUPLICATE ISSUED 15/4/2013

RECORD OF CERTIFICATE OF TITLE
UNDER THE TRANSFER OF LAND ACT 1893

VOLUME
2798FOLIO
467

The person described in the first schedule is the registered proprietor of an estate in fee simple in the land described below subject to the reservations, conditions and depth limit contained in the original grant (if a grant issued) and to the limitations, interests, encumbrances and notifications shown in the second schedule.

REGISTRAR OF TITLES

**LAND DESCRIPTION:**

LOT 194 ON DEPOSITED PLAN 72480

REGISTERED PROPRIETOR:
(FIRST SCHEDULE)

ROSS ANTHONY SMITH OF PO BOX 197, MERREDIN

(T M212540) REGISTERED 15 MARCH 2013

LIMITATIONS, INTERESTS, ENCUMBRANCES AND NOTIFICATIONS:
(SECOND SCHEDULE)

1. C786569 EASEMENT TO STATE ENERGY COMMISSION OF WESTERN AUSTRALIA FOR THE PURPOSE OF CONSTRUCTING, MAINTAINING AND USING ELECTRICITY EQUIPMENT - SEE SKETCH ON DEPOSITED PLAN 72480 REGISTERED 6.6.1984.

Warning: A current search of the sketch of the land should be obtained where detail of position, dimensions or area of the lot is required.
* Any entries preceded by an asterisk may not appear on the current edition of the duplicate certificate of title.
Lot as described in the land description may be a lot or location.

-----END OF CERTIFICATE OF TITLE-----

STATEMENTS:

The statements set out below are not intended to be nor should they be relied on as substitutes for inspection of the land and the relevant documents or for local government, legal, surveying or other professional advice.

SKETCH OF LAND: DP72480.
PREVIOUS TITLE: 2721-746.
PROPERTY STREET ADDRESS: NO STREET ADDRESS INFORMATION AVAILABLE.
LOCAL GOVERNMENT AREA: SHIRE OF MERREDIN.

WESTERN



AUSTRALIA

REGISTER NUMBER	
19444/DP229756	
DUPLICATE EDITION	DATE DUPLICATE ISSUED
1 (NDI)	16/7/2009

RECORD OF CERTIFICATE OF TITLE
UNDER THE TRANSFER OF LAND ACT 1893

VOLUME
2721FOLIO
743

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REGISTRAR OF TITLES

LAND DESCRIPTION:

LOT 19444 ON DEPOSITED PLAN 229756

REGISTERED PROPRIETOR:
(FIRST SCHEDULE)

ROSS ANTHONY SMITH OF POST OFFICE BOX 197, MERREDIN

(T M054551) REGISTERED 21/9/2012

LIMITATIONS, INTERESTS, ENCUMBRANCES AND NOTIFICATIONS:
(SECOND SCHEDULE)

1. C786569 EASEMENT TO STATE ENERGY COMMISSION OF WESTERN AUSTRALIA FOR THE PURPOSE OF CONSTRUCTING, MAINTAINING AND USING ELECTRICITY EQUIPMENT - SEE VOLUME 1182 FOLIO 319 REGISTERED 6/6/1984.
2. *M054553 MORTGAGE TO BANK OF WESTERN AUSTRALIA LTD REGISTERED 21/9/2012.

Warning: A current search of the sketch of the land should be obtained where detail of position, dimensions or area of the lot is required.
* Any entries preceded by an asterisk may not appear on the current edition of the duplicate certificate of title.
Lot as described in the land description may be a lot or location.

-----END OF CERTIFICATE OF TITLE-----

STATEMENTS:

The statements set out below are not intended to be nor should they be relied on as substitutes for inspection of the land and the relevant documents or for local government, legal, surveying or other professional advice.

SKETCH OF LAND: 1182-319 (19444/DP229756)
PREVIOUS TITLE: 1182-319
PROPERTY STREET ADDRESS: NO STREET ADDRESS INFORMATION AVAILABLE.
LOCAL GOVERNMENT AUTHORITY: SHIRE OF MERREDIN

NOTE 1: DUPLICATE CERTIFICATE OF TITLE NOT ISSUED AS REQUESTED BY DEALING L916171

Aboriginal Heritage Database Results



Search Criteria

0 Registered Aboriginal Sites in Custom search area; 615555.83mE, 6507539.52mN z50 (MGA94) : 619473.41mE, 6511213.72mN z50 (MGA94)

Disclaimer

The *Aboriginal Heritage Act 1972* preserves all Aboriginal sites in Western Australia whether or not they are registered. Aboriginal sites exist that are not recorded on the Register of Aboriginal Sites, and some registered sites may no longer exist.

The information provided is made available in good faith and is predominately based on the information provided to the Department of Aboriginal Affairs by third parties. The information is provided solely on the basis that readers will be responsible for making their own assessment as to the accuracy of the information. If you find any errors or omissions in our records, including our maps, it would be appreciated if you email the details to the Department at heritageenquiries@daa.wa.gov.au and we will make every effort to rectify it as soon as possible.

South West Settlement ILUA Disclaimer

Your heritage enquiry is on land **within or adjacent to** the following Indigenous Land Use Agreement(s): Ballardong People ILUA

On 8 June 2015, six identical Indigenous Land Use Agreements (ILUAs) were executed across the South West by the Western Australian Government and, respectively, the Yued, Whadjuk People, Gnaala Karla Booja, Ballardong People, South West Boojarah #2 and Wagyl Kaip & Southern Noongar groups, and the South West Aboriginal Land and Sea Council (SWALSC).

The ILUAs bind the parties (including 'the State', which encompasses all State Government Departments and certain State Government agencies) to enter into a Noongar Standard Heritage Agreement (NSHA) when conducting Aboriginal Heritage Surveys in the ILUA areas, unless they have an existing heritage agreement. It is also intended that other State agencies and instrumentalities enter into the NSHA when conducting Aboriginal Heritage Surveys in the ILUA areas. It is recommended a NSHA is entered into, and an 'Activity Notice' issued under the NSHA, if there is a risk that an activity will 'impact' (i.e. by excavating, damaging, destroying or altering in any way) an Aboriginal heritage site. The Aboriginal Heritage Due Diligence Guidelines, which are referenced by the NSHA, provide guidance on how to assess the potential risk to Aboriginal heritage.

Likewise, from 8 June 2015 the Department of Mines and Petroleum (DMP) in granting Mineral, Petroleum and related Access Authority tenures within the South West Settlement ILUA areas, will place a condition on these tenures requiring a heritage agreement or a NSHA before any rights can be exercised.

If you are a State Government Department, Agency or Instrumentality, or have a heritage condition placed on your mineral or petroleum title by DMP, you should seek advice as to the requirement to use the NSHA for your proposed activity. The full ILUA documents, maps of the ILUA areas and the NSHA template can be found at <https://www.dpc.wa.gov.au/lantu/Claims/Pages/SouthWestSettlement.aspx>.

Further advice can also be sought from the Department of Aboriginal Affairs (DAA) at heritageenquiries@daa.wa.gov.au.



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Coordinate Accuracy

Accuracy is shown as a code in brackets following the coordinates. Map coordinates (Latitude/Longitude and Easting/Northing) are based on the GDA 94 Datum. The Easting/Northing map grid can be across one or more zones. The zone is indicated for each Easting on the map, i.e. '500000mE:Z50' means Easting=500000, Zone=50.

Terminology (NB that some terminology has varied over the life of the legislation)

Place ID/Site ID: This is a unique ID assigned by the Department of Aboriginal Affairs to the place

Status:

- o **Registered Site:** The place has been assessed as meeting Section 5 of the *Aboriginal Heritage Act 1972*
- o **Other Heritage Place which includes:**
 - **Stored Data / Not a Site:** The place has been assessed as not meeting Section 5 of the *Aboriginal Heritage Act 1972*
 - **Lodged:** Information has been received in relation to the place, but an assessment has not been completed at this stage to determine if it meets Section 5 of the *Aboriginal Heritage Act 1972*

Status Reason: e.g. Exclusion - Relates to a portion of an Aboriginal site or heritage place as assessed by the Aboriginal Cultural Material Committee (ACMC). e.g. such as the land subject to a section 18 notice.

Origin Place ID: Used in conjunction with Status Reason to indicate which Registered Site this Place originates from.

Access and Restrictions:

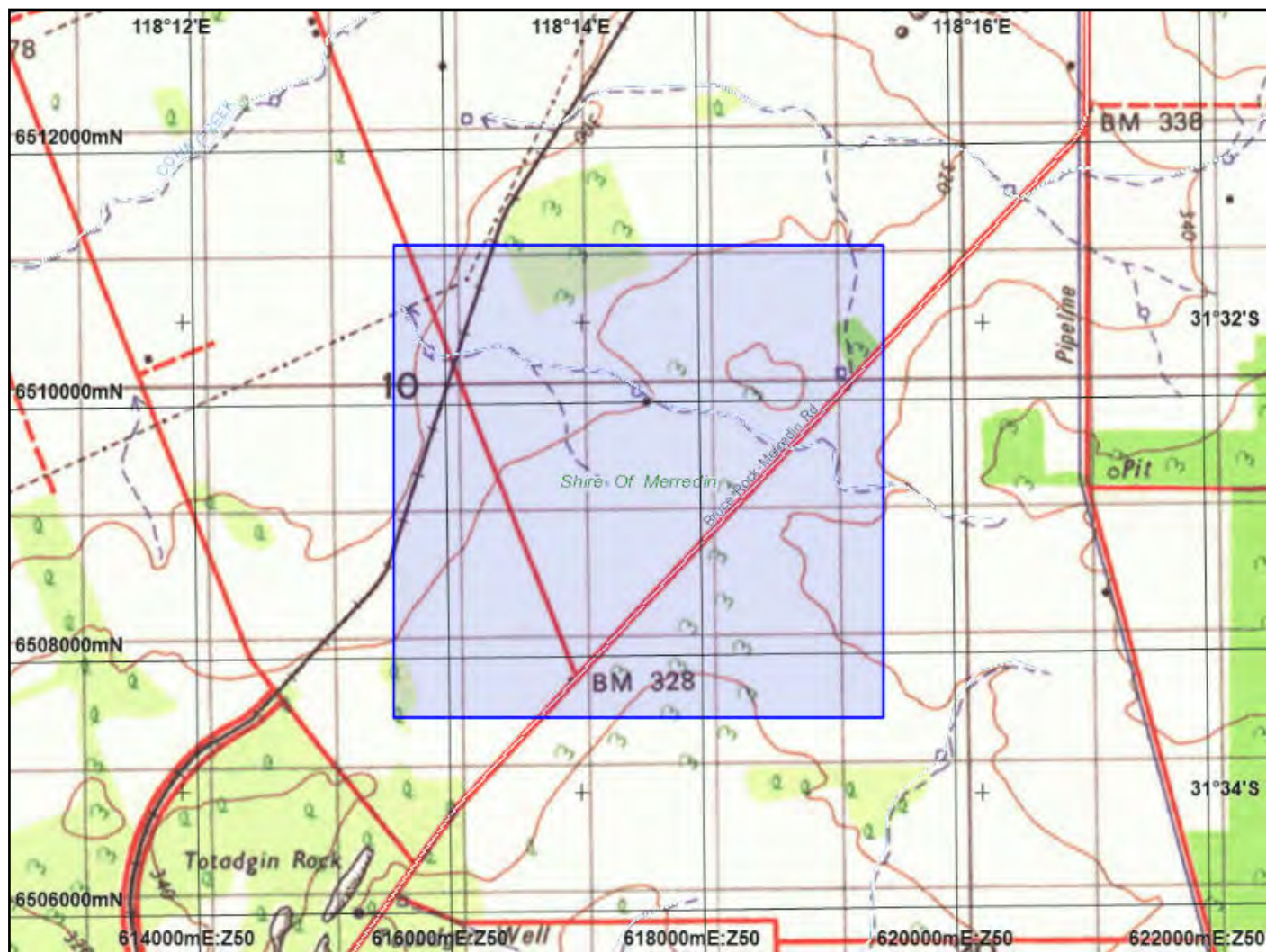
- o **File Restricted = No:** Availability of information (other than boundary) that the Department of Aboriginal Affairs holds in relation to the place is not restricted in any way.
- o **File Restricted = Yes:** Some of the information that the Department of Aboriginal Affairs holds in relation to the place is restricted if it is considered culturally sensitive. This information will only be made available if the Department of Aboriginal Affairs receives written approval from the informants who provided the information. Download the [Request to Access Restricted Information](#) letter and form.
- o **Boundary Restricted = No:** place location is shown as accurately as the information lodged with the Registrar allows.
- o **Boundary Restricted = Yes:** To preserve confidentiality the exact location and extent of the place is not displayed on the map. However, the shaded region (generally with an area of at least 4km²) provides a general indication of where the place is located. If you are a landowner and wish to find out more about the exact location of the place, please contact DAA.
- o **Restrictions:**
 - **No Restrictions:** Anyone can view the information.
 - **Male Access Only:** Only males can view restricted information.
 - **Female Access Only:** Only females can view restricted information

Legacy ID: This is the former unique number that the former Department of Aboriginal Sites assigned to the place. This has been replaced by the Place ID / Site ID.



List of Registered Aboriginal Sites with Map

No Results



Legend

Selected Heritage Sites

-  Registered Sites
-  Aboriginal Community Occupied
-  Aboriginal Community Unoccupied
-  Town
-  Search Area

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Fire Management Plan



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Bushfire Management Plan (Hazard Level Assessment)

Lot 194 Robartson Road & Lot 19444 Bruce
Rock-Merredin Road, Merredin

Shire of Merredin

Project Number: 169042

Assessment Date: 31 January 2017

Report Date: 3 March 2017

Plan Details

BMP Template v5.4 ©2016 BPP Group Pty Ltd

Plan Version	Submitted to	Submitted Date
v1.0	Proponent	2-Mar-17
Plan Version	Amendment Record	Submitted Date


-

Compliance Statement

This Bushfire Management Plan (the Plan) meets the requirements of both the *State Planning Policy No. 3.7: Planning in Bushfire Prone Areas* (SPP 3.7) and the supporting *Guidelines for Planning in Bushfire Prone Areas* (WAPC 2015; the 'Guidelines').

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BPP Group Pty Ltd t/a Bushfire Prone Planning ACN: 39 166 551 784

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Contents

1	EXECUTIVE SUMMARY	4
2	APPLICATION OF SPP 3.7	5
3	COMMISSIONING AND THE LAND USE PROPOSAL	6
4	THE PLANNING SUBMISSION AND THE DOCUMENTS REQUIRED	8
5	ASSESSMENT OF BUSHFIRE RISK.....	10
5.1	VEGETATION ASSESSMENT/CLASSIFICATION AND GROUND SLOPE.....	10
5.1.1	<i>Existing Vegetation</i>	<i>10</i>
5.1.2	<i>Vegetation Excluded from Classification.....</i>	<i>18</i>
5.1.3	<i>Expected On-site Vegetation Changes Due to Proposed Subdivision or Development</i>	<i>19</i>
5.1	BUSHFIRE HAZARD LEVEL (BHL) ASSESSMENT	21
5.1.1	<i>Identification of Specific Issues Arising from BHL Assessment</i>	<i>22</i>
5.2	BUSHFIRE ATTACK LEVEL (BAL) ASSESSMENT – BAL CONTOUR MAP	25
5.2.1	<i>Summary of Data Applied in Constructing the BAL Contours</i>	<i>27</i>
5.2.2	<i>BAL's as Indicated / Determined by the Contour Map.....</i>	<i>27</i>
5.2.3	<i>Identification of Specific Issues Arising from BAL Contour Map</i>	<i>28</i>
6	ENVIRONMENTAL CONSIDERATIONS.....	29
6.1	NATIVE VEGETATION AND RE-VEGETATION.....	29
7	BUSHFIRE RISK MANAGEMENT MEASURES	31
7.1	THE BUSHFIRE PROTECTION CRITERIA – ASSESS AND DEMONSTRATE COMPLIANCE	31
7.2	LOCATION OF BUILDINGS AND APPLICABLE BAL'S	39
7.3	VEGETATION MANAGEMENT	40
7.4	VEHICULAR ACCESS – ELEMENT 3 OF THE BUSHFIRE PROTECTION CRITERIA	43
7.5	FIREFIGHTING WATER SUPPLY	44
7.6	BUILDING CONSTRUCTION STANDARDS.....	44
7.6.1	<i>Future Habitable Buildings on the Subject Site</i>	<i>44</i>
8	SPECIFIC LAND USES.....	45
8.1	HIGH RISK LAND USE – DEFINITION / APPLICATION / REQUIREMENTS	45
9	COMPLIANCE STATEMENTS - OF THE PROPOSAL AND THIS PLAN.....	47
9.1	STATE PLANNING POLICY NO. 3.7: PLANNING IN BUSHFIRE PRONE AREAS.....	47
9.2	GUIDELINES FOR PLANNING IN BUSHFIRE PRONE AREAS (WAPC 2015 AS AMENDED)	50
9.3	BUSHFIRE PROTECTION CRITERIA (WAPC 2015 'GUIDELINES')	50
9.4	LOCAL VARIATIONS TO BUSHFIRE PROTECTION CRITERIA	50
9.5	WA BUILDING ACT 2011.....	50
9.6	AS 3959 CONSTRUCTION OF BUILDINGS IN BUSHFIRE PRONE AREAS (2009 AS AMENDED)	52
9.7	LOCAL GOVERNMENT FIREBREAK NOTICE.....	52
10	RESPONSIBILITIES FOR IMPLEMENTATION & MAINTENANCE.....	53
10.1	LANDOWNER / PROPONENT RESPONSIBILITIES (AND THOSE ACTING ON THEIR BEHALF).....	53
10.2	BUILDER RESPONSIBILITIES	55
10.3	LOCAL GOVERNMENT RESPONSIBILITIES.....	56
11	APPENDICES – ADVISORY INFORMATION ONLY.....	57

Appendices

APPENDIX 1.....	57
THE WA FRAMEWORK FOR BUSHFIRE RISK MANAGEMENT	57
APPENDIX 2.....	63
BUSHFIRE RISK ASSESSMENT – UNDERSTANDING THE METHODOLOGY	63
APPENDIX 3.....	66
VEGETATION CLASSIFICATION EXCLUSIONS (AS 3959-2009 s2.2.3.2)	66
APPENDIX 4.....	67
TECHNICAL REQUIREMENTS –	67
ASSET PROTECTION ZONES (APZ) - DESCRIPTION, ESTABLISHMENT, MAINTENANCE AND STANDARDS.....	67
APPENDIX 5.....	70
TECHNICAL REQUIREMENTS - BUSHFIRE PROTECTION CRITERIA (VEHICULAR ACCESS)	70
APPENDIX 6.....	76
TECHNICAL REQUIREMENTS - BUSHFIRE PROTECTION CRITERIA (WATER)	76

Disclaimer

The measures contained in this Bushfire Management Plan are considered to be minimum standards and they do not guarantee that a building will not be damaged in a bushfire. This is substantially due to the unpredictable nature and behaviour of fire and extreme weather conditions. Additionally, the achievement of and level of implementation of bushfire management measures will depend, among other things, on the actions of the landowners or occupiers over which Bushfire Prone Planning has no control.

All surveys, forecasts, projections and recommendations made in this report associated with the project are made in good faith on the basis of information available to Bushfire Prone Planning at the time.

All maps included herein are indicative in nature and are not to be used for accurate calculations.

Notwithstanding anything contained therein, Bushfire Prone Planning will not, except as the law may require, be liable for any loss or other consequences (whether or not due to the negligence of their consultants, their servants or agents) arising out of the services provided by their consultants.

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1 Executive Summary

This Bushfire Management Plan (the Plan) has been prepared to accompany the development application for a solar power station at Lot 194 Robartson Road and Lot 19444 Bruce Rock- Merredin Road within the Shire of Merredin.

The development site of approximately 532ha is within a designated bushfire prone area and the Proposal requires the application of *State Planning Policy No. 3.7: Planning in Bushfire Prone Areas* (SPP 3.7). The assessed bushfire risk is considered to be manageable and will be achieved by the identified stakeholders implementing and maintaining the bushfire risk management measures that are presented in this Plan.

Assessment of the planned location, vegetation and consideration of planned infrastructure indicates that compliance is able to be achieved against all applicable bushfire related legislation, policy, standards and guidelines, including the Bushfire Protection Criteria. This bushfire hazard level assessment demonstrates that compliance against the four elements of the Bushfire Protection Criteria can be achieved in subsequent planning stages.

The development site has access to two routes of escape and is serviced by Robartson and Bruce Rock- Merredin Roads that are existing public roads. The internal access roads will be designed and constructed to comply with the technical requirements of the Guidelines.

As the development will be for a solar power station and there is no reticulated water available to the site it is proposed to install 2 x 50,000ltr water tanks with the appropriate coupling, hardstand and turnaround areas.

Indicative BAL ratings of BAL-29 or less are able to be achieved within the lots with several areas of vegetation to be retained with the appropriate separation distances will being maintained.

Future buildings within 100 metres of classified vegetation will be constructed to standards which correspond to the determined BALs, as required by *AS 3959-2009 Construction of buildings in bushfire prone areas*. As this proposal does not identify the actual location of building works within the lots, there may be a requirement to determine the BAL for individual building works once any actual building site has been identified. Under the Building Code of Australia the proposed development is not required to be constructed to comply with AS3959-2009.

Due to the proposed development being a high risk land use, an emergency evacuation plan, with specific consideration to the management of a bushfire emergency will be required to be prepared prior to construction. This may form part of an overall emergency risk management plan for the site.

2 Application of SPP 3.7

The *State Planning Policy No. 3.7: Planning in Bushfire Prone Areas* (SPP 3.7) provides the foundation for land use planning to address bushfire risk in Western Australia.

This Proposal must consider SPP 3.7 and, if required, comply with its policy measures. The determination of this requirement is presented below.

Application of SPP 3.7 Policy Measures – Primary Triggers

The subject Proposal is a higher order strategic planning document, a strategic planning proposal or a subdivision or development application: ✓

The project site is in a designated bushfire prone area on the WA Map of Bushfire Prone Areas: ✓

The project site is not located in a designated bushfire prone area on the WA Map of Bushfire Prone Areas but the existing vegetation type and condition dictate that it should be:

The project site is in an area not yet designated as bushfire prone but is proposed to be developed in a way that introduces a bushfire hazard (*Guidelines for Planning in Bushfire Prone Areas WAPC 2015 s3.2.2*): ✓

Application of SPP 3.7 Policy Measures – Secondary Trigger/s

The Proposal is a strategic planning proposal, subdivision or development application relating to land that has or will have a Bushfire Hazard Level above low and/or where a Bushfire Attack Level rating above BAL-LOW applies (SPP 3.7 s6.2): ✓

The subject Proposal is a development application for the construction or/and use of a single house or ancillary dwelling on a lot or lots greater than 1100m² and subject to BAL-40 or BAL-FZ (LPS Amendment Regulations 2015):

The subject Proposal is a development application for the construction or/and use of a habitable building (other than a single house or ancillary dwelling), or a specified building on any lot size and subject to a BAL rating above BAL-LOW (LPS Amendment Regulations 2015):

3 Commissioning and the Land Use Proposal

Bushfire Prone Planning (BPP Group Pty Ltd) has been commissioned to carry out the assessments and prepare the required bushfire planning documentation to accompany the proponent's planning submission associated with their proposed land use project.

Commissioning Record

Proponent: Stellata Energy Ltd

BPP Commissioned by: Landinsights- Michael Taylforth

Purpose: Strategic Planning - Hazard Assessment

Project Location

Subject Site and Address: Lot No. 194 Robartson Road & Lot 19444 Bruce Rock- Merredin Road, Merredin

Local Government: Shire of Merredin

Zoning and R-Code: Rural

Project Description

Description: Development of a solar array power station

Building Class: N/A

Lot Areas: Lot 194- 294.202ha

Lot 19444- 237.773ha



Figure 3.1
Proposed Development Site

Lot 194 on Deposited Plan 72480
Lot 19444 on Deposited Plan 229756
Merredin

Aerial Image: Landgate Mar 2016

Coordinate System: GDA 1994 MGA Zone 50
Projection: Universal Transverse Mercator Units: Metre

LEGEND

- Lots 194 & 19444
- Other Lots
- Easement
- Other interests

SCALE (A3)

0 100 200 300 400 500

Metres



LOCALITY

Map compiled by: Russell Wornes Map created on: 1/03/2017

Disclaimer and Limitation: This map has been prepared for bushfire management planning purposes only. All depicted areas, contours and any dimensions shown are subject to survey. Bushfire Prone Planning does not guarantee that this map is without flaw of any kind and disclaims all liability for any errors, loss or other consequence which may arise from relying on any information depicted.

4 The Planning Submission and the Documents Required

Policy measures in *SPP 3.7* (and further instruction in the associated document *Guidelines for Planning in Bushfire Prone Areas WAPC 2015*) set out the bushfire planning information (including bushfire risk assessments) that are to accompany a planning submission. It is dependent on the type of proposal and stage of the development process. In most circumstances this information is to be presented in the form of a Bushfire Management Plan (BMP).

The Planning Submission – Stage and Specific Land Use or Development	
Planning Stage:	Development application
For Submission to:	Shire of Merredin
Project Type:	Development
‘Vulnerable’ Land Use:	N/A
‘High Risk’ Land Use:	Yes
‘Minor’ Development:	N/A
‘Unavoidable’ Development:	N/A

This Bushfire Management Plan will include the information indicated by the check mark. If an item is checked it is required by either: SPP 3.7 or by a local government variation. It may also have been prepared at an earlier planning stage and therefore re-included or included by the assessor as it improves the information presented in this Bushfire Management Plan.

Bushfire Hazard Level Assessment	Bushfire Attack Level Contour Map	Bushfire Attack Level Assessment	Identify any issues arising from the BAL contour map or BAL assessment	Identify and specifically address the list of issues related to strategic level planning and defined in the <i>Guidelines</i> s5.2	Demonstrate compliance with the Bushfire Protection Criteria can be achieved in subsequent planning stages	Demonstrate compliance with the Bushfire Protection Criteria
✓	✓		✓	✓	✓	

For vulnerable and high risk land use and development in areas with an extreme bushfire hazard level and/or areas where BAL-40 or BAL-FZ applies, the following additional bushfire planning information will accompany and/or be included in this Bushfire Management Plan.

Vulnerable Land Use		High Risk Land Use	Minor Development	Unavoidable Development
Provision for Emergency Evacuation	Emergency Evacuation Plan for Proposed Occupants	Risk Management Plan for Flammable On-site Hazards	Statements Against SPP 3.7 s6.7.1 items (a) to (d)	Statements Against SPP 3.7 s6.7.2 items (b) and (d)



Note that for vulnerable and high risk land uses involving Class 4 to Class 9 buildings, the planning process focuses on location, siting, vehicular access and firefighting water supply and not building construction requirements - as the Building Code of Australia only applies to Classes 1, 2, 3 and associated Class 10a buildings or decks. However, the construction requirements as set out in AS 3959 – 2009 can be utilised voluntarily to enhance a buildings survivability if it is subject to a bushfire.

5 Assessment of Bushfire Risk

5.1 Vegetation Assessment/Classification and Ground Slope

5.1.1 Existing Vegetation

All vegetation within 100 metres of the subject site has been identified and classified or excluded and presented in Table 5.1.1. This has been done with accordance with AS 3959-2009 and reference to the *Visual Guide for Bushfire Risk Assessment in WA* (WAPC February 2016).

The vegetation has been assessed as it will be in its mature state and where deemed appropriate, in its unmanaged state. The areas of classified vegetation that will determine bushfire risk are defined on the topography and vegetation map Figure 5.1. Representative photos of each vegetation area is presented after the table.

Table 5.1.1: Vegetation types identified, the applied classification and effective slope

All Vegetation Within 100 metres of Subject Site			
Vegetation Area	Identified Types (AS3959) or Description if 'Excluded'	Applied Classification	Effective Slope Under Classified Vegetation (degrees)
1	Woodland B-05	Class B Woodland	0-5
2	Open Woodland B-06	Class B Woodland	0-5
3	Woodland B-05	Class B Woodland	0-5
4	Open Scrub D-14	Class D Scrub	0-5
5	Open Woodland B-06	Class B Woodland	0-5
6	Woodland B-05	Class B Woodland	0-5
7	Woodland B-05	Class B Woodland	0-5
8	Open Heath C-11	Class C Shrubland	0-5
9	Open Woodland B-06	Class B Woodland	0-5
10	Open Tussock, G-23	Class G Grassland	0-5
11	Pasture & Crop, G-26	Class G Grassland	0-5
12	Pasture & Crop, G-26	Class G Grassland	0-5
13	Pasture & Crop, G-26	Class G Grassland	0-5
14	Pasture & Crop, G-26	Class G Grassland	0-5
15	Pasture & Crop, G-26	Class G Grassland	0-5
16	Open Heath C-11	Class C Shrubland	0-5
17	Pasture & Crop, G-26	Class G Grassland	0-5
18	Low Open Woodland B-07	Class B Woodland	0-5
19	Low Open Woodland B-07	Class B Woodland	0-5

20
Low Open Woodland B-07
Class B Woodland
0-5

Note: When more than one vegetation type is present each type is classified separately with the worst case scenario being applied. The predominant vegetation is not necessarily the worst case scenario.

Vegetation Area 1

Classification Applied: Class B Woodland

Assessment Comment: offsite woodland. Acacia, eucalypt, shrub and grass understorey, Nature reserve



Photo ID: 1a



Photo ID: 1b

Vegetation Area 2

Classification Applied: Class B Woodland

Assessment Comment: open woodland, remanent salmon gum woodland, grass understorey



Photo ID: 2a

Vegetation Area 3

Classification Applied: Class B Woodland

Assessment Comment: woodland dominated by acacia shrubs with eucalypt trees, remanent native vegetation



Photo ID: 3a



Photo ID: 3b

Vegetation Area 4

Classification Applied: Class D Scrub

Assessment Comment: acacia scrub, ~3m height, rocky outcrops throughout (see Photo 4a)



Photo ID: 4a



Photo ID: 4b

Vegetation Area 5

Classification Applied: Class B Woodland

Assessment Comment: open woodland offsite, Area 5 in background of Photo 5a, grass understorey



Photo ID: 5a

Vegetation Area 6

Classification Applied: Class B Woodland

Assessment Comment: offsite woodland, road verge vegetation, acacia shrubs and Eucalypt trees



Photo ID: 6a



Photo ID: 6b

Vegetation Area 6

Classification Applied: Class B Woodland

Assessment Comment: road verge vegetation, acacia shrub & eucalypt trees



Photo ID: 6c



Photo ID: 6d

Vegetation Area 7

Classification Applied: Class B Woodland

Assessment Comment: plantation eucalypt trees, currently recently planted ~2-4 years old



Photo ID: 5a

Vegetation Area 8

Classification Applied: Class C Shrubland

Assessment Comment: onsite shrubland, partly minor revegetated fenced area, grass understorey



Photo ID: 8a

Vegetation Area 9

Classification Applied: Class B Woodland

Assessment Comment: open woodland, historical buildings/sheds, grass understorey, ~10% foliage cover



Photo ID: 9a



Photo ID: 9b

Vegetation Area 10

Classification Applied: Class G Grassland

Assessment Comment: rocky outcrops, grassland, minor shrubs



Photo ID: 10a



Photo ID: 10b

Vegetation Area 11

Classification Applied: Class G Grassland

Assessment Comment: onsite cropping



Photo ID: 11a



Photo ID: 11b

Vegetation Areas 12 & 13 Classification Applied: Class G Grassland

Assessment Comment: offsite crops



Photo ID: 12



Photo ID: 13

Vegetation Areas 14 & 15 Classification Applied: Class G Grassland

Assessment Comment: offsite crops



Photo ID: 14



Photo ID: 15

Vegetation Area 16 Classification Applied: Class C Shrubland

Assessment Comment: offsite planted acacia shrubs, grass understorey



Photo ID: 16a

Vegetation Area 17

Classification Applied: Class G Grassland

Assessment Comment: offsite pasture, minor shrubs with grass understorey on boundary



Photo ID: 17a



Photo ID: 17b

Vegetation Area 18

Classification Applied: Class B Woodland

Assessment Comment: offsite woodlands, mallee eucalypt with grass understorey



Photo ID: 18a



Photo ID: 18b

Vegetation Area 19

Classification Applied: Class B Woodland

Assessment Comment: onsite low woodland, mallee eucalypt, grass understorey, tree height ~6-8m



Photo ID: 19a



Photo ID: 19b

Vegetation Area 20

Classification Applied: Class B Woodland

Assessment Comment: offsite low woodland, mallee eucalypt, grass understorey, tree height ~6-8m



Photo ID: 20a

Vegetation Areas

Classification Applied: Excluded AS3959-2009 2.2.3.2 (f)

Assessment Comment: managed areas associated with power station and sub station, bare earth area from construction currently fenced



Photo ID: 21



Photo ID: 22

5.1.2 Vegetation Excluded from Classification

Certain areas and vegetation within 100m of the subject site may be assessed as 'low threat or non-vegetated'. These are to be excluded from classification and are therefore rated BAL-LOW. They must be managed to maintain the specifications set out in AS3959-2009 s2.2.3.2 in perpetuity (refer to Appendix 3 'Vegetation Classification Exclusions').

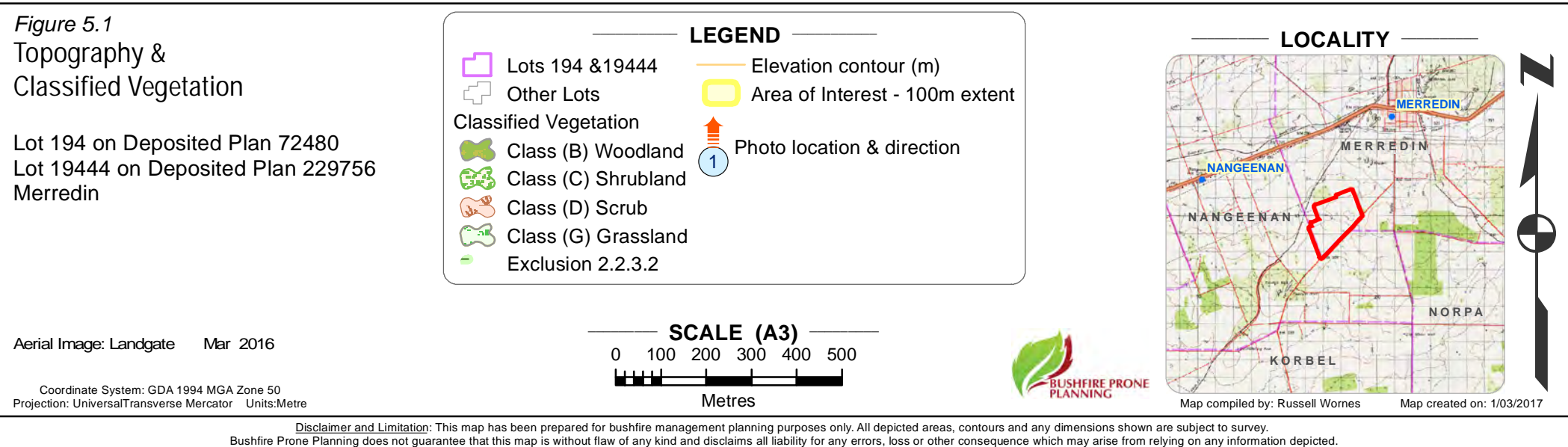
The only excluded areas are associated with the power station on Robartson Road and a bare earth area of land adjacent to the site that has been excluded as per AS3959-2009 s2.2.3.2 (e).

5.1.3 Expected On-site Vegetation Changes Due to Proposed Subdivision or Development

In assessing vegetation for bushfire threat, consideration must be given to possible future vegetation changes likely on the site that is being assessed, particularly those that would have the potential to increase the bushfire risk.

This may be due to growth of existing vegetation or growth of planned landscape plantings, including future roadside or water course re-vegetation. There must be careful consideration of the creation of vegetation corridors where they join offsite vegetation and may provide a route for fire to enter an area of future development.

This proposal has assumed the grassland vegetation onsite will be managed in a low threat state as short cropped grass or bare earth tracks within the development. Some of the internal vegetation areas such as areas 3, 4 & 9 will be retained onsite.



5.1 Bushfire Hazard Level (BHL) Assessment

“A Bushfire Hazard Level assessment provides a ‘broad-brush’ means of determining the potential intensity of a bushfire for a particular area. The Bushfire Hazard Level assessment assists in informing the suitability of land contained within strategic planning proposals for future subdivision and development.

The Bushfire Hazard Level assessment categorises land within a designated bushfire prone area as having a low, moderate or extreme bushfire hazard level. Different hazard levels may be assigned to different parts of individual lots.

Bushfire Hazard Level assessments allow for early strategic consideration of bushfire risk which can then be used to inform the more detailed stages that follow, ensuring all issues are considered, identified and properly addressed at the earliest possible time (‘Guidelines’ s4.1)”.

For a summary of the assessment methodology refer to Appendix 2. BHL assessments are required to accompany all strategic planning proposals unless the future lot layout of the Proposal is known in which case a BAL Contour Map is more appropriate (SPP 3.7 s6.3).

Assessment Results

The results of the Bushfire Hazard Level assessment detailing the vegetation type, class and the hazard levels assigned, are presented in Table 5.1.1 and visually in Figure 5.1.1 (pre development) and 5.1.2 (post development) as a Bushfire Hazard Level Map. If additional assessment inclusions are required in this Plan, they are identified in Table: 5.1.2

Table 5.1.1: BHL assessment

Bushfire Hazard Level Assessment	
Data Used (methodology as per the ‘Guidelines’ Appendix 2):	physical site inspection
Assessed Area	Bushfire Hazard Level
Land inside the external boundary of the subject site:	Low + Moderate + Extreme
Land within 100 metres of external boundary of the subject site:	Moderate + Extreme

The Bushfire Hazard Level mapping demonstrates that the Bushfire Hazard Level to which future and existing residences will be exposed, will be reduced after development.

Table 5.1.2: Required additional assessment.

Required Additional Assessment	
If any of the assessed area is determined to have an Extreme BHL this will trigger further considerations. Can the extreme hazard level be initially reduced to low or moderate and then maintained for the life of the development?	No
A 'Yes' response requires that Section 7 of this Plan 'Bushfire Risk Management Measures' will outline how this will be achieved. A 'No' response requires that the indicative Bushfire Attack Levels for the subject site will need to be BAL-29 or lower in order to be considered suitable for development – unless the development meets the definition of 'unavoidable' development.	
Are the indicative Bushfire Attack Levels for the subject site BAL-29 or lower?	Yes
Is this proposal for 'minor' or 'unavoidable' development?	No

5.1.1 Identification of Specific Issues Arising from BHL Assessment

The retaining of some of the onsite vegetation will require specific separation distances to be able to achieve BAL-29 for the development. The offsite vegetation will also affect the development with several vegetation areas along the lot boundaries will require separation to achieve BAL-29.

This is achievable and is demonstrated with the BAL Contour map in the next section.



Figure 5.1.1
Bushfire Hazard Level
Pre-development

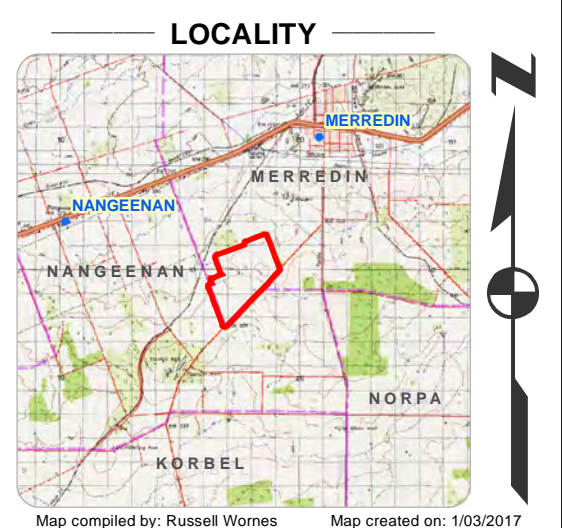
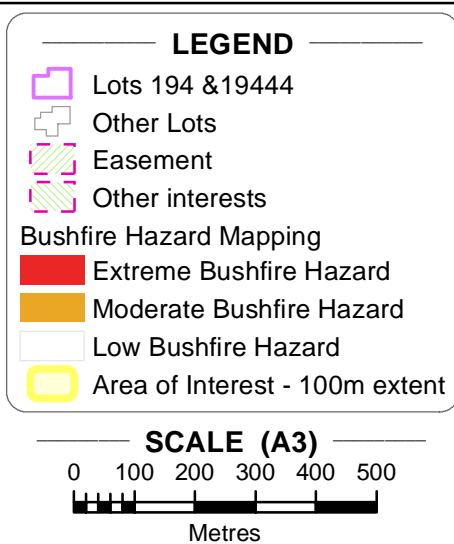
Lot 194 on Deposited Plan 72480
Lot 19444 on Deposited Plan 229756
Merredin

NOTE: Hazard mapping has been prepared in accordance with the methodology set out in the Guidelines for Planning in Bushfire Prone Areas, (WAPC 2015, as ammended).

Hazard mapping is required to extend for 100m beyond the property boundary.

Aerial Image: Landgate Mar 2016

Coordinate System: GDA 1994 MGA Zone 50
Projection: UniversalTransverse Mercator Units:Metre



Disclaimer and Limitation: This map has been prepared for bushfire management planning purposes only. All depicted areas, contours and any dimensions shown are subject to survey. Bushfire Prone Planning does not guarantee that this map is without flaw of any kind and disclaims all liability for any errors, loss or other consequence which may arise from relying on any information depicted.



Figure 5.1.2
Bushfire Hazard Level
Post-development

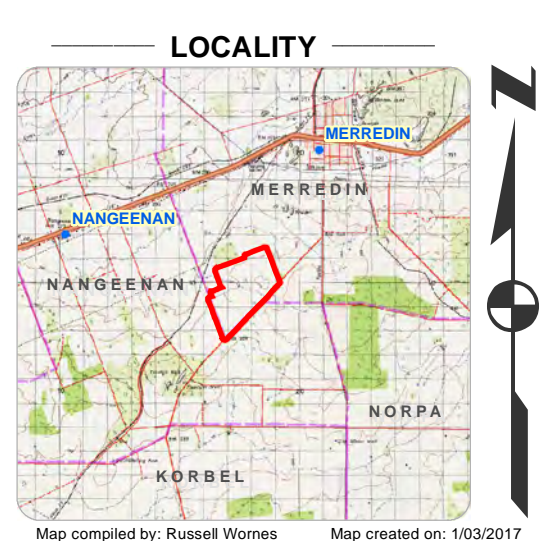
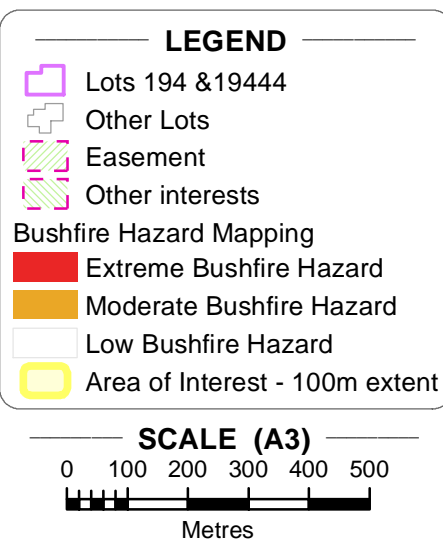
Lot 194 on Deposited Plan 72480
 Lot 19444 on Deposited Plan 229756
 Merredin

NOTE: Hazard mapping has been prepared in accordance with the methodology set out in the Guidelines for Planning in Bushfire Prone Areas, (WAPC 2015, as ammended).

Hazard mapping is required to extend for 100m beyond the property boundary.

Aerial Image: Landgate Mar 2016

Coordinate System: GDA 1994 MGA Zone 50
 Projection: UniversalTransverse Mercator Units:Metre



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5.2 Bushfire Attack Level (BAL) Assessment – BAL Contour Map

Description and Purpose of the BAL Contour Map

A Bushfire Attack Level (BAL) Contour Map identifies land suitable and unsuitable for development and guides the location of building envelopes within a development site. The BAL Contour Map is a scale map of a development site (which can include proposed or an existing lot layout), which identifies indicative BAL ratings across the development site and within the immediate surrounding area. The map illustrates potential bushfire attack levels and radiant heat impacts in relation to any classified vegetation that will remain within 100 metres of the assessment area once development is constructed i.e. when the land has been cleared and all the subdivision works have been undertaken. It needs to take into account any vegetation that will remain or will be introduced when the works are complete (source: WAPC Factsheet “BAL Contour Maps” Version 2 January 2016).

BAL Contour Map Interpretation

The contour map will present different coloured contour intervals constructed around the classified bushfire prone vegetation. These represent the different Bushfire Attack Levels (BAL's) that exist as the distance increases away from the classified vegetation. Each BAL represents a set range of radiant heat flux (refer to Appendix 2) that can be generated by the bushfire in that vegetation. The width of each shaded contour interval is determined by calculations involving vegetation type, fuel structure, ground slope, and climatic conditions (i.e. the expected fire behaviour) and are unique to a site and can vary across a site.

BAL Contour Map and ‘Class G Grassland’

Grassland vegetation types may have been identified and classified on the subject site (refer to the Vegetation and Topography Map in Figure 5.1). Where this is the situation for the subject Proposal, and it is considered appropriate by the assessor, the BAL contour map produced for this Plan will exclude the area of Class G Grassland. Therefore, the displayed BAL contours will exist for all classified vegetation types except Grassland.

The rationale for this approach is to be able to derive meaningful information from the contour map. If Grassland was to be contoured the entire mapped area could potentially be BAL-FZ and therefore be presented as a sole colour – providing no useful information.

Grassland is commonly not native vegetation. From a practical perspective, it can be easily managed to a low bushfire threat state and generally will not require approval for its removal. Section 7.3 of this Plan details the management measure required to reduce any classified Grassland to a BAL rating of BAL-LOW.

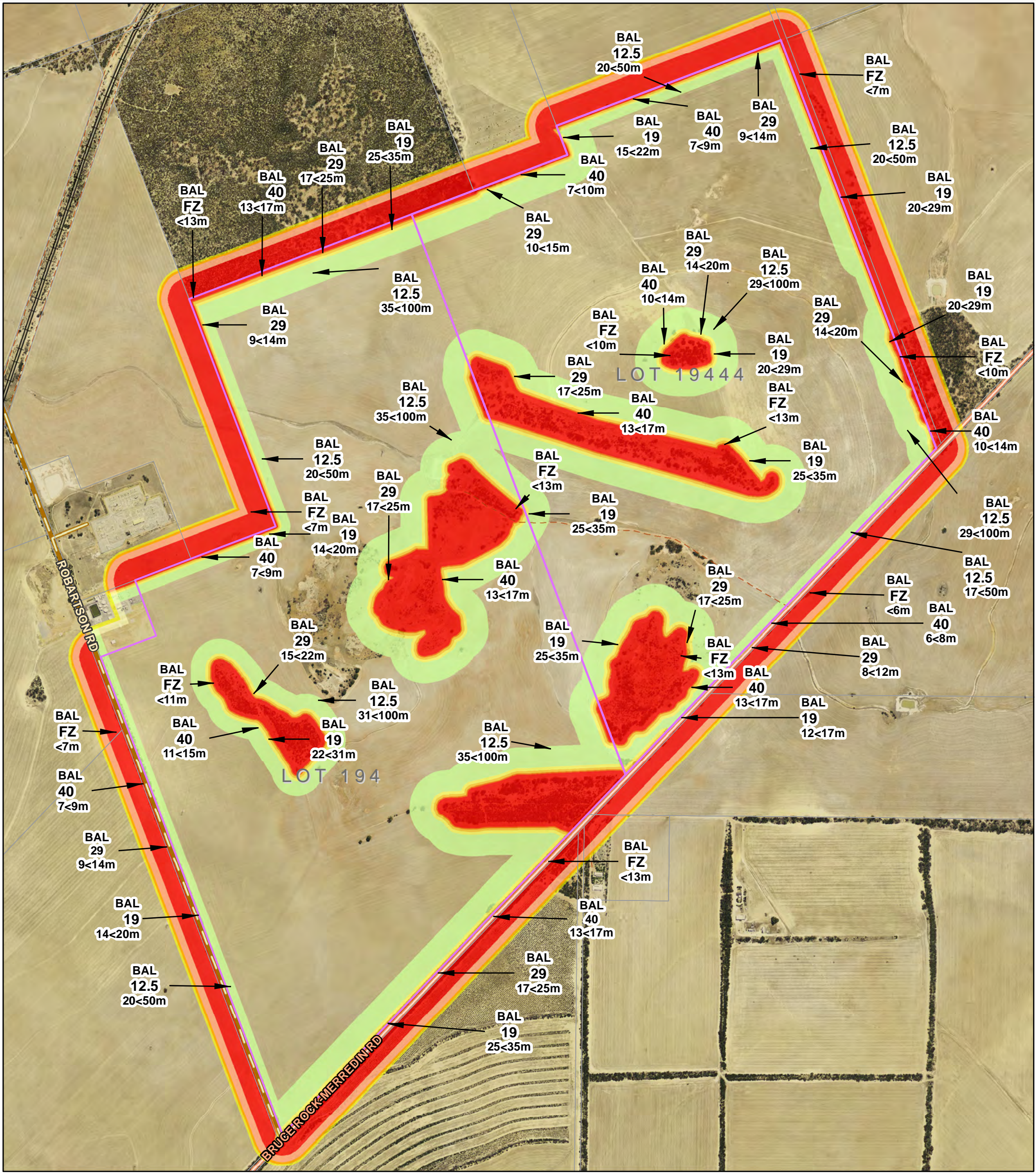


Figure 5.2
BAL Contour Map

Lot 194 on Deposited Plan 72480
Lot 19444 on Deposited Plan 229756
Merredin

Lots 194 & 19444 Bushfire Attack Levels (Method 1)

Other Lots

BAL FZ (Indicative only)

BAL 40 (Indicative only)

BAL 29 (Indicative only)

BAL 19 (Indicative only)

BAL 12.5 (Indicative only)

Area of Interest - 100m extent

Aerial Image: Landgate Mar 2016
Coordinate System: GDA 1994 MGA Zone 50
Projection: Universal Transverse Mercator Units: Metre

SCALE (A3)

0 100 200 300 400 500

Metres

LOCALITY

Map compiled by: Russell Wornes
Map created on: 1/03/2017

Disclaimer and Limitation: This map has been prepared for bushfire management planning purposes only. All depicted areas, contours and any dimensions shown are subject to survey. Bushfire Prone Planning does not guarantee that this map is without flaw of any kind and disclaims all liability for any errors, loss or other consequence which may arise from relying on any information depicted.

5.2.1 Summary of Data Applied in Constructing the BAL Contours

For the subject site, the vegetation separation distance range that corresponds to each Bushfire Attack Level (and represented by Figure 5.4, the BAL Contour Map), has been derived from:

1. An AS3959-2009 Method 1 assessment and sourced from AS3959-2009 Table 2.4.3; and/or
2. An AS3959-2009 Method 2 assessment as per AS3959-2009 Appendix B.

The determined separation distances are presented in the tables below along with a summary of the data used in their derivation. The complete data is found in Section 5.1 of this Plan.

The separation distances used to calculate the separation distance for the BAL Contour map, Figure 5.2, has been derived from the Classified Vegetation shown in Section 5.1 and specific separation distances taken from Table 2.4.3 in AS3959-2009.

5.2.2 BAL's as Indicated / Determined by the Contour Map

BUSHFIRE PRONE PLANNING'S INTERPRETATION AND USE GUIDE (of information derived from the BAL Contour Map)

The Primary Use of BAL Contour Mapping - Planning

BAL contour mapping is primarily a planning tool that can give an overview as to the suitability of a site for development with respect to the extent to which bushfire is a potential threat to future buildings and persons on the subject land.

The mapping considers the development site (i.e. all existing or proposed lots) and does not consider the bushfire risk at an individual lot level and over different development time frames. Rather it is assessing the situation that will exist when the entire development has been completed, including any vegetation management that would reasonably be expected to take place as part of establishing buildings on the lots. On this basis, it helps decision makers determine the suitability of the proposed development for planning approval.

As a result, there will be situations where, for the purposes of planning, classifiable vegetation is not contoured. However, at a specific point in time (prior to full completion of a development) this vegetation may impact on a proposed buildings BAL rating.

A Secondary Use of BAL Contour Mapping - Building

Building approval (and the issue of a building permit) requires that a BAL rating is determined for an actual building and not just a lot or a building envelope (i.e. an 'area'). Determination of this BAL rating must consider the actual location of a building within an individual lot and its separation distance from any classified vegetation at the actual time of applying for building approval. It is a site-specific assessment based on the buildings design and location at a given point in time.

This specific assessment (BAL report and BAL certificate) required for a building application cannot always be derived from an assessment that is primarily designed to inform planning decisions. As a

result, there are limitations to obtaining a single BAL rating for a future building of unknown location, from a BAL contour map assessment.

Nonetheless, there are limited specific situations where the required building application information (i.e. a BAL Certificate) might be obtained quickly and cost effectively from a BAL contour map assessment. When these 'determined' BAL's can be derived is explained on the following page.

As there are no buildings proposed as part of this proposal the BAL Contour map is indicating that within the lot a development can achieve a BAL-29 rating that is acceptable at this stage of planning. The specific detail of the proposed solar power station of where the infrastructure will be located has not been finalised and is not presented in this plan.

5.2.3 Identification of Specific Issues Arising from BAL Contour Map

Onsite Vegetation

Vegetation onsite is within the control of the subject site's landowner and therefore can potentially be removed or modified to lower the bushfire risk, subject to any approval being required by a local government.

As discussed in the BHL section, the some of the onsite vegetation will be retained and will require the associated separation distance to achieve a BAL-29 rating.

Offsite Vegetation

Vegetation offsite is not within the control of the subject site's landowner and therefore the vegetation cannot be removed or modified by the landowner and as a result the assessed BAL's determined by this vegetation are unable to be reduced.

6 Environmental Considerations

“Many bushfire prone areas also have high biodiversity values. SPP 3.7 Policy objective 5.4 recognises the need to consider bushfire risk management measures alongside environmental, biodiversity and conservation values” (‘Guidelines’ s2.3).

“Clearing of native vegetation in Western Australia requires a clearing permit under Part V, Division 2 of the Environmental Protection Act 1986 unless clearing is for an exempt purpose. Exemptions from requiring a clearing permit are contained in Schedule 6 of the Act or are prescribed in the Environmental Protection Regulations” (‘Guidelines’ s2.3).

Existing conservation areas that are potentially affected by the development proposal are required to be identified. This may result in vegetation removal/modification prohibition or limitations. These areas include:

- National Parks;
- Nature Reserves; and
- Bush Forever sites.

Further, the Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act), administered by the Australian Government Department of Environment, provides a national scheme of environment and heritage protection and biodiversity conservation. The objectives of the of the EPBC Act include the protection of the environment with respect to matters of national environmental significance and conservation of Australian biodiversity.

Nationally threatened species and ecological communities are a specific matter of significance. Areas of vegetation can be classified as a Threatened Ecological Community (TEC) under the EPBC Act and consequently have removal restrictions imposed.

6.1 Native Vegetation and Re-vegetation

Protection of Native Vegetation

For the proposed development site, have any existing conservation areas been identified?	Yes
Type of existing conservation area:	Nature Reserve
For the proposed development site, have any areas of native vegetation been identified as species that might result in the classification of the area as a Threatened Ecological Community (TEC)?	No
Potential TEC species identified:	N/A

Comment: There is a small shire nature reserve on the adjacent land to the north of the subject site. The proposed development will not impact on the nature reserve with respect to bushfire.

Minimising Removal of Native Vegetation

Establishing development in bushfire prone areas can adversely affect the retention of native vegetation through clearing associated with the creation of Asset Protection and Hazard Separation Zones. Where loss of vegetation is not acceptable or causes conflict with landscape or environmental objectives, it will be necessary to consider available options to minimise the removal of native vegetation.

Options to Minimise Removal of Native Vegetation	Considered and Implemented in this Proposal
Reduce lot yield	Yes
Cluster development	Yes
Construct building to a higher standard as per BCA and AS 3959-2009	N/A
Modify the development location	Yes

Comment: By retaining several areas of the onsite vegetation the development will be working around these areas and modifying the location of the infrastructure to avoid these areas to a degree.

Impact on Adjoining Land

Does this planning proposal satisfy bushfire protection requirements within the boundaries of the land being developed so as not to impact on the bushfire and environmental management of neighbouring reserves, properties or conservation covenants?	Yes
---	-----

7 Bushfire Risk Management Measures

7.1 The Bushfire Protection Criteria – Assess and Demonstrate Compliance

State Planning Policy 3.7 Planning in Bushfire Prone Areas (Dept. of Planning and WAPC 2015) requires an assessment against the bushfire protection criteria requirements contained in the *Guidelines for Planning in Bushfire Prone Areas (WAPC 2015 s4.5 and Appendix 4)*.

This assessment is to accompany any strategic planning proposal, subdivision application or development application.

Strategic planning proposals need to demonstrate that compliance can be achieved in subsequent planning stages. Subdivision and development applications must demonstrate compliance within the boundary of the subject site or provide justification for those criteria that are not able to be fully met.

The bushfire protection criteria are divided into four elements location, siting and design, vehicular access and water.

For each element, there is:

1. An intent stating the required outcome (overall aim);
2. A performance principle that is a general statement of how best to achieve the intent; and
3. One or more specific criteria to be addressed and for which an acceptable solution is provided as an example of one way of meeting the criteria (and therefore the elements intent).

A proposals compliance with each element is determined by either one or a combination of the following:

1. For each relevant criterion, fully meeting the requirements of the acceptable solution (which automatically achieves the intent for that criteria); and/or
2. For one or more relevant criteria, not fully meeting the requirements of the acceptable solution but achieving the requirements of the performance principle by employing a relatively minor variation on the acceptable solution; and/or
3. For one or more relevant criteria, developing an alternative solution that will achieve the performance principle.

Bushfire Prone Planning presents the required assessment against all the bushfire protection criteria as a separate table for each element and includes the intent, the performance principle and acceptable solution examples, for convenient reference.

Summarised Outcome of the Assessment Against the Bushfire Protection Criteria

Element <i>each element consists of one or more criteria</i>	Complies With the Acceptable Solution for ALL Relevant Criteria <i>or will comply</i>	Achieves the Intent of the Element for ALL Relevant Criteria <i>or will achieve</i>	Required Basis of the Planning Assessment				Notes
			Acceptable Solutions	Performance Principle		As Minor or Unavoidable Development	
				Achieves the Intent of the Element (or will achieve)			
				<i>For one or more criterion, the given acceptable solution is not fully met. A variation of the solution is provided and justified.</i>	<i>An Alternative Solution is Developed</i>		
Location	Will in the Future		✓			N/A	
Siting and Design of Development	Will in the Future		✓				
Vehicular Access	Yes		✓				
Water	Will in the Future		✓				

Bushfire Protection Criteria - Element 1- Location

Intent: To ensure that strategic planning proposals, subdivision and development applications are located in areas with the least possible risk of bushfire to facilitate the protection of people, property and infrastructure.

Performance Principle P1 (to be complied with to meet the intent and used to develop alternative solutions): The intent may be achieved where the strategic planning proposal, subdivision or development application is located in an area where the bushfire hazard assessment is or will, on completion, be moderate or low **OR** a BAL-29 or below applies **AND** the risk can be managed. For minor or unavoidable development in areas where BAL-40 or BAL-FZ applies, demonstrating that the risk can be managed to the satisfaction of DFES and the decision maker.

Acceptable Solution	Further Explanation	Compliance	Assessment Statements
<p>A1.1 Development Location</p> <p>The strategic planning proposal, subdivision and development application is located in an area where the bushfire hazard assessment is or will, on completion, be moderate or low</p> <p>OR</p> <p>The development is subject to BAL-29 or below.</p>	<p>Land is most suitable for land use intensification where hazard levels are low. Where there is an extreme bushfire hazard level or requirements for use of BAL-40 or BAL-FZ construction standards, the land is not considered suitable for development unless it meets the definition of minor or unavoidable development (which requires WAPC, DFES and local planning approval).</p>	<p>Will Fully Comply with the Acceptable Solution</p>	<p>The proposed development is located within a designated bushfire prone area.</p> <p>By implementing the positioning and vegetation management measures identified in this Plan the proposed development can meet the acceptable solution of being subject to BAL-29 or below.</p>

Bushfire Protection Criteria - Element 2 - Siting and Design of Development

Intent: To ensure that the siting and design of development (*note: not building/construction design*) minimises the level of bushfire impact.

Performance Principle P2 (to be complied with to meet the intent and used to develop alternative solutions): The intent may be achieved where the siting and design of the strategic planning proposal, subdivision or development application, including roads, paths and landscaping, is appropriate to the level of bushfire risk that applies to the site. That it minimises the bushfire risk to people, property and infrastructure, including compliance with AS3959 if appropriate.

Acceptable Solution	Further Explanation	Compliance	Assessment Statements
<p>Either or both solutions to be met to the extent that it satisfies Element 1.</p> <p>A2.1 Asset Protection Zone (APZ)</p> <p>Every habitable building is surrounded by, and every proposed lot can achieve, an APZ depicted on submitted plans, which meets the following requirements:</p> <p>Width: Measured from any external wall or supporting post or column of the proposed building, and of sufficient size to ensure the potential radiant heat impact of a bushfire does not exceed 29 kW/m² (BAL-29) in all circumstances.</p> <p>Location: The APZ should be contained solely within the boundaries of the lot on which the building is situated, except in instances where the neighbouring lot/s will be managed in a low-fuel state on an ongoing basis, in perpetuity.</p> <p>Management: The APZ is managed in accordance with the requirements of 'Standards for Asset Protection Zones' ('Guidelines' Appendix 4, Element 2 Schedule 1). Refer to Appendix 4 of this Report/Plan.</p>	<p>The APZ is an area surrounding a building that is managed to reduce the bushfire hazard to an acceptable level by reducing fuel loads (predominantly combustible vegetation).</p> <p>The required width of the APZ varies with the vegetation impacting the site and ground slopes.</p> <p>The APZ is to include a defendable space (minimum 3m width) – an area adjoining the asset in which vegetation is kept to an absolute minimum and free from combustible items and obstructions – to facilitate fire fighting operations.</p> <p>Where the loss of vegetation is not acceptable or causes conflict with landscape and environmental objectives, then the development may need to be modified.</p>	<p>Will Fully Comply with the Acceptable Solution</p>	<p>The proposed development meets the acceptable solution: This is achieved by:</p> <ul style="list-style-type: none"> Incorporating an APZ, to the extent possible within the boundary of the lot, into the landscaping surrounding the proposed development and maintaining it to comply with specified requirements into the future; and The extent of the APZ being established within the boundary of the lot results in the potential radiant heat impact of a fire on the proposed development not exceeding 29kW/m²

Bushfire Protection Criteria - Element 3 - Vehicular Access

Intent: To ensure that the vehicular access serving a subdivision/development is available and safe during a bushfire event.

Performance Principle P3 (to be complied with to meet the intent and used to develop alternative solutions): The intent may be achieved where the internal layout, design and construction of public and private vehicular access and egress in the subdivision /development allow emergency and other vehicles to move through it easily and safely at all times.

Acceptable Solution	Further Explanation	Compliance	Assessment Statements
A3.1 Two access routes Two different vehicular access routes are provided, both of which connect to the public road network, provide safe access and egress to two different destinations and are available to all residents and the public at all times and under all weather conditions.	This is to apply to access routes leading into a subdivision as well as those within a subdivision. All access should accommodate type 3.4 fire appliances (4WD 7t chassis). Two-way access should be provided as a public road, however, where a public road cannot be provided (and this will need to be demonstrated by the proponent providing justification), an emergency access way may be considered.	Fully Complies with the Acceptable Solution	Robartson Road and Bruce Rock – Merredin Road provides safe access and egress to two different destinations. As a sealed public road, it is available to all residents and the public at all times and under all weather conditions.

Bushfire Protection Criteria - Element 3 - Vehicular Access (continued)

Intent: To ensure that the vehicular access serving a subdivision/development is available and safe during a bushfire event.

Performance Principle P3 (to be complied with to meet the intent and used to develop alternative solutions): The intent may be achieved where the internal layout, design and construction of public and private vehicular access and egress in the subdivision /development allow emergency and other vehicles to move through it easily and safely at all times.

Acceptable Solution	Further Explanation	Compliance	Assessment Statements
A3.2 Public Road Minimum trafficable surface of 6m. Constructed to meet the technical requirements stated in Appendix 5.	In special circumstances, where ≤ 8 lots serviced, a minimum 4m trafficable surface for a maximum of 90 might be approved.	Fully Complies with the Acceptable Solution	Robartson Road and Bruce Rock- Merredin Roads are existing public roads.
A3.3 Cul-de-sacs - (includes dead-end roads). A maximum length of 200m with a 17.5m turnaround. 600m length if cul-de-sacs services ≤ 8 lots and is joined to another cul-de-sac by an emergency access way of < 600 m). Constructed to meet the technical requirements stated in Appendix 5.	Should be avoided in bushfire prone areas as they do not provide access/egress in different directions. Where no alternative exists this will need to be demonstrated by the proponent including if the lot layout already exists. Cul-de-sac is to connect to a public road.	N/A	
A3.4 Battle-axe Maximum length 600m, minimum width 6m, passing bays @ 200m, turnaround area @ 500m and at house site. Constructed to a minimum of private driveway standards. Constructed to meet the technical requirements stated in Appendix 5.	Should be avoided in bushfire prone areas If no alternative exists this will need to be demonstrated by the proponent.	N/A	

Bushfire Protection Criteria - Element 3 - Vehicular Access (continued)

Acceptable Solutions	Further Explanation	Compliance	Assessment Statements
A3.5 Private Driveways Are required where a house is >50m from a public road. Passing bays @ 200m, turnaround area @ 500m and within 50m of house. Bridges/culverts to support 15t. All weather surface. Constructed to meet the technical requirements stated in Appendix 5.		Will Fully Comply with the Acceptable Solution	The private driveway/access roads will be designed and constructed to comply with the minimum technical requirements of the Guidelines.
A3.6 Emergency Access Way Provided as a right of way or public access easement in gross (maximum length of 600m) to ensure accessibility to the public and fire services in emergencies. It should comply with minimum standards for a public road and be signposted. Constructed to meet the technical requirements stated in Appendix 5.	An access way that does not provide through access to a public road is to be avoided in bushfire prone areas. Where no alternative exists this will need to be demonstrated by the proponent. It is to be provided as an alternative link to a public road during emergencies.	N/A	
A3.7 Fire Service Access Routes - (perimeter roads) Provided as rights of way or public access easements in gross; all weather surface and allow for two-way traffic; dead-end roads not permitted; turnarounds every 500m; less than 600m to a public road and be signposted. Constructed to meet the technical requirements stated in Appendix 5.	Fire service access routes should be established to separate bushfire prone areas from developed areas and to provide access within and around the edge of the subdivisions and related development. To be used during bushfire suppression operations and prevention work.	N/A	
A3.8 Firebreak Width Lots greater than 0.5 hectares must have an internal perimeter firebreak of a minimum width of three metres or to the level prescribed in the local firebreak notice issued by the local government.		Will Fully Comply with the Acceptable Solution	The proposed lots will comply with the requirements of the local government annual firebreak notice issued under s33 of the Bush Fires Act 1954.

Bushfire Protection Criteria - Element 4 – Water

Intent: To ensure water is available to the subdivision, development or land use to enable people, property and infrastructure to be defended from bushfire.

Performance Principal P4 (to be complied with to meet the intent and used to develop alternative solutions): The intent may be achieved where the subdivision, development or land use is provided with a permanent and secure supply that is sufficient for firefighting purposes.

Acceptable Solution	Further Explanation	Compliance	Assessment Statements
A4.1 Reticulated Areas The subdivision, development or land use is provided with a reticulated water supply, in accordance with the specifications of the relevant water supply authority and DFES. Constructed to meet the technical requirements stated in Appendix 6.	The Water Corporations 'No 63 Water Reticulation Standard' is deemed to be the baseline criterion for developments and should be applied unless local water supply authorities' conditions apply. Additionally, any local government variation must be met (s8.4).	N/A	A reticulated water supply is not currently available to the site.
A4.2 Non-Reticulated Areas Water tanks for firefighting purposes with a hydrant or standpipe are provided. Minimum of 50,000l/tank; minimum 1 tank/25 lots (or part thereof); house ≤2km from a tank; 20min turnaround time for 2.4 appliance; hardstand area suitable for 3.4 appliance within 3m of tank Must meet the technical requirements stated in Appendix 6. Any local government variation must also be met (s8.4).	The specification of the requirements for the proposal being assessed will be set by the water supply authority and DFES. A procedure must be in place to ensure that water tanks are maintained at or above the designated capacity at all times, including home tanks on single lots. This could be in the form of an agreement with the local government and the fire service. Water tanks and associated facilities are vested in the relevant local government	Will Fully Comply with the Acceptable Solution	Due to the nature of the development it is recommended that 2 x 50,000 litre water tanks for firefighting purposes will be provided to comply with the technical requirements including approved fittings, hardstand and turnaround area suitable for a 3.4 fire appliance.
A4.3 Non-reticulated Areas (Individual Lots) Single lots above 500 m ² need a dedicated static water supply on the lot that has the effective capacity of 10,000 litres. Must meet the technical requirements stated in Appendix 6.	A4.3 is only for use if creating one additional lot and cannot be applied cumulatively.	N/A	

7.2 Location of Buildings and Applicable BAL's

Future buildings on the proposed lots are to be located in areas where an appropriate Bushfire Attack Level rating can be achieved and where minimal removal of valuable existing native vegetation is required to achieve this rating. The intent is to have the subject land of this Proposal located in an area where the bushfire hazard level is, or will on completion, be moderate or low or be subject to a maximum Bushfire Attack Level of BAL-29.

The proposed subdivision is unlikely to be approved if the indicative BAL rating for future buildings on any proposed lots is either BAL-40 or BAL-FZ as it is unacceptable on planning grounds. The exception will be if it meets the definition of unavoidable development ('Guidelines' s5.4 and s5.7). If this applies the appropriate additional assessment and input from the relevant authorities, if required, is included in this Plan.

The proposed location of the development within the lots will result in it being subject to BAL-29. As such it is located appropriately but the required separation distances from the classified vegetation will need to be maintained. These distances are stated in the next section of this Plan, Section 7.3 'Vegetation Management'.

The future planning stages will be able to locate the solar power infrastructure to allow the development to be within BAL-29 areas.

7.3 Vegetation Management

Ongoing Maintenance of Assessed Vegetation

1. Where any existing or planned, re-vegetation has been assessed as “low threat” (meeting AS 3959-2009 Section 2.2.3.2 requirements) and excluded from classification then this area will be managed to continue to meet those requirements (refer to Appendix 3) and enable the buildings to retain their determined BAL ratings;
2. Any classified vegetation onsite (i.e. within a subject lot) that has directly contributed to the determined BAL rating for a given building, will be managed such as to not change that vegetation to a higher risk classification; and
3. Where a local government issues an annual firebreak notice under s33 of the Bush Fires Act 1954, this will be complied with.

Bushfire Protection Zones

The *Guidelines for Planning in Bushfire Prone Areas (WAPC 2015)* set out the requirements to create an Asset Protection Zone (APZ) and a Hazard Separation Zone (HSZ). The aim of these bushfire protection zones is to have a fire of diminishing intensity and flame length as it approaches development. These reduced fuel loads will reduce the intensity of radiant heat onto the buildings, thereby increasing their survivability. This will also be important for firefighter and occupant's safety during fire suppression activities.

Asset Protection Zone (APZ) – This is to be established, within a subject lot's boundary such that a building will not be subject to a BAL rating greater than BAL-29. On a lot size where it is possible to achieve, it is to be a minimum width of 20 metres and increased when directed to the width required such that a building will not be subject to a BAL rating greater than BAL-29.

The APZ must be maintained as either a non-vegetated area or as low threat vegetation managed in a minimal fuel condition as per AS 3959-2009 s2.2.3.2 (e) and (f). A minimal fuel condition is stated in the standard as meaning “there is insufficient fuel available to significantly increase the severity of the bushfire attack” and being “recognisable as short cropped grass for example to a nominal height of 100mm.”

Hazard Separation Zone (HSZ) - Where the lot size permits, a Hazard Separation Zone (HSZ) should also be established.

Refer to Appendix 3 and Appendix 4 for specific technical requirements.

Establishing the APZ

An Asset Protection Zone (APZ) creating a low fuel area will be required to be incorporated into the landscaping and infrastructure of the development.

Minimum Vegetation Separation Distances

To retain the stated BAL rating of BAL-29 the separation distances from the classified vegetation to the proposed development will need to be maintained to at least the minimum distances shown in Table 7.3.1.

This minimum separation distance from any classified vegetation, that corresponds to the proposed building's assessed BAL will be maintained as either a non-vegetated area or as low threat vegetation managed in a minimal fuel condition as per AS 3959-2009 s2.2.3.2 (e) and (f). A minimal fuel condition is stated in the standard as meaning "there is insufficient fuel available to significantly increase the severity of the bushfire attack" and being "recognisable as short cropped grass for example to a nominal height of 100mm." Refer to Appendix 4 of this Plan for further detail.

It is also recognised that the local government issues an annual firebreak notice under s33 of the Bush Fires Act 1954 and this will be complied with.

Table 7.3.1: Ongoing maintenance of the separation area from any future building works to the classified vegetation (refer to Figure 5.1 for vegetation area details)

Achievable (Indicative) Bushfire Attack Levels for the Proposed Lots						
Relevant Fire Danger Index (AS3959-2009 Table 2.1)						80
BAL Determination Method			Method 1 as per AS 3959-2009 s2.2.6 and Table 2.4.3. Refer to Appendix 2 this Plan			
Vegetation Area	Applied Vegetation Classification	Effective Slope Under the Classified Vegetation (degrees)	Achievable BAL's			
			BAL-29	BAL-19	BAL-12.5	BAL-LOW
Identified by stating the separation distance (in metres) to classified vegetation that is required to achieve the corresponding BAL rating. (Refer below Table for further explanation)						
1	Class B Woodland	0-5	17-<25	25-<35	35-<100	Not Achievable
2	Class B Woodland	0-5	17-<25	25-<35	35-<100	Not Achievable
3	Class B Woodland	0-5	17-<25	25-<35	35-<100	Not Achievable
4	Class D Scrub	0-5	15-<22	22-<31	31-<100	Not Achievable
5	Class B Woodland	0-5	17-<25	25-<35	35-<100	Not Achievable
6	Class B Woodland	0-5	17-<25	25-<35	35-<100	Not Achievable
7	Class B Woodland	0-5	17-<25	25-<35	35-<100	Not Achievable
8	Class C Shrubland	0-5	10-<15	15-<22	22- <100	Not Achievable
9	Class B Woodland	0-5	17-<25	25-<35	35-<100	Not Achievable
10	Class G Grassland	0-5	9-<14	14-<20	20-<50	Not Achievable
11	Class G Grassland	0-5	9-<14	14-<20	20-<50	Not Achievable
12	Class G Grassland	0-5	9-<14	14-<20	20-<50	Not Achievable
13	Class G Grassland	0-5	9-<14	14-<20	20-<50	Not Achievable
14	Class G Grassland	0-5	9-<14	14-<20	20-<50	Not Achievable
15	Class G Grassland	0-5	9-<14	14-<20	20-<50	Not Achievable
16	Class C Shrubland	0-5	10-<15	15-<22	22- <100	Not Achievable

17	Class G Grassland	0-5	9-<14	14-<20	20-<50	Not Achievable
18	Class B Woodland	0-5	17-<25	25-<35	35-<100	Not Achievable
19	Class B Woodland	0-5	17-<25	25-<35	35-<100	Not Achievable
20	Class B Woodland	0-5	17-<25	25-<35	35-<100	Not Achievable

7.4 Vehicular Access – Element 3 of the Bushfire Protection Criteria

The intent of the 'Vehicular Access' element of the bushfire protection criteria is "to ensure that the vehicular access/egress servicing a subdivision/development is available and safe during a bushfire event". The performance principle to be met is that "The internal layout, design and construction of public and private roads must allow emergency and other vehicles to move through the subdivision/development easily and safely at all times".

The required outcome is that in the event of a bushfire, personal safety must be able to be maintained when travelling on the access/egress route.

How this Proposal complies with the acceptable solutions for the vehicular access criterion and is stated in Section 7.1 'The Bushfire Protection Criteria – Assess and Demonstrate Compliance'. If additional information is required to further demonstrate compliance and/or present alternative solutions, this is presented below in this Section 7.4 'Vehicular Access'.

Vehicular Access - Acceptable Solution A3.1 - Two Access Routes

Robartson Road and Bruce Rock – Merredin Road provides safe access and egress to two different destinations. As a sealed public road, it is available to all residents and the public at all times and under all weather conditions.

The private driveway/access roads will be designed constructed to comply with the minimum technical requirements of the Guidelines including clearance, trafficable width and turn around areas suitable for a 3.4 fire appliance.

7.5 Firefighting Water Supply

The intent is to ensure water is available to the subdivision, development or land use to enable people, property and infrastructure to be defended from bushfire. This intent may be achieved where the subdivision, development or land use is provided with a permanent and secure supply that is sufficient for firefighting purposes.

Due to the nature of the development it is recommended that 2 x 50,000 litre water tanks for firefighting purposes will be provided to comply with the technical requirements including approved fittings, hardstand and turnaround area suitable for a 3.4 fire appliance.

7.6 Building Construction Standards

7.6.1 Future Habitable Buildings on the Subject Site

Building Classes 1, 2, 3 and 10a

The Building Code of Australia (BCA) contains bushfire construction requirements that are applied to residential buildings of Class 1, 2 or 3 and associated Class 10a buildings and decks. These are required by the BCA to be constructed to reduce the risk of ignition from a bushfire at a level that corresponds to the potential risk for a given situation (determined as a BAL rating). The BCA references *AS3959-2009 Construction of buildings in bushfire prone areas* or the *(NASH) Standard – Steel Framed Construction in Bushfire Prone Areas* (for Class 1a and 1b buildings only) as deemed to satisfy solutions that provide one way of complying with the Building Code's bushfire performance requirements.

(Note: Higher construction standards can be applied by a local government or as a part of an alternative solution that might be presented in this Plan to enable compliance with the Bushfire Protection Criteria).

Building Classes 4 - 9

The BCA bushfire performance requirements do not apply to Class 4 – Class 9 buildings unless imposed by the relevant local government (or voluntarily adopted).

However, determining the BAL ratings of proposed Class 4-9 buildings allows for them to be:

- Sited appropriately and have classified vegetation removed and /or managed such that their exposure to flames, radiant heat and embers is as low as is practically possible.
- Constructed to the standard corresponding to the BAL rating if the developer, owner or local government deem it is prudent and necessary.

This proposal is for a solar power station that under the Building Code of Australia is not required to be constructed to comply with AS3959-2009.

8 Specific Land Uses

State Planning Policy 3.7 Planning in Bushfire Prone Areas (Department of Planning and WAPC 2015) sets out in policy measure 6.6 what is required for ‘vulnerable’ or ‘high risk’ land uses to be supported in bushfire prone areas subject to BAL-12.5 or higher.

8.1 High Risk Land Use – Definition / Application / Requirements

Is this Bushfire Management Plan (BMP) to accompany a development application for building work associated with a land use that is considered a ‘high risk’ land use?	Yes
Is a Risk Management Plan for flammable on-site hazards to be provided as a separate document and be considered as forming a part of this Bushfire Management Plan?	No
Is the required content of the Risk Management Plan for flammable on-site hazards to be provided as an addition to the proponents existing emergency planning?	No

Information reference: SPP 3.7 *Planning in Bushfire Prone Areas* (Dept. of Planning and WAPC 2015 s6.6 and s7) and the *Guidelines for Planning in Bushfire Prone Areas* (WAPC 2015 s 5.6).

Definition and Application

SPP 3.7 defines high risk land use as a land use which may lead to the potential ignition, prolonged duration and/or increased intensity of a bushfire. Such uses may also expose the community, firefighters and the surrounding environment to dangerous, uncontrolled substances during a bushfire event. The ‘Guidelines’ provide examples of such uses including (but not limited to) service stations, landfill sites, bulk storage of hazardous materials, fuel depots and certain heavy industries as well as military bases, power generating land uses, saw-mills, highways and railways.

Required Information

1. In areas where BAL-12.5 to BAL-29 applies that a subdivision or a development application will not be supported unless it is accompanied by a Bushfire Management Plan (BMP) jointly endorsed by the relevant local government and the State authority for emergency services;
2. The BMP is to include an assessment against the bushfire protection criteria requirements demonstrating compliance within the boundary of the development site.
3. Development applications should include a Risk Management Plan for any flammable on-site hazards. This may include establishing an appropriate Asset Protection Zone (APZ) or Hazard Separation Zone (HSZ). It may determine that a reduction in on-site flammable material or appropriate storage of such material, would be required to reduce the threat, among other considerations.; and
4. Where BAL-40 or BAL-FZ applies, applications will not be supported unless they meet the definition of ‘minor’ or ‘unavoidable’ development.

As this development application is for a solar power generating land use it would be classified as a high risk. At a later planning stage, further information will be required to be compiled to include an overall risk management plan with specific identification of bushfire hazards and the mitigation measures to reduce the bushfire risk.

The overall risk management plan will need to incorporate an evacuation plan for occupants of the site. At this stage of planning there is not enough information for the Bushfire Evacuation Plan to be completed.

9 Compliance Statements - of the Proposal and this Plan

This section of the Plan makes statements with respect to the Proposal's compliance against the components of the WA framework for bushfire risk management. It also states how the content of this BMP satisfies the requirements of SPP 3.7.

The key components of the WA framework for bushfire risk management are summarised in Appendix 1.

9.1 State Planning Policy No. 3.7: Planning in Bushfire Prone Areas

SPP 3.7 Policy Objectives - Proposal Compliance Statement		The Proposal Meets Objectives
s5.1	Avoid any increase in the threat of bushfire to people property and infrastructure	Yes
Implementation of the bushfire risk management measures as set out in this Plan, including meeting the requirements of the bushfire protection criteria; will avoid any increase in the threat of bushfire.		
s5.2	Identify and consider bushfire risks in decision-making at all stages of the planning and development process (to reduce vulnerability to bushfire).	Yes
The bushfire risks have been identified and assessed, as relevant for the stage of this planning submission, using the tools prescribed in <i>SPP 3.7</i> (and the associated document <i>Guidelines for Planning in Bushfire Prone Areas WAPC 2015</i>). Refer to Section 5 'Assessment of Bushfire Risk'.		
s5.3	Ensure that all stages of planning submissions take into account bushfire protection requirements and include specified bushfire protection methods.	Yes
The bushfire protection requirements and any specified protection methods, relevant for the stage of this planning submission, have been taken into account and presented in Section 7 'Bushfire Risk Management Measures'.		
s5.4	Achieve an appropriate balance between bushfire risk management measures; biodiversity conservation values; environmental protection and biodiversity management; and landscape amenity, with consideration of climate change.	Yes
The components of this objective have been considered along with the requirements set out in the 'Guidelines' s2.3. Identifying and addressing issues relevant for the stage of this planning submission is presented in this Plan in Section 6 'Environmental Considerations'.		

SPP 3.7 Policy Measures – BMP Compliance Statement		This BMP is Compliant
s6.1	Higher order strategic planning documents in bushfire prone areas	N/A
s6.2	Strategic planning proposals, subdivision and development applications	Yes
Plans relating to land that has or will have a BHL above low and/or where a BAL rating above BAL-Low apply, are to comply with these policy measures. If the proposal has or will on completion have a moderate BHL and/or where BAL-12.5 to BAL-29 applies, it may be considered for approval when the required information is provided and it can be undertaken in accordance with policy measures 6.3, 6.4 or 6.5.		
s6.3	Information to accompany strategic planning proposals	N/A
s6.4	Information to accompany subdivision applications	N/A
s6.5	Information to accompany development applications	Yes
The requirements stated in SPP 3.7 s6.5 include provision of a BAL contour map (or BAL assessment), identify issues arising from the contour map (or BAL assessment) and an assessment against the bushfire protection criteria. Refer to Section 5 of this Plan.		
s6.6	Vulnerable or high risk land uses (subdivision and development applications).	Yes
Development applications should include an emergency evacuation plan for proposed occupants and/or a risk management plan for any flammable on-site hazards (presented as a separate document). In areas where BAL-40 or BAL-FZ applies, development applications will additionally require statements against the items of SPP 3.7 s6.7.1 and s6.7.2 (included in Section 7 of this Plan).		

SPP 3.7 Policy Measures – BMP Compliance Statement		This BMP is Compliant
s6.7	Strategic planning proposals, subdivision or development applications in areas where an extreme BHL and/or BAL-40 or BAL-FZ applies	N/A
<p>These will not be supported unless the proposal is considered to be</p> <ul style="list-style-type: none"> Minor development (for specific development applications only, refer to s5.2 5.3) and requiring statements against the items of SPP 3.7 s6.71 (included in Section 7 of this Plan); or Unavoidable development and requiring statements against the items of SPP 3.7 s6.72 (included in Section 7 of this Plan). 		
s6.8	Advice of State/relevant authority/s for emergency services to be sought	Yes
<p>For all stages of planning proposals, advice from relevant authorities has been sought, considered and is referenced in Section 7 of this Plan where:</p> <ul style="list-style-type: none"> compliance with SPP 3.7 policy measures is unlikely to be achieved; additional/alternative measures are proposed; and/or this application contains unavoidable development or vulnerable or high-risk land uses 		
s6.9	Advice of State/relevant agencies/authorities for environmental protection to be sought	N/A
<p>For all stages of planning proposals, advice from relevant authorities has been sought, considered and is referenced in Section 7 of this Plan where:</p> <ul style="list-style-type: none"> The clearing of vegetation within protected environmentally sensitive areas is proposed Substantial clearing of native vegetation is proposed Development abuts land managed by a State or Federal authority 		
s6.10	Bushfire conditions may be imposed by the decision maker (detailed requirements including modifications and/or conditions)	Yes
<p>WAPC and/or the local government may, as a condition of approval, require that a notification be placed on certificates of title and notice of the notification on the deposited plan advising that the lots are in a designated bushfire prone area and subject to a Bushfire Management Plan. This is noted in Section 10 'Responsibilities for Implementation and Maintenance'.</p>		

9.2 Guidelines for Planning in Bushfire Prone Areas (WAPC 2015 as amended)

The 'Guidelines' are designed to assist in the interpretation of SPP3.7's objectives and policy measures. As such they have been referenced and complied with in compiling this Bushfire Management Plan which is to accompany the planning submission. This Plan contains, as a minimum, the information required as per the 'Guidelines' checklist.

9.3 Bushfire Protection Criteria (WAPC 2015 'Guidelines')

The proposed land use has been assessed against the bushfire protection criteria. The assessment of the bushfire risk management measures (i.e. those relevant to each element) and the demonstration of how the proposal meets the criteria are presented in Section 7.1 of this Plan - 'Bushfire Protection Criteria - Assess and Demonstrate Compliance'.

Where the proposal has not been able to fully meet an acceptable solution for a given element or an alternative solution is proposed, then the appropriate sub section of Section 7 'Bushfire Risk Management Measures', demonstrates how the Proposal will comply with the performance principle and the intent of that element. Any required advice and recommendations from DFES and other referral authorities will be included.

9.4 Local Variations to Bushfire Protection Criteria

Are there any endorsed local variations to the bushfire protection criteria (e.g. through a local planning policy) that are to apply to the proposed land use and therefore addressed in Section 7 'Bushfire Risk Management Measures' of this Plan?	No
Does the proposal satisfy the local variations to the bushfire protection criteria?	N/A

9.5 WA Building Act 2011

Relevant regulations associated with the Act are the *Building Regulations 2012* and the *Building Amendment Regulations (No 3) 2015*. The legislation adopts the Building Code of Australia as the minimum technical requirement for the design and construction of buildings and certain other structures in WA and prescribes applicable building standards for certain classes of buildings located in areas designated by the Fire and Emergency Services Commissioner as bushfire prone areas (identified on the Map of Bushfire Prone Areas).

Is this land use proposal at a planning stage at which lot layout is known and construction of buildings (any class) is being proposed?	No
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If the response is 'No', then this Proposal is at a planning stage where specific compliance with the Building Act 2011 is not required – rather it will apply at future planning stages. However, if a BAL Contour Map and/or BAL assessment has been provided as part of this Plan, they can apply and may be able to be used for any future planning application (at the applicable planning stage involving construction of buildings).

If the response is 'Yes', then one of the situations below will apply to this proposal.

The Nature of this Land Use Proposal	Applicable
A proposal for a single house or ancillary dwelling (Class 1); or a specified building located in a bushfire prone area on a lot less than 1100m ² or on a lot equal to or greater than 1100m ² but subject to a BAL of BAL-29 or less, does not need to lodge a development application (but will require a building permit application). However, the relevant local government can additionally require that a development application is submitted for planning approval. Bushfire construction requirements will apply in both cases.	-
A proposal for a single house or ancillary dwelling (i.e. Class 1); or a specified building located in a bushfire prone area on a lot equal to or greater than 1100m ² but subject to BAL-40 or BAL-FZ must lodge a development application and bushfire construction requirements will apply.	-
A proposal, regardless of lot size, for a habitable building other than a single house or ancillary dwelling (i.e. Class 2 or 3 residential or accommodation buildings); or a specified building, located in a bushfire prone area, must lodge a development application and bushfire construction requirements will apply.	-
A proposal, regardless of lot size, for mixed use, commercial, industrial buildings or public facilities (i.e. Class 4-9 buildings), located in a bushfire prone area, and must lodge a development application. Bushfire construction requirements will not apply (unless the local government additionally requires them to apply).	-

This Proposal is for a planning stage that does not yet require compliance with the *WA Building Act 2011*. However, the obligation for future buildings to be constructed to the standard corresponding to the determined bushfire attack levels is noted in Section 10 of this Plan 'Responsibilities for Implementation and Maintenance'.

9.6 AS 3959 Construction of Buildings in Bushfire Prone Areas (2009 as amended)

This Proposal complies with the methodology set out in AS 3959 to classify vegetation that is a bushfire threat and to calculate the bushfire attack levels presented as a BAL Contour Map and/or a BAL assessment in Section 5 of this Plan 'Assessment of Bushfire Risk'.

For the construction of any Class 1, 2, 3 buildings and associated Class 10a buildings and decks, this land use proposal will comply with the construction requirements, set out in AS 3959, that correspond to the determined bushfire attack level/s for the subject site. This obligation is stated in Section 9 of this Plan 'Responsibilities for Implementation and Maintenance'.

9.7 Local Government Firebreak Notice

This Proposal complies with the requirements of the relevant local government notice by stating the landowner's obligations in Section 10 of this Plan 'Responsibilities for Implementation and Maintenance.' Additionally, the obligation is noted in Section 7.3 'Vegetation Management'.

10 Responsibilities for Implementation & Maintenance

This section sets out the responsibilities of landowners/proponents (including future landowners), builders and local government in relation to the implementation and maintenance of the requirements of SPP 3.7 and the 'Guidelines'.

10.1 Landowner / Proponent Responsibilities (and those acting on their behalf)

Implementation

- Ensure anyone listed as having responsibility under the Plan has endorsed it and is provided with a copy for their information. This includes the landowners/proponents, local government and any other authorities or referral agencies ('Guidelines' s4.6.3).
- Construction of private driveways must comply with the standards (Appendix 5 'Vehicular Access').
- For a non-reticulated water supply, ensure that the emergency water supply structure for firefighting purposes (tanks, couplings and access) is constructed to comply with the standards (s7.5 'Fire Fighting Water Supply' and Appendix 6 'Water') or to the standard set out by the relevant local government.
- A procedure must be in place to ensure that the emergency water supply tanks are maintained at or above designated capacity, including home tanks on single lots, at all times ('Guidelines Appendix 4 'Bushfire Protection Criteria').
- Implement the low fuel Asset Protection Zone (APZ)) as per s7.3 'Vegetation Management' and Appendix 4 'APZ'.
- WAPC requires that an approved detailed plan demonstrating the location and capacity of fire emergency infrastructure be prepared and implemented. This is noted in Section 9 'Responsibilities for Implementation and Maintenance'.
- Ensure all future buildings the landowner/proponent has responsibility for, are designed and constructed in full compliance with the requirements of the WA Building Act 2011 and the referenced Building Code of Australia (BCA), and with any identified additional requirements of the relevant local government. This should include due consideration of constructing any Class 4-9 buildings to the standard corresponding to their determined BAL even though not required by the BCA.

For any Class 1, 2, or 3 buildings and associated Class 10a buildings or decks this will include compliance with AS 3959-2009 *Construction of Buildings in Bushfire Prone Areas* (2009 as amended) and/or the National Association of Steel Housing – (NASH) *Standard – Steel Framed Construction in Bushfire Prone Areas*, whereby construction standards corresponding to the assessed BAL will be applied (Appendix 2 ‘Bushfire Risk Assessment – Methodology Explained’).

- Provide a risk management plan for the site with particular reference to bushfires.

Deposited Plan and Certificate of Title – Potential Obligation

The local government may condition a development application approval with a requirement for the landowner/proponent to register a notification onto the certificate of title (and may need to be included on the deposited plan). This will be done pursuant to Section 70A Transfer of Land Act 1893 as amended (‘Factors affecting use and enjoyment of land, notification on title:’). This is to give notice of the bushfire hazard and any restrictions and/or protective measures required to be maintained at the owner’s cost.

This condition ensures that:

1. Landowners/proponents are aware their lot is in a designated bushfire prone area and of their obligations to apply the stated bushfire risk management measures; and
2. Ensures that potential purchasers are alerted to the Bushfire Management Plan so that future landowners/proponents can continue to apply the bushfire risk management measures that have been established in the Plan.

Maintaining Compliance

- Current and future landowners/proponents must continue to apply the bushfire management measures set out in this Plan. They must inform any builders (of future structures on a Lot) of the existence of the Plan and the responsibilities it contains.
- The landowner/proponent is responsible for the ongoing review and implementation of the Bushfire Management Plan to ensure that the bushfire risk management measures remain effective. Bushfire plans do not expire and should be seen as a ‘living document’. They may require updating in certain circumstances, including (but not limited to) if site conditions change, if further details are required at subsequent stages of the planning process or to reflect new technologies or methodologies in best practice bushfire risk management (‘Guidelines’ s4.6.4 and s4.6.5).
- Respond to and comply with fire protection or hazard management notices issued by the local government. This includes compliance with the Shire of Merredin Annual Firebreak Notice (the

current requirements can be found on the Shire of Merredin website), issued under s33 of the Bush Fires Act 1954 as directed by the 'Guidelines' s6.1 and referenced in this Plan s7.3 'Vegetation Management', s9.7 'Local Government Firebreak Notice' and Appendix 4 'APZ'.

- Maintain the low fuel Asset Protection Zone (APZ) within the Lot boundary as per s7.2 'Vegetation Management' and Appendix 4 'APZ'.
- The stated minimum separation distance (refer to s7.3 Table 7.3.1) from any classified vegetation, that corresponds to a particular lot's assessed BAL, must be maintained as either a non-vegetated area or as low threat vegetation managed in a minimal fuel condition as per AS 3959-2009 s2.2.3.2 (e) and (f). A minimal fuel condition is stated in the standard as meaning "there is insufficient fuel available to significantly increase the severity of the bushfire attack" and being "recognisable as short cropped grass for example to a nominal height of 100mm." Refer to Appendix 3 of this Plan for further detail.
- Where any existing or planned re-vegetation has been assessed as "low threat" (meeting AS 3959-2009 Section 2.2.3.2 requirements) and excluded from classification then this area will be managed to continue to meet those requirements and enable the buildings to retain their determined BAL ratings.
- Any classified vegetation that has directly contributed to the determined BAL rating for a given Lot or building, must be managed such as to not change that vegetation to a higher risk classification.
- For the emergency water supply tank/s that have been installed to service the development, be aware of the arrangement that is in place regarding who has the responsibility for maintaining the emergency water supply tank at or above designated capacity at all times. Check that this is being complied with (refer to s7.5 'Fire Fighting Water Supplies' and Appendix 6 'Water').

10.2 Builder Responsibilities

The builder (generally named on the building permit) is responsible for ensuring that the building or incidental structure to which a building permit applies is, on completion, compliant with the Building Code of Australia (BCA).

For Classes 1a, 1b, 2, 3 and associated 10a buildings or decks located in a designated bushfire prone area, compliance with the BCA requires that these buildings are constructed to the requirements corresponding to their bushfire attack level rating.

The construction standards for Class 1a and 1b buildings are contained in:

- *AS 3959 - 2009 Construction of buildings in bushfire prone areas; or*

- National Association of Steel Housing – (NASH) *Standard – Steel Framed Construction in Bushfire Prone Areas*.

The construction standards for Classes 2, 3 and associated 10a buildings or decks are contained in:

- *AS 3959 - 2009 Construction of buildings in bushfire prone areas*.

The building/s must also comply with any additional local government requirements.

For any Class 4-9 buildings the builder must comply with any construction requirements that are additional to those contained in the BCA. Of particular issue is any requirement, made by the relevant local government or the owner, to construct to the standard corresponding to the determined BAL for proposed buildings.

10.3 Local Government Responsibilities

Implementation

- Provide advice where the clearing of locally significant vegetation is proposed.
- Register this Bushfire Management Plan and keep a record of the sites referred to for the purpose of identify servicing and infrastructure gaps. ('Guidelines' s4.6.4).

Maintaining Compliance

- Develop and maintain district bushfire fighting services and facilities.
- Monitor landowner compliance with the annual firebreak notice issued under s33 of the Bush Fires Act 1954.

11 Appendices – Advisory Information Only

Appendix 1 The WA Framework for Bushfire Risk Management

This section of the Bushfire Management Plan sets out the applicable legislation, regulations, policies, guidelines, documents, and associated bushfire risk assessments that a Bushfire Management Plan will need to reference and where applicable, comply with. Statements of compliance against these requirements, as required by the 'Guidelines', are presented in Section 8 of this Plan.

The state government of WA has committed to addressing bushfire through the implementation of a risk-based system of land-use planning and development that aims to reduce the risk of bushfire. The legislative means of facilitating this is through the **Planning and Development Act 2005** and its interaction with the **Fire and Emergency Services Act 1998** and the **Building Act 2011**.

Planning and Development (Local Planning Schemes) Amendment Regulations 2015

These regulations are given effect under the **Planning and Development Act 2005**. The *Planning and Development (Local Planning Schemes) Regulations 2015* are amended to introduce 'Schedule 2 Part 10A 'Bushfire Risk Management' which establishes the *deemed provisions relating to bushfire risk management*.

"The deemed provisions relating to bushfire risk management work with the State Planning Policy 3.7: Planning in Bushfire Prone Areas (SPP 3.7) and Guidelines for Planning in Bushfire Prone Areas (Guidelines); Map of Bushfire Prone Areas; Building Regulations 2012 and Building Code of Australia to guide planning and development proposals in bushfire prone areas to ensure bushfire risk is properly managed.

The deemed provisions provide a mechanism to require a development approval, and through this the application of SPP 3.7 and the Guidelines, to development on sites where BAL-40 or BAL-Flame Zone (FZ) applies. SPP 3.7 sets out the planning hierarchy and the information required at each stage of the planning process whilst the Guidelines provide information on how SPP 3.7 should be implemented" (source: WAPC Planning Bulletin 111/2015 Planning in Bushfire Prone Areas).

The **deemed bushfire provisions**:

- Only apply to development that is proposed on a site in a designated bushfire prone area.
- Override any existing local planning scheme provisions relating to bushfire, including any inconsistent provisions, apart from special control areas.
- Are in addition to any provisions relating to development in a bushfire prone area that apply to a special control area.

- Can be supplemented by a local planning scheme (by implementing a special control area) but not varied or exempted.
- Are applied and work through the following legislation, regulations, policies, guidelines, and documents – each of which this Bushfire Management Plan will address.

Map of Bushfire Prone Areas

The Map of Bushfire Prone Areas identifies land that has been designated as being bushfire prone by the Fire and Emergency Services Commissioner under the *Fire and Emergency Services (Bushfire Prone Areas) Order 2015* as part of the ***Fire and Emergency Services Act 1998***.

Designation as a bushfire prone area (highlighted as pink on the map) reflects the potential of bushfire to affect that site. It acts as a mechanism for initiating further assessment in the planning and building process. This can involve bushfire risk assessment and management measures being required in planning submissions and activation of the bushfire construction requirements of the Building Code of Australia.

State Planning Policy No. 3.7: Planning in Bushfire Prone Areas (SPP 3.7)

This policy is made under the ***Planning and Development Act 2005*** and provides the foundation for land use planning to address bushfire risk management in Western Australia.

SPP 3.7 applies to every stage of the planning process (i.e. all higher order strategic planning documents; strategic planning proposals; subdivision and development applications) in designated bushfire prone areas. It also applies to an area not yet designated as bushfire prone but is proposed to be developed in a way that introduces a bushfire hazard (*Guidelines for Planning in Bushfire Prone Areas WAPC 2015 s3.2.2*).

The objectives of this policy are to:

- Ensure that all stages of land use planning (higher order strategic planning documents; strategic planning proposals; subdivision and development applications) identify and consider bushfire risk and apply specified bushfire protection measures; and
- To have an outcome that will avoid any increase in the threat of bushfire to people, property and infrastructure, preserve life and achieve an appropriate balance between bushfire risk management measures and all environmental conservation aspects.

Policy measures to achieve the objectives are defined and:

- They vary according to the type and scale of the planning proposal and stage of the development process;
- They set out the information to be prepared for each type of proposal; and

- They refer to the *Guidelines for Planning in Bushfire Prone Areas (WAPC 2015)* as supporting this policy and providing the procedural detail for assessment and presentation of the required information.

Guidelines for Planning in Bushfire Prone Areas (WAPC 2015 as amended)

These Guidelines are designed to supplement and assist in the interpretation of SPP3.7's objectives and policy measures. They provide advice on how bushfire risk is to be addressed when planning, designing or assessing a planning proposal.

As an endorsed standard (by the Office of Bushfire Risk Management), these Guidelines, in conjunction with SPP 3.7, are the predominant documents in the State for use by decision making authorities and referral agencies, during the consideration of strategic planning proposals, subdivisions and development applications.

The Guidelines set out the interrelationships between, and requirements for, various assessment tools used to assess risk in the planning context, as prescribed by SPP 3.7. These include:

- A Bushfire Hazard Level assessment;
- A Bushfire Attack Level (BAL) Contour Map;
- A Bushfire Attack Level (BAL) assessment;
- The Bushfire Protection Criteria; and
- A Bushfire Management Plan

The 'Guidelines' reference the Bushfire Attack Level descriptions and assessment methodologies that are defined in AS 3959.

Bushfire Protection Criteria

The bushfire protection criteria (set out in the 'Guidelines Appendix 4) are a performance based system of assessing bushfire risk management measures. An assessment against the criteria is to be undertaken for any strategic planning proposal, subdivision and development application for a site that has or will on completion, have a bushfire hazard level above 'Low or a BAL rating above BAL-LOW.

The protection criteria consist of four elements: Location; Siting and Design of Development; Vehicular Access; and Water.

Each element has three components: Intent; Acceptable Solutions; and a Performance Principle. How to apply the Criteria is set out in the 'Guidelines' s4.5.2.

Local Variations to Bushfire Protection Criteria

Local governments may seek to add or to modify the acceptable solutions to recognise special local or regional circumstances (e.g. topography / vegetation / climate which reinforce the intent of a particular bushfire protection element and apply across a defined locality.

These endorsed (by WAPC and DFES) variations will be in the form of a local planning scheme amendment /provision or special control area. Currently they may be in the form of a local planning policy.

WA Building Regulations 2012

- These regulations exist under the **WA Building Act 2011** and adopt the **Building Code of Australia** as the minimum technical requirements for the design and construction of buildings and certain other structures in WA.
- The majority of development in WA requires a building permit before construction can commence. This process typically occurs after the planning process.
- The Regulations include the **Building Amendment Regulations (No.3) 2015** that prescribe applicable building standards for buildings located in areas designated by the Fire and Emergency Services Commissioner as bushfire prone areas (identified on the Map of Bushfire Prone Areas).

Building Code of Australia (BCA)

- The BCA provides minimum technical requirements for the construction of buildings. These are presented as Volumes One and Two of the National Construction Code series.
- The BCA requires an assessment of the potential intensity of bushfire attack for specific classes of residential buildings located in designated bushfire prone areas (Classes 1a, 1b, 2, 3 and associated 10a buildings or decks).
- The BCA requires that these buildings are constructed to the requirements corresponding to their bushfire attack level rating.
- Compliance with BCA bushfire requirements for Class 1a and 1b buildings in designated bushfire prone areas can be demonstrated by compliance with:
 - a. Australian Standard *AS 3959 Construction of buildings in bushfire prone areas*; or
 - b. National Association of Steel Housing – (NASH) *Standard – Steel Framed Construction in Bushfire Prone Areas*.
- Compliance with BCA bushfire requirements for Classes 2, 3 and associated 10a buildings or decks in designated bushfire prone areas can be demonstrated by compliance with:
 - a. Australian Standard *AS 3959 Construction of buildings in bushfire prone areas*.

AS 3959 Construction of Buildings in Bushfire Prone Areas (2009 as amended)

The objective of this Standard is to prescribe construction details for buildings to reduce the risk of ignition from a bushfire, appropriate to the:

- a) Potential for ignition caused by embers, radiant heat or flame generated by a bushfire; and
- b) Intensity of the bushfire attack on the building.

To achieve this, the Standard defines six categories of Bushfire Attack Level (BAL), details their assessment methodology and specifies constructions standards corresponding to each.

Western Australia Bush Fires Act 1954 (as amended)

‘An Act to make better provision for diminishing the dangers resulting from bush fires, for the prevention, control and extinguishment of bush fires’. Matters addressed in the Act include prohibited burning times, total fire bans, bushfire control and extinguishment

The Act sets out the authority given to local government which enables them to:

- Control and extinguish bushfires
- Establish and maintain Bushfire Brigades
- Require landowners and/or occupiers to install and maintain firebreaks to their required specifications

- Require landowners and/or occupiers manage bushfire fuel loads upon the land to their required specifications

The applicable document is the annually issued **Firebreak Notice** published by the relevant local government that sets out the obligations for landowners and/or occupiers.

Other Applicable Local Government Documents

These may include:

- Local planning scheme provisions.
- Local planning strategy references to bushfire risk management.
- Local planning strategy references to environment.
- Applicable structure plans
- Special control area provisions
- Previous planning approvals

Other Documents

These may include:

- Any existing Bushfire Management Plan, Bushfire Hazard Level assessment or BAL assessment prepared over the site.
- Relevant landscaping plans applicable to the subject site.

Appendix 2

Bushfire Risk Assessment – Understanding the Methodology

In SPP 3.7 ‘bushfire risk’ is defined as “the chance of a bushfire igniting, spreading and causing damage to people, property and infrastructure.”

“Before a strategic planning proposal, subdivision or development application can be considered, it is necessary to understand the extent of the bushfire hazard and its potential to affect people, property and infrastructure. An assessment of bushfire risk is a key component of deciding whether a strategic planning proposal, subdivision or development application should be approved in an area with a potential bushfire threat (from the ‘Guidelines’).”

Policy measures in *SPP 3.7* (and the associated document *Guidelines for Planning in Bushfire Prone Areas WAPC 2015*) prescribe the various assessment tools to be used to assess bushfire risk in the planning context. These are:

- Bushfire Hazard Level assessment;
- Bushfire Attack Level (BAL) Contour Map;
- Bushfire Attack Level (BAL) assessment;
- Bushfire protection criteria; and
- Bushfire Management Plan

The intent of this Appendix ‘Bushfire Risk Assessment – Understanding the Methodology’ is to provide an overview of the methodology used in assessing the Bushfire Hazard Level and the Bushfire Attack Level.

Bushfire Hazard Level Assessment Methodology

Used at a strategic planning level, this methodology rates bushfire hazards into three potential categories of low, moderate and extreme by considering the following characteristics:

- Vegetation types and areas
- Effective ground slope under the vegetation threat
- Existing land use on and around the area being assessed
- Prevailing climatic conditions when appropriate

These results are then presented as a Bushfire Hazard Level Map.

Bushfire Attack Level Assessment Methodology

The Australian Standard AS 3959-2009 *Construction of Buildings in Bushfire Prone Areas* defines a Bushfire Attack Level (BAL) as:

“A means of measuring the severity of a building’s potential exposure to ember attack, radiant heat and direct flame contact, using increments of radiant heat expressed in kilowatts per metre squared, and is the basis for establishing the requirements for construction to improve protection of building elements from attack by bushfire.”

AS 3959-2009 defines six categories of Bushfire Attack Level (BAL) (AS 3959 Appendix G); provides the assessment methodology (AS 3959 s2 and Appendix B); and specifies constructions standards corresponding to each BAL (AS 3959 s3 Table 3.1). The BAL’s and corresponding descriptions of the predicted levels of exposure and heat flux exposure thresholds are contained in the table on the following page.

AS 3959-2009 provides two methods to calculate Bushfire Attack Levels:

1. **Method 1** - a simplified procedure that involves five procedural steps to determine the BAL. It is subject to some limitations of the circumstances in which it can be used.
2. **Method 2** - a detailed procedure using calculations to determine BALs where a more specific result is sought or site conditions are outside the scope of Method 1. In particular, the use of Method 2 is to apply if the effective slope under the classified vegetation is greater than 20° down slope (and no more than 30° down slope) and the slope of the land between the site and the classified vegetation is no more than 20° regardless of slope type.

Method 1 – Summarised Procedure

- Determination of the area to be assessed
- Determine predominant vegetation type(s) within 100 metres of the site and classify
- Determination of distance of the site, building or building envelop from the classified vegetation type(s)
- Determination of the effective slope under the classified vegetation type(s)
- Determination of BAL’s - Forest Fire Danger Index (FFDI) of 80 is used for WA

Separation Distance: *The distance from a subject site (or building) to a specific area of classified vegetation (i.e. the bushfire threat) is labelled in the tables of this Plan as a separation distance. This distance is measured to a point in the vegetation area represented by the “edge of the vegetation” as per AS 3959 -2009 s2.2.4 and the “base of the bushfire prone vegetation (not the canopy)” as per the BAL Assessment [Basic] Factsheet Version 1 December 2015 WAPC. The exact point of measurement is then decided by the assessor on the basis of the fuel structure and expected fire behaviour. If a precautionary approach is considered appropriate to a given situation the measurement will be taken at the canopy line.*

Bushfire Attack Level Definitions and Corresponding Sections Specifying Construction Requirements (Source: AS 3959-2009, Appendix G and Table 3.1)

Bushfire Attack Level (BAL)	Description of Predicted Bushfire Attack and Levels of Heat Flux Exposure	Construction Section of AS 3959
BAL - LOW	There is insufficient risk to warrant specific construction requirements but there is still some risk. There is risk of ember attack.	4
BAL - 12.5	The construction elements are expected to be exposed to a heat flux not greater than 12.5 kW/m ²	3 and 5
BAL - 19	There is a risk of ember attack and burning debris ignited by wind borne embers and a likelihood of exposure to radiant heat. The construction elements are expected to be exposed to a heat flux not greater than 19 kW/m ²	3 and 6
BAL - 29	There is an increased risk of ember attack and burning debris ignited by wind borne embers and a likelihood of exposure to an increased level of radiant heat. The construction elements are expected to be exposed to a heat flux not greater than 29 kW/m ²	3 and 7
BAL - 40	There is a much increased risk of ember attack and burning debris ignited by wind borne embers, a likelihood of exposure to a high level of radiant heat and some likelihood of direct exposure to flames from the fire front. The construction elements are expected to be exposed to a heat flux not greater than 40 kW/m ²	3 and 8
BAL - FZ	There is an extremely high risk of ember attack and burning debris ignited by wind borne embers, a likelihood of exposure to an extreme level of radiant heat and direct exposure to flames from the fire front. The construction elements are expected to be exposed to a heat flux greater than 40 kW/m ²	3 and 9



Appendix 3

Vegetation Classification Exclusions (AS 3959-2009 s2.2.3.2)

Certain vegetation can be excluded from being classified in which case the Bushfire Attack Level shall be rated as BAL-LOW and no bushfire specific construction requirements apply. Such vegetation is one or a combination of the following:

- a) Vegetation of any type that is more than 100m from the site.
- b) Single areas of vegetation less than 1ha in area and not within 100m of other areas of vegetation being classified.
- c) Multiple areas of vegetation less than 0.25ha in area and not within 20m of the site or each other.
- d) Strips of vegetation less than 20m in width regardless of length and not within 20m of the site or each other, or other areas of vegetation being classified.
- e) Non-vegetated areas, including waterways, roads, footpaths, buildings, and rocky outcrops.
- f) Low threat vegetation, including grassland managed in a **minimal fuel condition** (i.e. insufficient fuel available to significantly increase the severity of a bushfire attack – recognisable as short cropped grass to a nominal height of 100mm for example), maintained lawns, golf courses, maintained public reserves and parklands, vineyards, orchards, cultivated gardens, commercial nurseries, nature strips and windbreaks.

Appendix 4

Technical Requirements –

Asset Protection Zones (APZ) - Description, Establishment, Maintenance and Standards

Description: An APZ is an area surrounding a building that is managed to reduce the bushfire hazard to an acceptable level (by reducing fuel loads). The width of the required APZ varies with slope and vegetation. The APZ should at a minimum be of sufficient size to ensure the potential radiant heat impact of a fire does not exceed 29kW/m² (BAL-29). It will be site specific.

(For subdivision planning, hazard separation in the form of using subdivision design elements or excluded and low threat vegetation adjacent to the lot may be used to reduce the dimensions of the APZ within the lot).

Defendable Space: The APZ includes a defendable space which is an area adjoining the asset within which firefighting operations can be undertaken to defend the structure. Vegetation within the defendable space should be kept at an absolute minimum and the area should be free from combustible items and obstructions. The width of the defendable space is dependent on the space which is available on the property, but as a minimum should be 3 metres.

Establishment: The APZ should be contained solely within the boundaries of the lot on which the building is situated, except in instances where the neighbouring lot or lots will be managed in a low-fuel state on an ongoing basis, in perpetuity. The APZ may include public roads, waterways, footpaths, buildings, rocky outcrops, golf courses, maintained parkland as well as cultivated gardens in an urban context, but does not include grassland or vegetation on a neighbouring rural lot, farmland, wetland reserves and unmanaged public reserves.

Native Vegetation: APZ's can adversely affect the retention of native vegetation. Where the loss of vegetation is not acceptable or causes conflict with landscape or environmental objectives, such as waterway foreshore areas and wetland buffers, reducing lot yield may be necessary to minimise the removal and modification of remnant vegetation.

Responsibility: It is the responsibility of the landowner/proponent to maintain their APZ in accordance with the 'Guidelines' Appendix 4 Schedule 1 'Standards for Asset Protection Zones' (WAPC 2017). It is likely that this requirement is also contained in the firebreak notice issued by the relevant local government under s33 of the Bushfire Act 1954 along with any additional requirements.

Source: Guidelines for Planning in Bushfire Prone Areas (WAPC 2017 v1.1) Appendix 4 Element 2

Standards for Asset Protection Zones

(‘Guidelines’ WAPC 2017 v1.1 Appendix 4 Schedule 1)

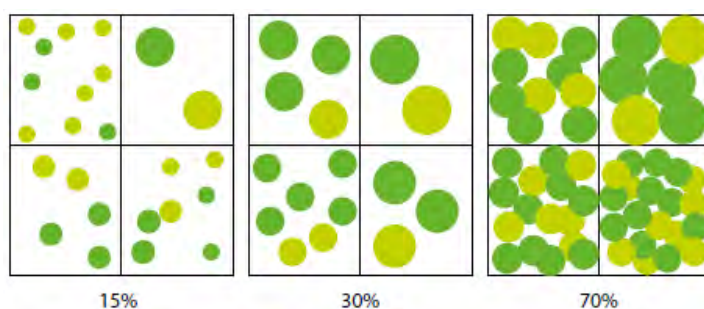
Fences: within the APZ are constructed from non-combustible materials (e.g. iron, brick, limestone, metal post and wire). It is recommended that solid or slatted non-combustible perimeter fences are used.

Objects: within 10 metres of a building, combustible objects must not be located close to the vulnerable parts of the building i.e. windows and doors.

Fine Fuel Load: combustible dead vegetation matter less than 6 mm in thickness reduced to and maintained at an average of two tonnes per hectare. The visual guide below shows a fuel load that equates to approximately 2t/ha (source: Shire of Augusta Margaret River’s Firebreak and Fuel Reduction Hazard Notice).



Trees (> 5 metres in height): trunks at maturity should be a minimum distance of 6 metres from all elevations of the building, branches at maturity should not touch or overhang the building, lower branches should be removed to a height of 2 metres above the ground and or surface vegetation, canopy cover should be less than 15% with tree canopies at maturity well spread to at least 5 metres apart as to not form a continuous canopy. Diagram below represents tree canopy cover at maturity.



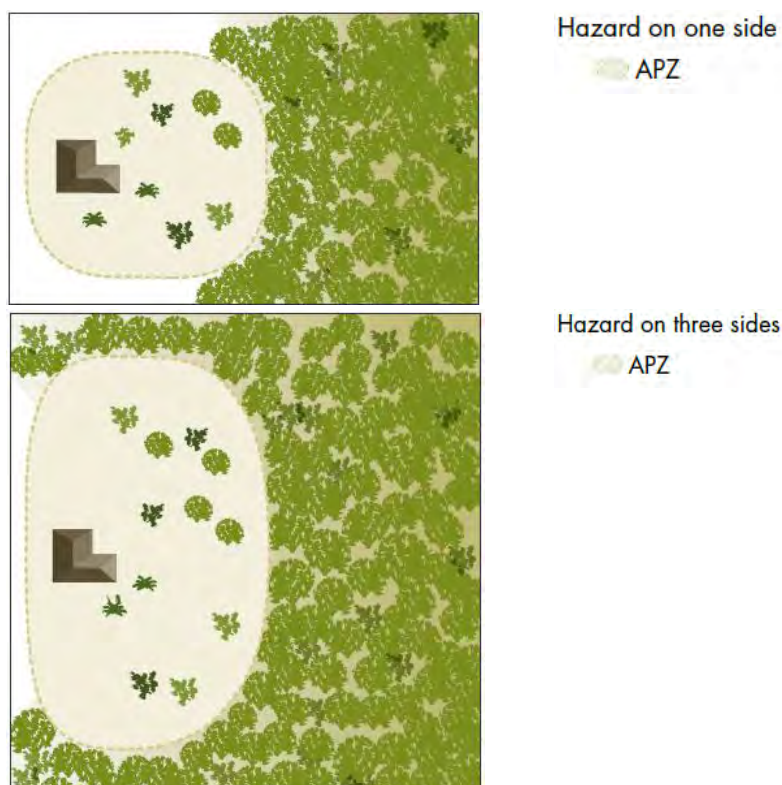
Shrubs (0.5 metres to 5 metres in height): should not be located under trees or within 3 metres of buildings, should not be planted in clumps greater than 5m² in area, clumps of shrubs should be separated from each other and any exposed window or door by at least 10 metres. Shrubs greater than 5 metres in height are to be treated as trees.

Ground covers (<0.5 metres in height): can be planted under trees but must be properly maintained to remove dead plant material and any parts within 2 metres of a structure, but 3 metres from windows or doors if greater than 100 mm in height. Ground covers greater than 0.5 metres in height are to be treated as shrubs.

Grass: should be managed to maintain a height of 100 mm or less.

Note that individual local governments may set their APZ standards with additional requirements compared to the standard set in the 'Guidelines'. These will be contained in their annual firebreak notice issued under s33 of the Bushfires Act 1954 and are to be complied with.

The example diagrams below illustrate how the required dimensions of the APZ will be determined by the type and location of the vegetation



Additional DFES Guidance

- Store firewood at least 20 metres away from the building.
- Keep gutters free of leaves and other combustible material.
- Roof mounted evaporative coolers to be fitted with ember screens.
- Gas cylinders to vent away from a building and be tethered to prevent falling over.
- Driveways and access ways must allow for safe passage of a fire appliance to all buildings on the land.
- Land owners/occupiers must maintain compliance with the local government's annual firebreak notice issued under s33 of the Bush Fires Act 1954.

Regardless of whether an Asset Protection Zone exists in accordance with the acceptable solutions and is appropriately maintained, it should be noted that fire fighters are not obliged to protect an asset if they think the separation distance between the dwelling and vegetation is unsafe.

Appendix 5

Technical Requirements - Bushfire Protection Criteria (Vehicular Access)

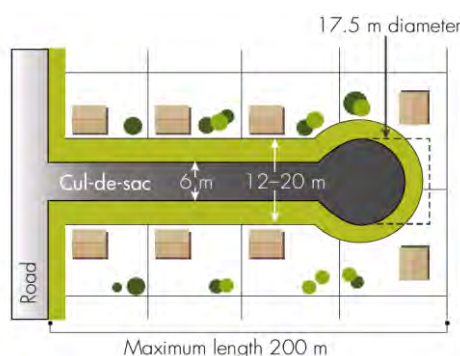
Vehicular Access – Technical Requirements of Acceptable Solutions - Part 1

Source: *Guidelines for Planning in Bushfire Prone Areas WAPC 2015*

Acceptable Solution 3.3 Cul-de-sacs (including a dead-end road)

Their use in bushfire prone areas should be avoided. Where no alternative exists then the following requirements are to be achieved:

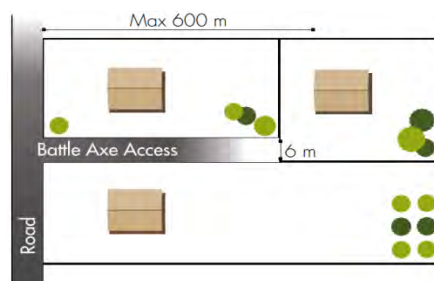
- Maximum length is 200m. If public emergency access is provided between cul-de-sac heads (as a right of way or public access easement in gross), the maximum length can be increased to 600m provided no more than 8 lots are serviced and the emergency access way is less than 600m in length;
- Turnaround area requirements, including a minimum 17.5m diameter head to allow type 3.4 fire appliances to turn around safely;
- The cul-de-sac connects to a public road that allows for travel in two directions; and
- Meet the additional design requirements set out in Part 2 of this appendix.



Acceptable Solution 3.4 Battle-axe

Their use in bushfire prone areas should be avoided. Where no alternative exists then the following requirements are to be achieved:

- Maximum length 600m and minimum width 6m; and
- Comply with minimum standards for private driveways.



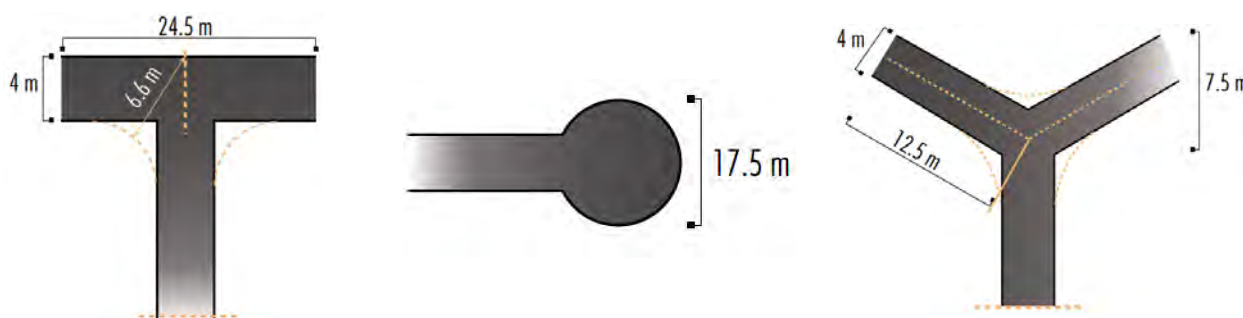
Acceptable Solution 3.5 Private Driveways

The following requirements are to be achieved:

- The design requirements set out in Part 2 of this appendix; and

Where the house site is more than 50 metres from a public road:

- Passing bays every 200 metres with a minimum length of 20 metres and a minimum width of two metres (ie combined width of the passing bay and constructed private driveway to be a minimum six metres);
- Turn-around areas every 500 metres and within 50 metres of a house, designed to accommodate type 3.4 fire appliances to turn around safely (ie kerb to kerb 17.5 metres);
- Any bridges or culverts are able to support a minimum weight capacity of 15 tonnes; and
- All weather surface (i.e. compacted gravel, limestone or sealed).

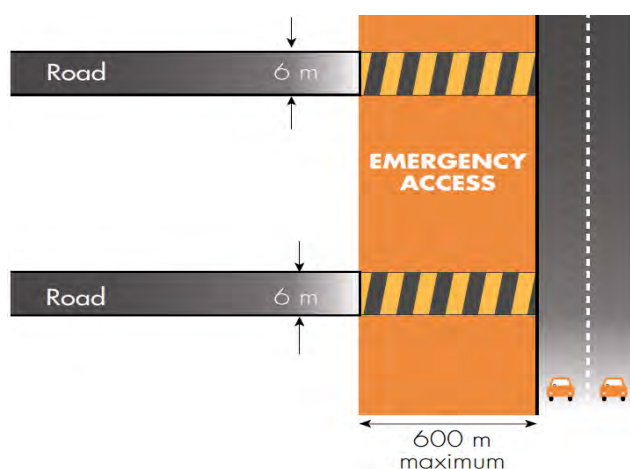


Acceptable Solution 3.6 Emergency Access Way

An access way that does not provide through access to a public road is to be avoided bushfire prone areas.

Where no alternative exists, an emergency access way is to be provided as an alternative link to a public road during emergencies. The following requirements are to be achieved:

- No further than 600 metres from a public road;
- Must be signposted including where they ajoin public roads;
- Provided as a right of way or public access easement in gross;
- Where gates are used they must not be locked and they must be a minimum width of 3.6 metres with design and construction approved by local government (refer to the example in this appendix); and
- Meet the additional design requirements set out in Part 2 of this appendix.



Acceptable Solution 3.7 Fire Service Access Routes (Perimeter Roads)

Are to be established to provide access within and around the edge of subdivision and related development and to provide direct access to bushfire prone areas for firefighters and link between public road networks for firefighting purposes. Fire service access is used during bushfire suppression activities but can also be used for fire prevention work. The following requirements are to be achieved:

- No further than 600 metres from a public road (driveways may be used as part of the designated fire service access;
- Dead end roads not permitted;
- Allow for two-way traffic (i.e. two 3.4 fire appliances);
- Provide turn-around areas designed to accommodate 3.4 fire appliances and to enable them to turn around safely every 500m (i.e. kerb to kerb 17.5 metres);
- All weather surface (i.e. compacted gravel, limestone or sealed) and have erosion control measures in place;
- Must be adequately sign posted;
- Where gates are used they must be a minimum width of 3.6 metres with design and construction approved by local government (refer to the example in this appendix) and may be locked (use a common key system);
- Meet the additional design requirements set out in Part 2 of this appendix;
- Provided as right of ways or public access easements in gross; and
- Management and access arrangements to be documented and in place.

A3.8 Firebreak Width

Lots greater than 0.5 hectares must have an internal perimeter firebreak of a minimum width of three meters or to the level as prescribed in the local firebreak notice issued by the local government.

Vehicular Access - Technical Requirements of Acceptable Solutions - Part 2

Source: *Guidelines for Planning in Bushfire Prone Areas WAPC 2015*

Technical Component	Vehicular Access Types				
	Public Roads	Cul-de-sacs	Private Driveways	Emergency Access Ways	Fire Service Access Routes
Minimum trafficable surface (m)	6*	6	4	6*	6*
Horizontal clearance (m)	6	6	6	6	6
Vertical clearance (m)	4.5	4.5	4.5	4.5	4.5
Maximum grade <50 metres	1 in 10	1 in 10	1 in 10	1 in 10	1 in 10
Minimum weight capacity (t)	15	15	15	15	15
Maximum cross-fall	1 in 33	1 in 33	1 in 33	1 in 33	1 in 33
Curves minimum inner radius (m)	8.5	8.5	8.5	8.5	8.5

* A six metre trafficable surface does not necessarily mean paving width. It could, for example, include four metres of paving and one metre of constructed road shoulders. In special circumstances, where 8 lots or less are being serviced, a public road with a minimum trafficable surface of four metres for a maximum distance of ninety metres may be provided subject to the approval of both the local government and DFES.

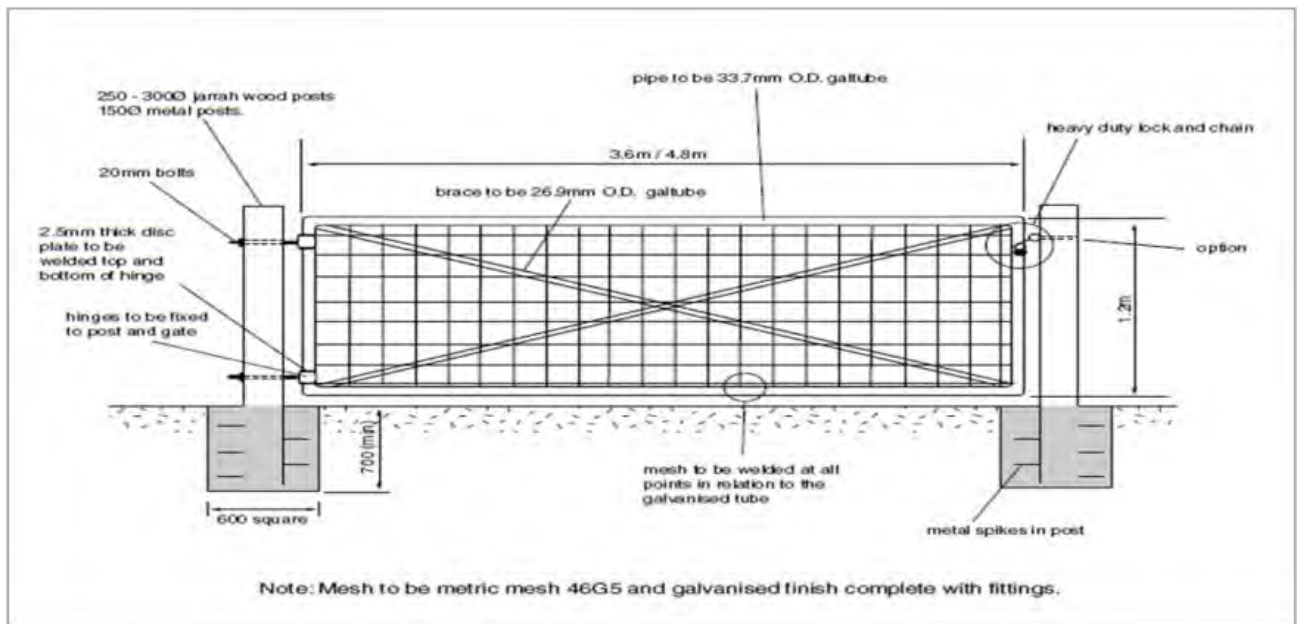
Vehicular Access - Technical Requirements of Acceptable Solutions

Gates and Signs

(example requirements – check with local government)

Gates (Bollards)

- Minimum width 3.6m
- Design and construction to be approved by relevant local government.
- Emergency access way gates must not be locked.
- Fire service access route gates may be locked but only with a common key that is available to local fire service personnel.
- Bollards will be to the relevant local government specifications



Signs

- Minimum height above ground of 0.9m.
- Lettering height to be 100mm.
- To display the words (as appropriate) “Emergency Access Only” or “Fire Service Access – No Public Access”.
- Design and construction to be approved by the relevant local government.
- Size 600mm x 400mm.
- Sign colour red, base (white) area is reflective background.
- Rounded corners, radius 20mm.
- White key-line 3mm wide, 3mm from outside edge.
- Suggested mounting hole six 6mm diameter.



Appendix 6

Technical Requirements - Bushfire Protection Criteria (Water)

Source: *Guidelines for Planning in Bushfire Prone Areas WAPC 2015* and DFES website

Acceptable Solution 4.1 Reticulated Areas

The requirement is to supply a reticulated water supply, together with fire hydrants, in accordance with the specifications set by DFES and the relevant water supply authority (WA Water Corporation or Aqwest - Bunbury or Busselton Water). The Water Corporation's 'No 63 Water Reticulation Standard' is deemed to be the baseline criteria for developments and should be applied unless local water supply authority's conditions apply. Key specifications in the most recent version/revision of the design standard include:

- **Residential Standard** – hydrants are to be located so that the maximum distance between the hydrants shall be no more than 200 metres.
- **Commercial Standard** – hydrants are to be located with a maximum of 100 metre spacing in Industrial and Commercial areas.
- **Rural Residential Standard** – where minimum site areas per dwelling is 10,000 m² (1ha), hydrants are to be located with a maximum 400m spacing. If the area is further subdivided to land parcels less than 1ha, then the residential standard (200m) is to be applied.

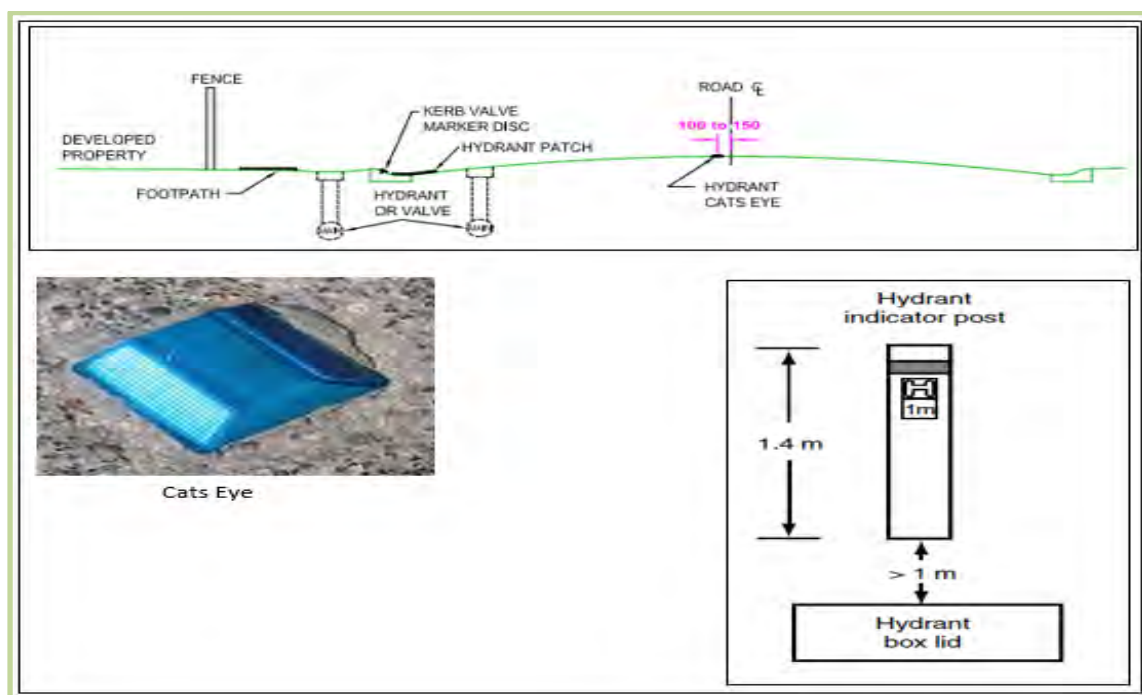


Figure A4.1: Hydrant Location and Identification Specifications

Acceptable Solution 4.2 Non-Reticulated Areas

Static water supplies are used by firefighters in areas where there is no reticulated water supply. Water tanks are the only acceptable static water source acceptable to meet Element 4 (Water) of the Bushfire Protection Criteria as per the *Guidelines for Planning in Bushfire Prone Areas (WAPC 2015) Appendix 4*.

The requirements for the development being assessed can be increased by the relevant local government. If a variation applies it will be noted in s7.1 and s7.5.

Volume:	50,000 litres per tank
Ratio of tanks to lots:	1 tank per 25 lots (or part thereof)
Location:	No more than two kilometres to the furthestmost house site within the residential development to allow a 2.4 fire appliance to achieve a 20-minute turnaround time at legal road speeds.
Tank Construction:	Above ground tanks constructed using concrete or metal. Stands of raised tanks are constructed using non-combustible materials and heat shielding where applicable (required for metal stands).
Pipe Construction:	Galvanised or copper (PVC if buried 300mm below ground).
Access:	Hardstand and turnaround areas suitable for a 3.4 appliance (i.e. kerb to kerb 17.5metres) are provided within three metres of each tank.
Couplings:	Tanks are to be fitted with a full flow gate (not ball) valve and a 100mm cam-lock coupling of metal/alloy construction (source: DFES). Examples below:



Ownership and Responsibility:	Water tanks and associated facilities are vested in the relevant local government. A procedure must be in place to ensure that water tanks are maintained at or above designated capacity at all times.
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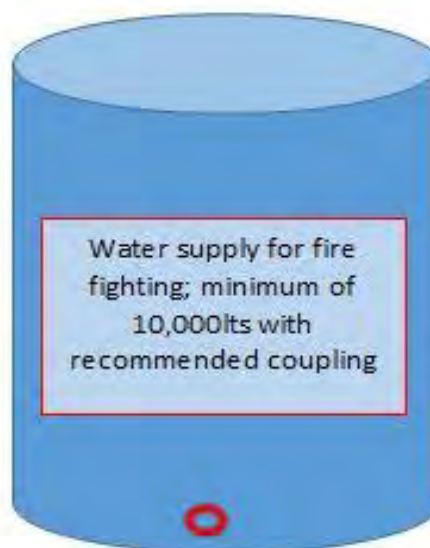
Acceptable Solution 4.3 Non-Reticulated Areas - Individual Lots

This solution is only for use if creating one additional lot and cannot be applied cumulatively (*Guidelines for Planning in Bushfire Prone Areas WAPC 2015 Appendix 4*).

Single lots above 500 m² need a dedicated static water supply on the lot that has an effective capacity of 10,000 litres (*Guidelines for Planning in Bushfire Prone Areas WAPC 2015*).

An Example Local Government Requirement:

Volume:	Minimum 10,000 litres (effective) per tank dedicated to firefighting purposes. The storage tank must not facilitate sharing the water for domestic use (danger of contamination).
Tank Construction:	Above ground tanks constructed using concrete or metal.
Pipe Construction:	Galvanised or copper (PVC if buried 300mm below ground).
Access:	Hardstand and turnaround area suitable for a 3.4 appliance (i.e. kerb to kerb 17.5metres) is provided at the tank.
Couplings:	Tanks are to be fitted with a full flow gate (not ball) valve and a 50mm or 100mm cam-lock coupling of metal/alloy construction. Examples below:
Responsibility:	A procedure must be in place to ensure that water tanks are maintained at or above designated capacity at all times.



Bushfire Management Plan Coversheet

This Coversheet and accompanying Bushfire Management Plan has been prepared and issued by a person accredited by Fire Protection Association Australia under the Bushfire Planning and Design (BPAD) Accreditation Scheme.

Bushfire Management Plan and Site Details

Site Address / Plan Reference: Lot 194 Robartson Road

Suburb: Merredin

State: WA

P/code: 6348

Local government area: Shire of Merredin

Description of the planning proposal: Solar Power Station development

BMP Plan / Reference Number: 169042

Version: Ver1.0

Date of Issue: 03/03/17

Client / Business Name: Stellata

Reason for referral to DFES	Yes	No
Has the BAL been calculated by a method other than method 1 as outlined in AS3959 (tick no if AS3959 method 1 has been used to calculate the BAL)?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Have any of the bushfire protection criteria elements been addressed through the use of a performance principle (tick no if only acceptable solutions have been used to address all of the BPC elements)?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Is the proposal any of the following special development types (see SPP 3.7 for definitions)?		
Unavoidable development (in BAL-40 or BAL-FZ)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Strategic planning proposal (including rezoning applications)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Minor development (in BAL-40 or BAL-FZ)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
High risk land-use	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Vulnerable land-use	<input type="checkbox"/>	<input checked="" type="checkbox"/>

If the development is a special development type as listed above, explain why the proposal is considered to be one of the above listed classifications (E.g. considered vulnerable land-use as the development is for accommodation of the elderly, etc.)?

High Risk Land use- Solar Panel Plant

Note: The decision maker (e.g. local government or the WAPC) should only refer the proposal to DFES for comment if one (or more) of the above answers are ticked "Yes".

BPAD Accredited Practitioner Details and Declaration

Name	Accreditation Level	Accreditation No.	Accreditation Expiry
Kathy Nastov	Level 3	BPAD27794	01/08/2017
Company		Contact No.	
Bushfire Prone Planning		6477 1144	

I declare that the information provided within this bushfire management plan is to the best of my knowledge true and correct

Signature of Practitioner



Date 03/03/2017

Traffic Impact Statement

Site Oblique Photos (February 2017)









CONSULTING CIVIL & TRAFFIC ENGINEERS, RISK MANAGERS.



Project: Merredin Solar Facility
Lot 194 Robertson Road & Lot 19444 Bruce Rock –
Merredin Road
Traffic Impact Assessment

Client: Land Insights

Author: Keli Li

Signature: 

Date: 13/03/2017

Version: 2

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Document Status

Version No.	Author	Reviewed by	Date	Document status	Signature	Date
1	K Li	E Wilks	08/03/2017	Draft		08/03/2017
2	K Li	E Wilks	13/03/2017	Review		13/03/2017

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CONTENTS

1. Summary.....	1
2. Introduction	2
2.1. Proponent.....	2
2.2. Site Location and Land Use.....	2
1.1. Referenced Information	3
3. Site Proposal.....	4
3.1. Regional Context	4
3.2. Land Use	4
3.3. Transport Metrics.....	5
4. Existing Situation.....	6
4.1. Existing Road.....	6
4.2. RAV Network Status	7
4.3. Road Hierarchy vs Actual Flows.....	8
4.4. Crash History	9
4.5. Changes to Surrounding Transport Networks.....	9
5. Transport Assessment	10
5.1. Assessment Years.....	10
5.2. Time Periods for Assessment.....	10
5.3. Other Development.....	10
5.4. Development Traffic Generation and Distribution	10
5.4.1. Traffic Generation.....	10
5.4.2. Traffic Distribution	10
5.5. Intersection Assessment.....	12
5.5.1. Warrants for Analysis	12
5.5.2. Intersection Geometry	12
5.6. Site Access	13



5.6.1. Crossover Geometry	13
5.6.2. Access Sight Distance.....	14
5.7. Parking	16
6. Conclusion	17
Appendix A - Site Plan	18
Appendix B - Traffic Count	20



1. Summary

Shawmac was commissioned by Land Insights to assess the traffic impacts associated with the generation of traffic from the construction phase of a proposed solar farm at Lot 194 Robartson Road & Lot 19444 Bruce Rock - Merredin Road, Merredin.

The assessment follows the recommended outline contained in the West Australian Planning Commission draft **guideline** "Transport Impact Assessment Guidelines for Developments". Potential traffic flow from the site was estimated by quantity of construction materials needed to be delivered and number of site staff.

Traffic was assigned to the adjacent existing road network and flows used as a basis for assessing traffic impacts associated with the site. Based on the assessment it was shown that the flows predicted can be accommodated within the existing network without unacceptable adverse impacts.

2. Introduction

2.1. Proponent

Shawmac was commissioned by Land Insights to assess the traffic impacts associated with the generation of traffic from the construction phase of a proposed solar farm at Lot 194 Robertson Road & Lot 19444 Bruce Rock - Merredin Road, Merredin.

2.2. Site Location and Land Use

The site is located as shown on Figure 1 and is within the Shire of Merredin. The layout of the site and surrounding road network is shown in Figure 2. The proposed site plan is provided in Appendix A



Figure 1 - Site Location



Figure 2 - Site Location Aerial View

1.1. Referenced Information

In undertaking the study, the information listed below was referenced.

- MRWA Functional Hierarchy Criteria;
- Austroads Guide to Road Design Part 3 -- Geometric Design
- Austroads Guide to Road Design Part 4A – Unsignalised and signalised intersections.
- Austroads Guide to Traffic Management Part 3 -- Traffic Studies and Analysis
- Australian Standard AS2890.2:2004 Parking Facilities Part 1 Off-Street Parking Facilities
- Australian Standard AS2890.2:2002 Parking Facilities Off-Street Commercial Vehicle Facilities

3. Site Proposal

3.1. Regional Context

The site is located within the Shire of Merredin approximately 8 km to the southwest of Merredin Townsite. The site is bounded by Bruce Rock-Merredin Road to the south and Robertson Road to the east.

3.2. Land Use

The subject site is zoned “General Farming” under the Shire of Merredin Town Planning Scheme.

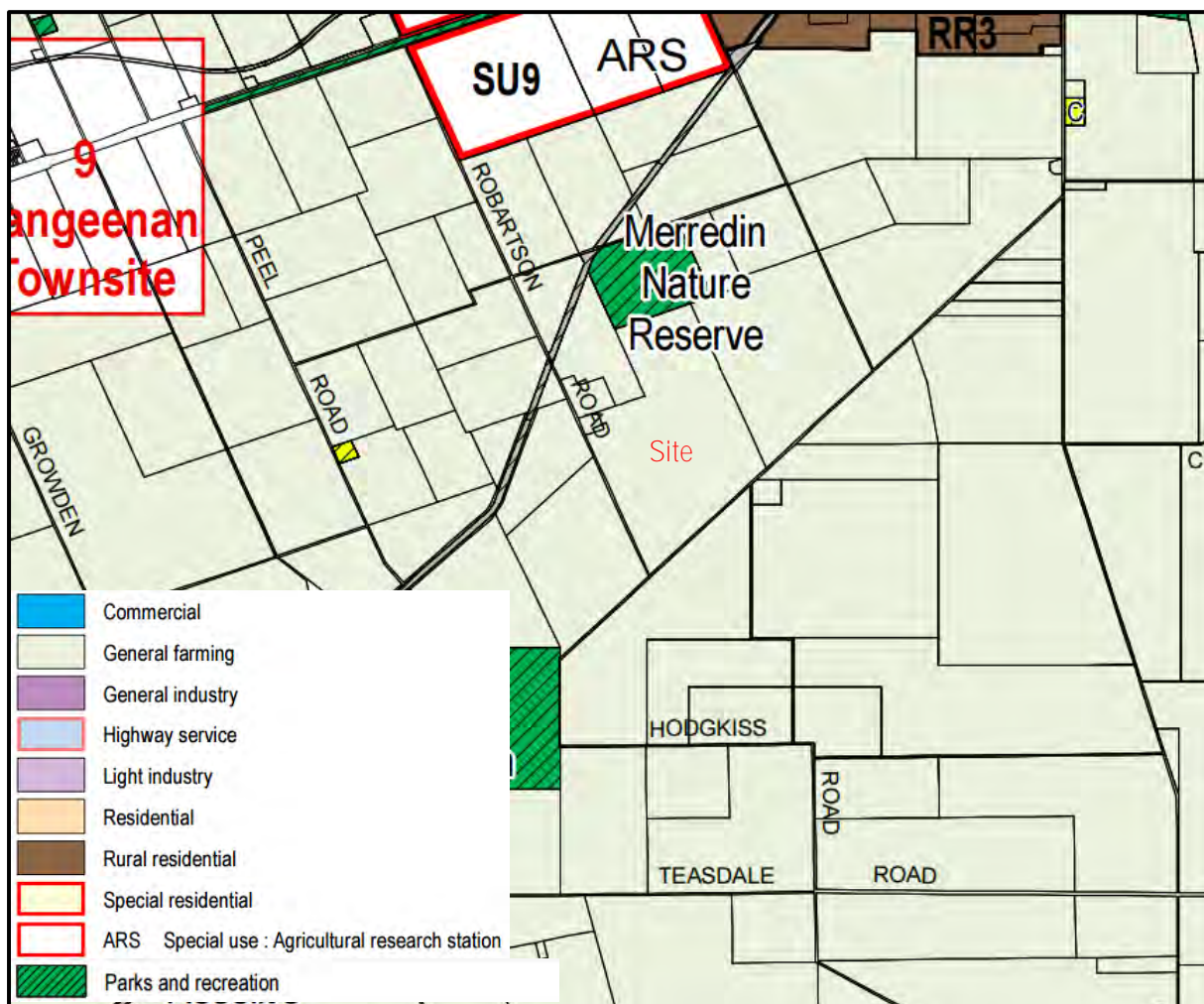


Figure 3 - Extract of Shire of Merredin Town Planning Scheme

The proposed solar farm will have a generation capacity at the point of connection of 120MW (AC) via the use of between 360,000 and 400,000 tracking solar panels and associated infrastructure, including:

- Photo Voltaic Modules
- Piles and Framework
- Inverters (and associated housings)

- Transformers (and associated housings)
- Substations (including circuit breakers and metering)
- Underground cabling
- Overhead wires
- Perimeter Fence
- CCTV (at entrance and adjacent to substations)
- Battery Storage
- Spares Storage building
- Maintenance compound.

3.3. Transport Metrics

Table 1 Below lists the approximate number of trucks expected for Merredin Solar farm project.

Table 1 - Vehicle Types and Numbers for Merredin Solar Farm Project

Vehicle	RAV category	No.
Maximum 36.5m RAV 6 trucks	RAV 6	800
10m tipper trucks (2)	As of right	113
10m rigid	As of right	62
8.8m service vehicle (water tanker)	As of right	Variable
Light vehicles / Buses	As of right	Variable

The construction work is expected to commence in second quarter of 2018 for approximately a 6-month period. Trucks are proposed to travel east on Great Eastern Highway, turn right onto Robartson Road and left into the site. Returning route would be the same but in an opposite direction.

The haulage proposal is for approximately 20 RAV 6 trucks daily (resulting 40 vehicle movements per day).

There will be up to 200 site staff during the peak construction period. The construction crew will be mainly based in Merredin Townsite. Travel between the site and Merredin Townsite will be using buses or carpooling where possible, however there may be some construction crew coming from other surrounding towns.

4. Existing Situation

4.1. Existing Road

Figure 4 shows the Road Hierarchy for the road network adjacent to and around the site.

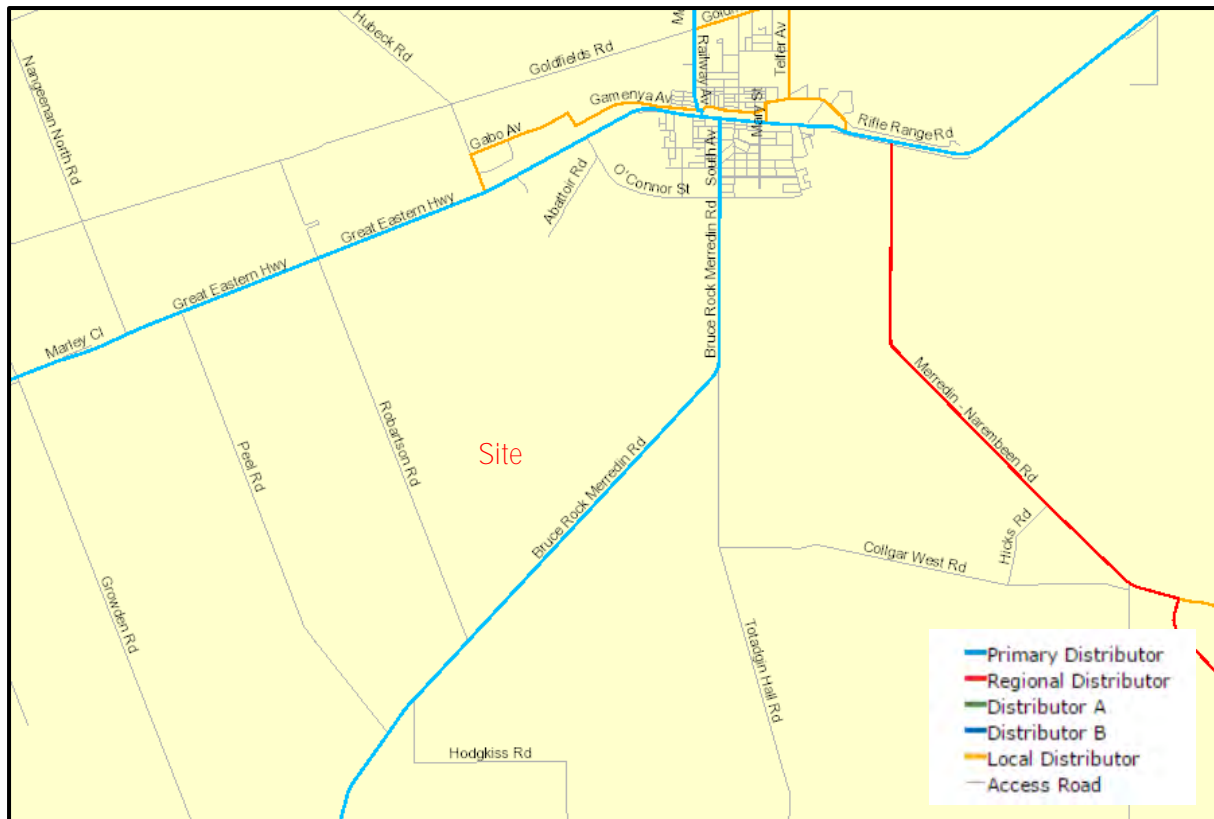


Figure 4 - Road Hierarchy

Robertson Road

Robertson Road is classified as an Access Road according to the MRWA digital mapping website. Robertson Road at the site is described as a sealed and unmarked single carriageway road approximately 8.0m wide with open roadside drains. Traffic data for Robertson Road is not available however there are few other properties linked to this road. It can be concluded that the existing traffic on Robertson Road is below 40 vehicles per day.

Robertson Road has a posted speed limit of 110km/h.

Great Eastern Highway

Great Eastern Highway is located approximately 4.5km to the north of the site and is classified as a Primary Distributor road according to the MRWA digital mapping website. Great Eastern Highway is described as a sealed and marked single carriageway road approximately 9.0m wide with open roadside drains. Traffic data for Great Eastern Highway is only available at 14 km to the east and 54km to the west of Robertson Road intersection, however traffic counts at these two locations share similar results. It can be concluded that the existing traffic on

Great Eastern Highway is identical to the MRWA count at Great Eastern Highway - west of Kellerberrin (54km to the west of Robartson Road Intersection).

Great Eastern Highway has a posted speed limit of 110km/h.

Bruce Rock-Merredin Road




Bruce Rock-Merredin Road is classified as a Primary Distributor road according to the MRWA digital mapping website. Bruce Rock-Merredin Road is described as a sealed and marked single carriageway road approximately 7.0m wide with open roadside drains. Traffic data for Bruce Rock-Merredin Road is available from MRWA Trafficmap.

Bruce Rock-Merredin Road has a posted speed limit of 110km/h.

4.2. RAV Network Status

Figure 5 shows the Restricted Access Vehicle categories for the road network adjacent to and around the site. Table 2 below shows the permitted Prime Mover and trailer combinations for the surrounding road network.

Table 2 - Permitted Prime Mover and Trailer Combination

Road Name	Prime Mover and Trailer Combinations	Length	Max permitted mass
Robartson Road	 <p>(A) PRIME MOVER, TOWING SEMI TRAILER AND B DOUBLE</p>	>27.5, <=36.5	107.5 Tonnes
Great Eastern Highway	 <p>(A) PRIME MOVER, TOWING SEMI TRAILER AND B DOUBLE</p>	>27.5, <=36.5	107.5 Tonnes
Bruce Rock-Merredin Road	 <p>(A) PRIME MOVER, SEMI TRAILER TOWING 6 AXLE DOG TRAILER</p> <p>(B) B-TRIPLE</p>	>27.5, <=36.5	87.5 Tonnes

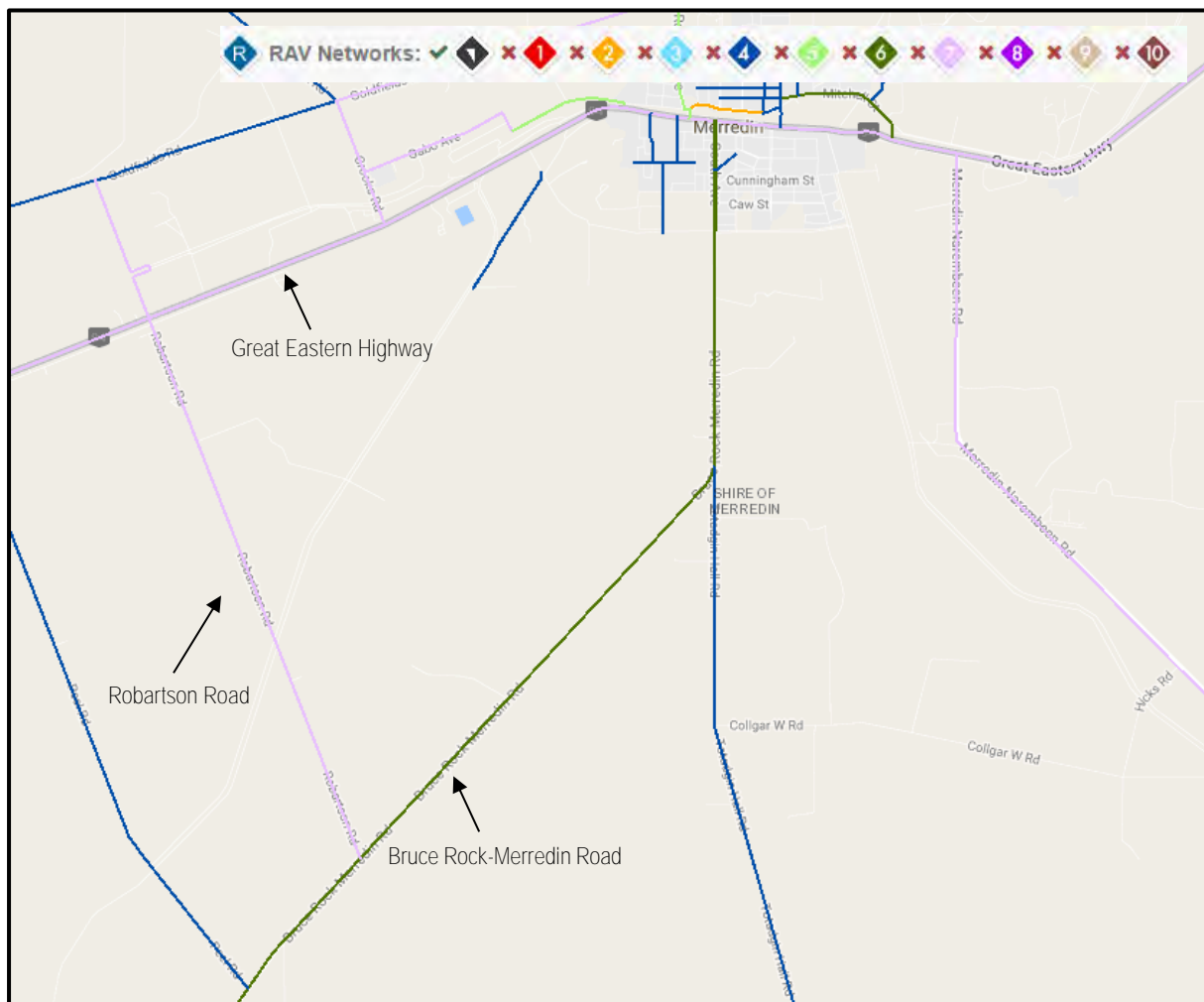


Figure 5 - RAV Network

4.3. Road Hierarchy vs Actual Flows

Table 3 details the desirable traffic volume based on MRWA Functional Hierarchy criteria and recorded and assumed traffic volumes of the surrounding road network.

Table 3 - Road Classification and Indicative Traffic Volume

Location of Count	MRWA Classification	MRWA Indicative Traffic Volume. (vpd)	Traffic Volume (vpd)	Source
Robertson Road	Access Road	< 75	40	Assumed
Great Eastern Highway	Primary Distributor	< 35,000	1703 (33.9% HV)	MRWA 2014-2015
Bruce Rock-Merredin Road	Primary Distributor	< 35,000	296 (19.6% HV)	MRWA 2014-2015

Detailed traffic count data is provided in Appendix B.

4.4. Crash History

The crash history of the roads surrounding the site for the five-year period ending December 2015 was accessed via the MRWA Crash Analysis Reporting System (CARS).

The report indicated that:

- There was one recorded crash on Great Eastern Highway between Peel Road and Robartson Road
- There were no recorded midblock crashes on Robartson Road.
- There were no recorded crashes at Great Eastern Highway / Robartson Road intersection
- There were no recorded crashes at Bruce Rock-Merredin Road / Robartson Road intersection

The crash records indicate no particular safety issues for the surrounding road network.

4.5. Changes to Surrounding Transport Networks

There are no known changes to the adjacent network that have the potential to affect the assessment.

5. Transport Assessment

5.1. Assessment Years

The development is assessed on current network conditions.

5.2. Time Periods for Assessment

Assessment is based on daily traffic period.

5.3. Other Development

No other development in the vicinity of the site has been identified that would significantly alter current traffic generation or have the potential to affect this assessment.

5.4. Development Traffic Generation and Distribution

5.4.1. Traffic Generation

Potential traffic generation of truck movements to and from the site has been estimated by the client. Light vehicle and bus movements generated by staff are expected to occur during morning and afternoon peak hours.

Based on the information provided by the client, maximum daily delivery would be 20 loads of RAV 6 trucks. Assuming people car-pool to and from the site with average 4 people in each vehicle (cars and buses). 200 site staff will generate approximately 50 vehicle trips during both morning and afternoon peak hours.

Therefore, daily trips generated from the construction of solar farm would be 140 vehicle movements per day.

Operational traffic will be minimal, as the only expected traffic is a limited number of employees to occasionally undertake equipment maintenance and ensure the fire management aspects are taken care of.

5.4.2. Traffic Distribution

Trucks are proposed to travel east on Great Eastern Highway, turn right onto Robartson Road and left into the site. Returning route would be the same but in an opposite direction. Site staff vehicle movement between the site and Merredin Townsite or other towns will be split 80/20 to the north and south of Robartson Road as shown in Figure 6.

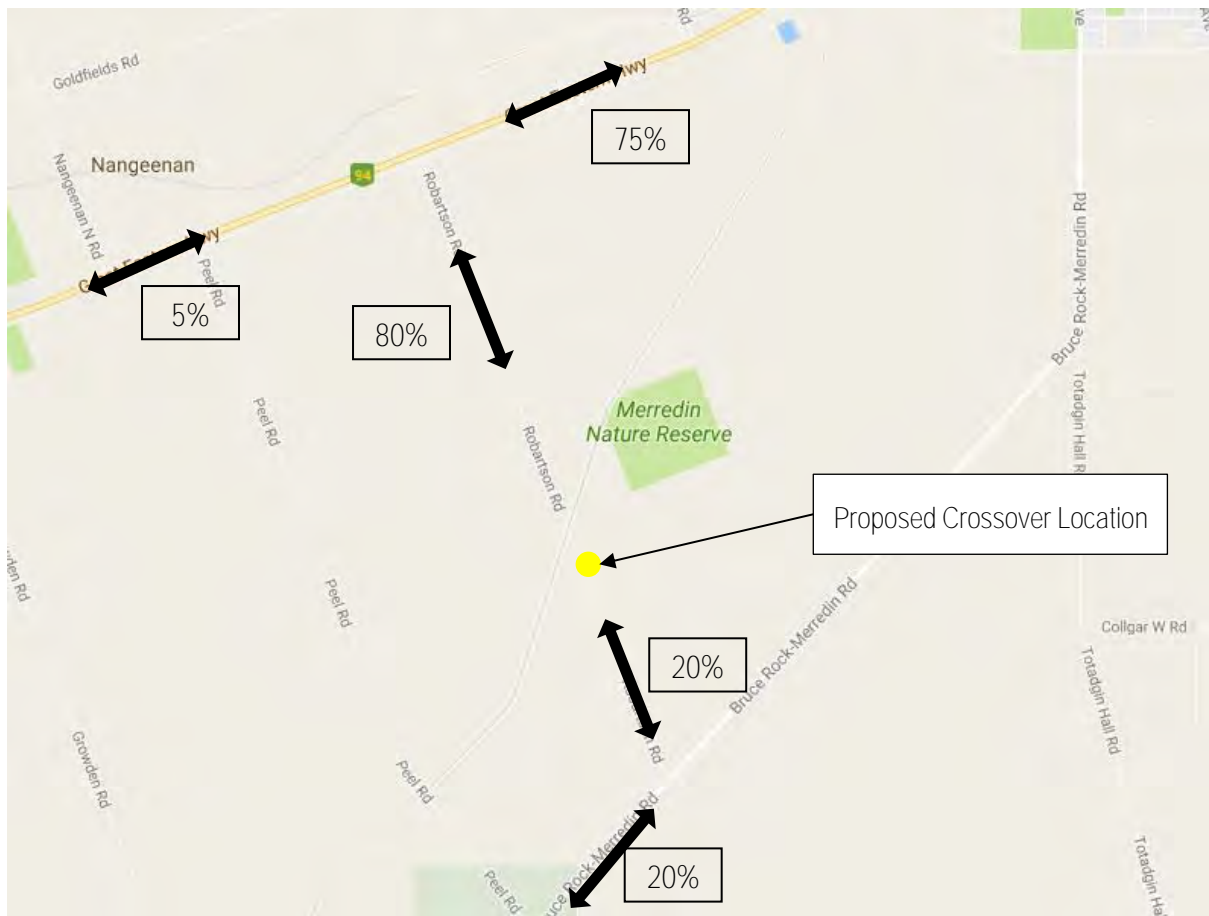


Figure 6 - Traffic Distribution

The impact on adjacent roads is summarised on Table 4. Existing peak hour traffic on Robertson Road was assumed to be 10% of its daily traffic.

Table 4 - Traffic Prediction Adjacent Network

Location	Daily Traffic - Existing / Predicted (vpd)	MRWA Indicative Traffic Volume. (vpd)	AM Peak Hour Traffic - Existing / Predicted (vph)	PM Peak Hour Traffic - Existing / Predicted (vph)
Robertson Road	40 / 160	< 75 (Access Road)	4 / 44	4 / 44
Great Eastern Highway	1703 / 1778	< 35,000 (Primary Distributor)	132 / 172	130 / 170
Bruce Rock-Merredin Road	296 / 316	< 35,000 (Primary Distributor)	25 / 45	23 / 43

The table above indicates that all roads are operating within their desirable capacity, with exception of Robartson Road which will have its daily traffic volume higher than MRWA indicative volume, however as indicated by MRWA Road Hierachy For Western Australia Road Types and Criteria, indicative traffic volume is a secondary criterion. Ideally, a road should have met all secondary criteria, but it is recognised that is unlikely to occur in a number of instances, particularly for traffic volumes in rural areas. Robartson Road is approximately 8m wide and has RAV 7 status. It can therefore be concluded that the predicted traffic volume is within the recognised current capacity of these roads.

5.5. Intersection Assessment

5.5.1. Warrants for Analysis

The existing road network has sufficient capacity to cater for the generated traffic and the impact on the surrounding road network is considered low. As such a detailed capacity analysis of the Great Eastern Highway / Robartson Road intersection and Bruce Rock-Merredin Road / Robartson Road intersection was not warranted.

5.5.2. Intersection Geometry

The layout of the Great Eastern Highway / Robartson Road intersection was assessed in accordance with **Austroads "Guide to Road Design – Part 4A: Unsignalised and Signalised Intersections"**. Based on the predicted major road traffic flows (132 peak hour vehicle movements (64 eastbound and 68 westbound)) and predicted left and right turn movements (40 movement and 8 movements), the development falls within the BAR/BAL area of the graph as shown in Figure 7. In this instance, a BAL turn treatment is not considered necessary as both Great Eastern Highway and Robartson Road are both within RAV 7 network.

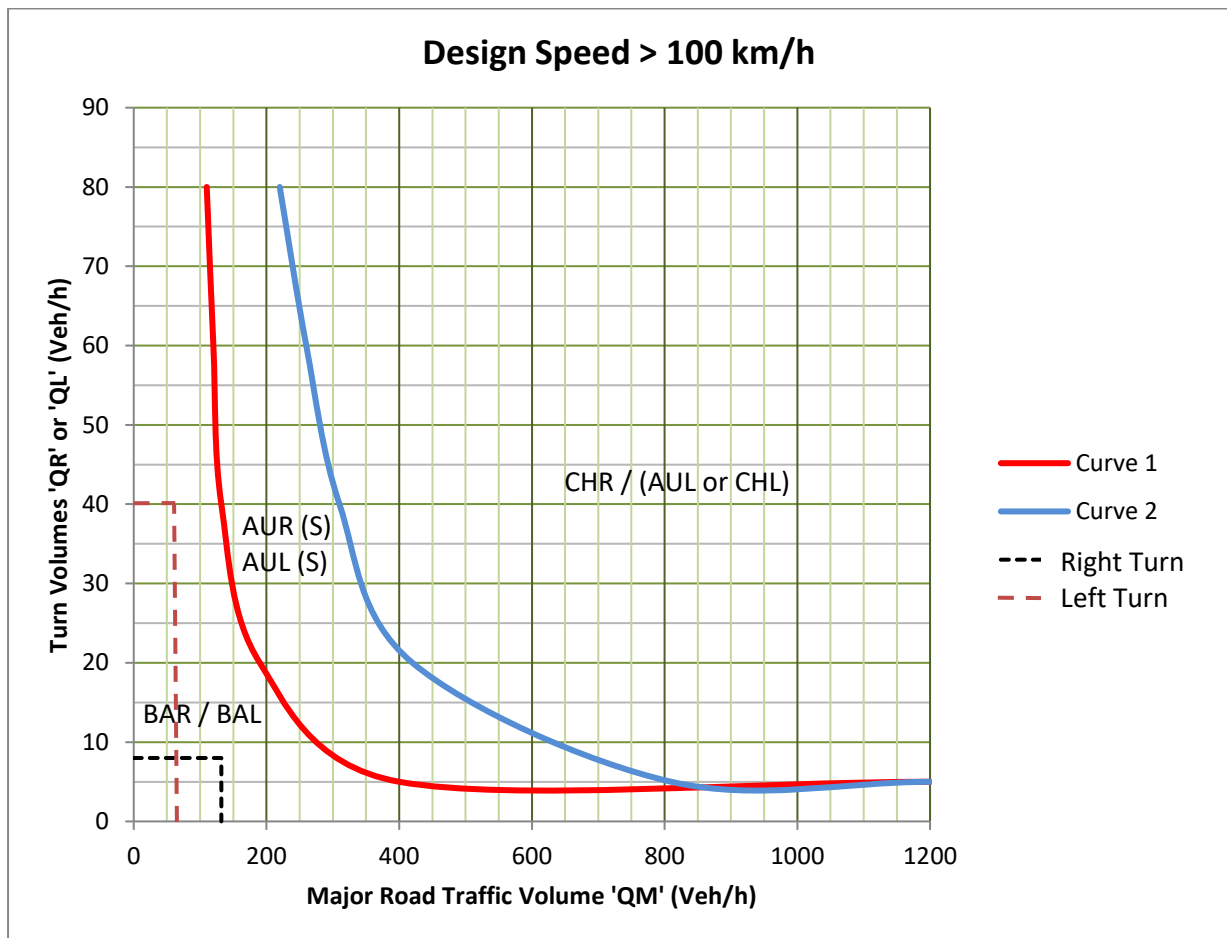


Figure 7 - Intersection Configuration Assessment

5.6. Site Access

5.6.1. Crossover Geometry

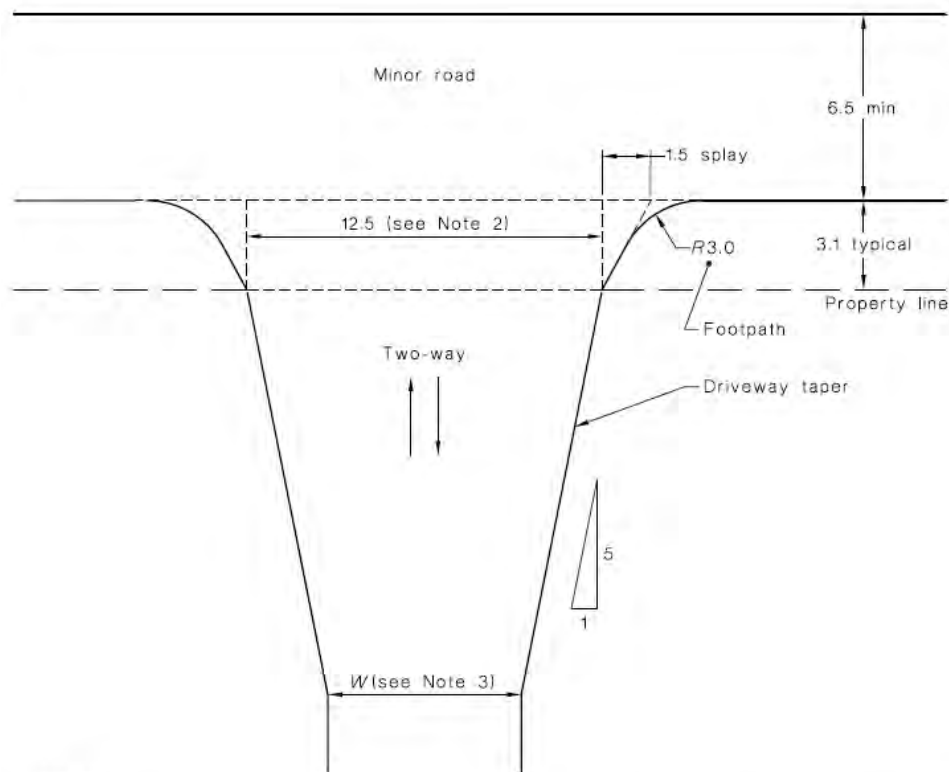
The site access movements were assessed in accordance with Australian Standard AS2890.2:2002 Parking Facilities Off-Street Commercial Vehicle Facilities.

Section 3.4.4 of the Standard recommends the driveway gradient to be as follows:

3.4.4 Driveway grade

The maximum grade on an access driveway together with the connecting circulation roadway for a distance extending from the property line to at least the longest wheelbase of any vehicle likely to use the driveway, shall be 1:20(5%). For AVs the wheelbase to be considered in this case shall be the longest single span between the centres of any two successive axles or axle groups.

Figure 3.1 of the Standard sets out the minimum design geometry of an access driveway.



NOTES:

- 1 In the case illustrated the HRV can turn left into the driveway from the left hand side of the public road. The design (19.0 m long) AV will take up most of the public road width when turning left into or out of the driveway, as will the HRV when turning out.
- 2 Corresponding dimensions for the MRV and SRV are 9 m and 6 m respectively. Larger vehicles may be able to use these narrower driveways depending on the width of public road available for manoeuvring in or out.
- 3 W = width of circulation roadway (see Table 3.1).

DIMENSIONS IN METRES

Detailed dimensions of the proposed crossover were not available at the time of preparing of this report, however as indicated by the client, site crossover will be designed in accordance with Australian Standards.

5.6.2. Access Sight Distance

The proposed access point is shown in Figure 8.

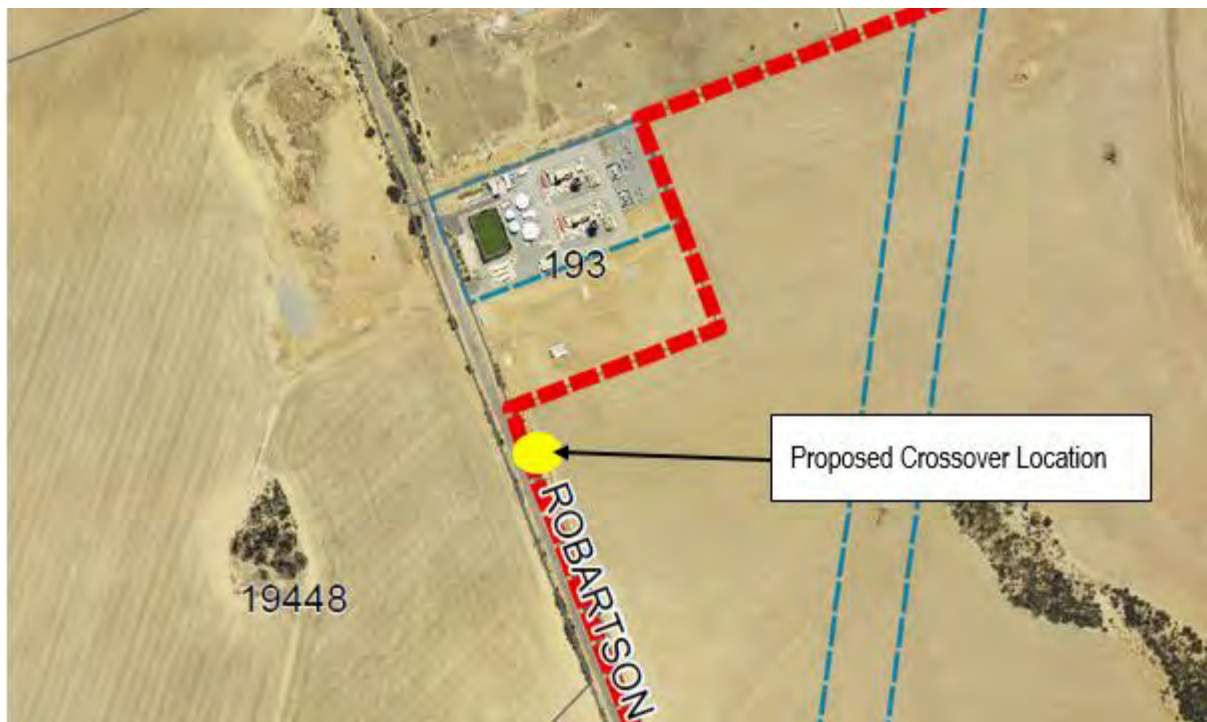


Figure 8 - Crossover Location

The required sight distance from the site egress along the street is defined in Figure 3.3 of AS2890.2 which is reproduced in Figure 9. Assuming operating speed on Robertson Road is 110km/hr.

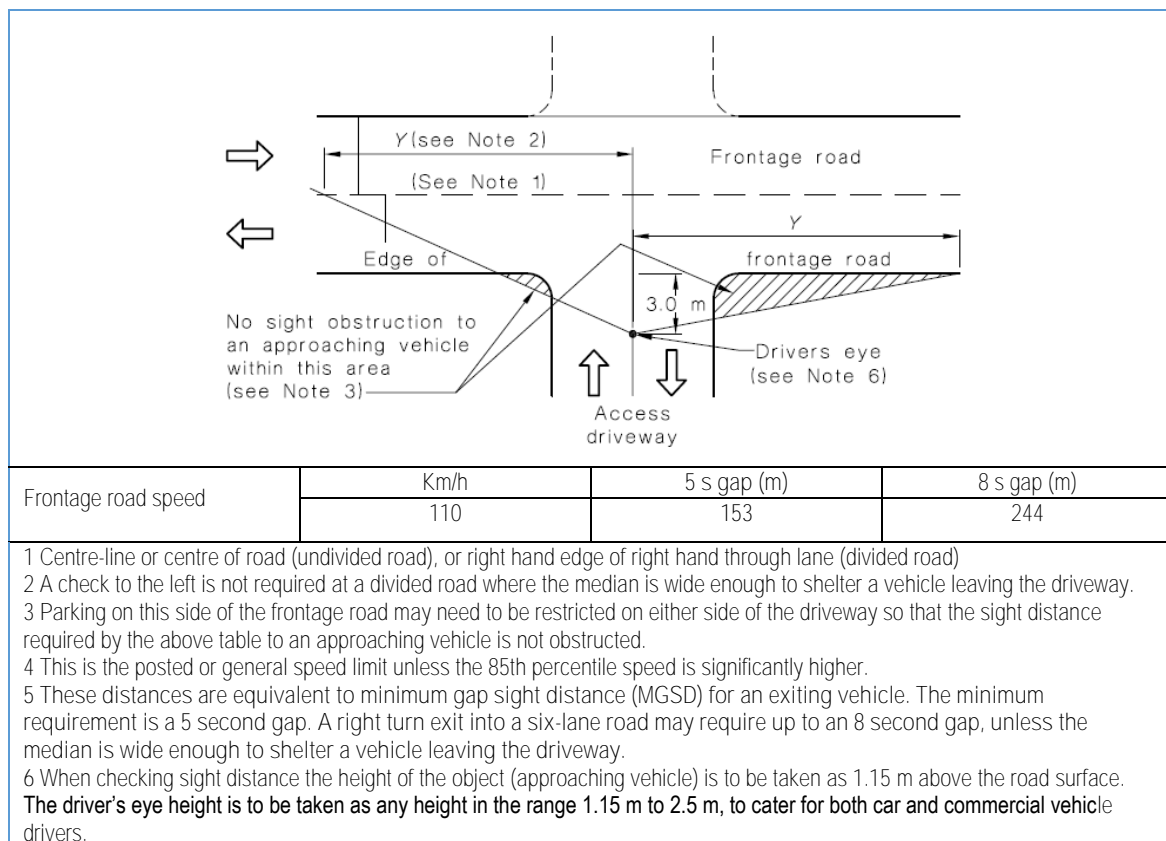


Figure 9 - Sight Distance Requirement

Robartson Road in the vicinity of the proposed crossover is relatively flat and has a straight alignment. The sight distance measurements to the north and south of the crossover location is shown below in Figure 10. A desktop review concluded that minimum sight distance in and out of the site could be achieved.



Figure 10 - Sight Distance Measurements

5.7. Parking

It is recognised that the parking demand would be much higher during construction period than the operation of the solar farm. Detailed parking provision and bay dimensions are not shown on site plan, however as indicated by the client, there will be ample parking provided during the construction period and dimensions of parking bays will be in accordance with Shire of Merredin Car Parking Policy.

6. Conclusion

A review of the traffic impacts associated with the construction phase of a proposed Solar Farm at Lot 194 Robartson Road & Lot 19444 Bruce Rock - Merredin Road, Merredin indicated the following:

- During the construction period of the proposed Solar Farm, the predicted increase of traffic from the site is 140 vehicles per day. Truck deliveries will typically be from the Perth using Great Eastern Highway and Robartson Road and site staff movements and in and out is expected to split 80/20 to the north and south of Robartson Road.
- Expected average increase in traffic of both construction and operation of the solar farm will not adversely impact the operation of the existing road network.
- No modifications are considered necessary to Great Eastern Highway / Robartson Road intersection and Bruce Rock-Merredin Road Robartson Road intersection.
- Sight distances at the proposed crossover location are considered to be satisfactory and the crossover is expected to operate safely.
- The required car parking provision will be in accordance with Shire of Merredin Local Planning Scheme No. 9 and Australian Standards AS2890.1.



Appendix A - Site Plan



LEGEND

- EXISTENT
- Fence - Personnel type substation
- Substation Fence - Personnel type substation
- Immersed High Road
- PV TRACKER: TAIL FRAME
- PV TAIL FRAME
- SEE EXPLANATORY NOTE 1 FOR DETAILS OF BATTERY STORAGE
- SCALE 1:100

SYSTEM SPECIFICATIONS		
AC CAPACITY @ 75°C	108.10	MW _{ac}
DC CAPACITY @ 75°C	121.21	MW _{dc}
MODULE CAPACITY	355	W
INVERTER CAPACITY	7.5	MVA
PCS CAPACITY	5.0	MVA
DC/AC RATIO	1.21	
ROW SPACING	7	m
TILT ANGLE	26.0°	
WIDTH	8°	
TOTAL MODULES	341040	
MODULES PER STRING	24	
NUMBER OF STRINGS	11160	
NUMBER OF PCS	20	
NUMBER OF INVERTERS @ 7.5MW	40	
NUMBER OF TRACKERS	8470	

NOTE 1

PROVISION FOR FUTURE BATTERY STORAGE:
 LAYOUT INCLUDES A PROVISION FOR BATTERY STORAGE THAT MAY BE INSTALLED AT A LATER STAGE. THE BATTERY STORAGE WILL CONSIST OF UP TO 50 NO. 40FOOT SHIPPING CONTAINERS. IT IS ANTICIPATED THAT THE LAYOUT COULD ACCOMMODATE UP TO 50MWH SUBJECT TO PROJECT FUNDING AND APPROVAL.

NOT FOR CONSTRUCTION

RCR-O'Donnell Gilchrist Pty Ltd
 Level 30
 50 Bridge Street
 Sydney NSW 2000
 Tel: +61 2 8412 3000

50 100 200 300 400

SCALE 1:8000

REVISION

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PROJ: MERREDIN

DESIGN: GA

STATUS: DRAFT

DATE: 2023-07-10



Appendix B - Traffic Count

Volume by Hour

2014/15

Great Eastern Hwy (H005)
West of Kellerberrin (SLK 195.42)

Count: Classification Counts

Average Vehicle Volume																Directional			
Hour	Mon		Tue		Wed		Thu		Fri		Sat		Sun		Mon - Fri		Mon - Sun		
	E	W	E	W	E	W	E	W	E	W	E	W	E	W	E	W	E	W	
0000	5	10	10	3	13	4	8	7	9	10	14	5	6	3	9	7	9	6	
0100	3	7	7	6	7	5	5	6	6	12	8	4	3	4	6	7	6		
0200	3	6	5	3	7	5	5	5	4	8	8	4	3	4	5	5	5	5	
0300	6	8	6	5	11	6	8	7	6	10	11	4	2	4	7	7	7	6	
0400	10	14	8	9	10	15	9	11	10	10	12	5	4	4	9	12	9	10	
0500	15	14	14	11	17	12	15	14	15	14	12	12	4	6	15	13	13	12	
0600	21	20	25	22	24	23	24	26	24	31	17	22	9	12	24	24	21	22	
0700	48	38	45	38	35	38	36	46	39	52	24	37	14	19	41	42	34	38	
0800	61	35	58	42	49	47	48	50	50	64	38	62	23	36	53	48	47	48	
0900	62	48	53	53	44	49	47	62	55	79	62	73	38	44	52	58	52	58	
1000	70	52	54	53	54	55	53	68	60	82	67	63	54	59	58	62	59	62	
1100	77	48	60	57	57	65	55	66	66	92	75	64	63	65	63	66	65	65	
1200	82	59	65	58	60	61	57	70	62	87	61	66	70	64	65	67	65	66	
1300	71	54	57	57	54	63	52	69	61	85	58	62	70	73	59	66	60	66	
1400	68	48	59	58	62	68	67	68	61	68	50	56	68	69	63	62	62	62	
1500	61	51	57	58	62	60	56	73	64	88	45	42	61	63	60	66	58	62	
1600	50	45	54	51	59	49	58	66	62	75	45	45	64	53	57	57	56	55	
1700	45	36	48	46	47	43	49	58	67	69	34	32	50	48	51	50	49	47	
1800	41	27	32	25	36	39	29	44	51	48	24	26	42	30	38	37	36	34	
1900	29	22	28	20	24	26	26	31	40	42	23	16	30	25	29	28	29	26	
2000	25	14	32	15	22	20	28	25	37	32	12	15	19	21	29	21	25	20	
2100	18	12	32	12	23	20	24	20	35	22	10	12	15	18	26	17	22	17	
2200	15	8	26	10	16	14	18	17	30	14	9	8	8	17	21	13	17	13	
2300	14	9	19	8	10	12	11	12	21	8	5	6	7	11	15	10	12	9	
Total	900	685	854	720	803	799	788	921	935	1102	724	741	727	752	855	845	818	815	

Peak Statistics

		Mon		Tue		Wed		Thu		Fri		Sat		Sun		Mon - Fri		Mon - Sun	
		E	W	E	W	E	W	E	W	E	W	E	W	E	W	E	W	E	W
AM	1/4 Hour	1145	1100	1130	1130	1015	1145	0830	0915	1130	1130	1100	0945	1145	1130	1130	1130	1130	1130
	1/4 Hr Vol	21	14	16	16	16	18	16	18	17	23	21	19	18	18	17	17	17	17
	1 Hour	1115	1145	1145	1130	1130	1130	1115	1130	1100	1100	1100	0900	1130	1130	1145	1130	1115	1130
	1 Hr Vol	81	54	64	63	59	64	59	72	63	89	74	71	71	68	64	68	65	68
	1 Hr Fact	.9567	.8438	.9256	.9587	.9031	.9143	.9415	.8926	.9265	.9604	.8691	.9204	.9089	.9444	.9557	.9344	.975	.941
PM	1/4 Hour	1245	1215	1215	1215	1215	1430	1445	1545	1530	1545	1200	1215	1200	1315	1445	1215	1200	1215
	1/4 Hr Vol	21	16	17	16	16	19	21	21	19	24	16	19	20	20	17	18	17	18
	1 Hour	1200	1200	1200	1445	1500	1415	1415	1500	1615	1215	1200	1215	1245	1315	1415	1200	1200	1200
	1 Hr Vol	80	58	64	60	61	71	70	74	65	87	60	67	71	73	64	66	64	66
	1 Hr Fact	.9677	.9063	.9256	.913	.9337	.9509	.8468	.881	.9648	.9667	.9459	.8883	.9632	.906	.9306	.9069	.969	.9133



Volume by Hour

2014/15

Bruce Rock Merredin Rd (M041)
South of Great Eastern Hwy (SLK 190.12)

Count: Classification Counts

Average Vehicle Volume

Directional

Hour	Mon		Tue		Wed		Thu		Fri		Sat		Sun		Mon - Fri		Mon - Sun	
	N	S	N	S	N	S	N	S	N	S	N	S	N	S	N	S	N	S
0000	1	1	1	1	1	1	1	2	1	2	1	2	1	1	1	1	1	1
0100	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1
0200	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
0300	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
0400	1	1	1	1	1	2	1	2	1	2	1	1	1	1	1	2	1	1
0500	2	3	1	3	2	3	1	4	1	3	1	2	1	1	1	3	1	3
0600	2	5	2	6	2	6	2	7	3	6	2	3	2	2	2	6	2	5
0700	7	6	7	8	7	7	7	7	5	7	5	4	3	4	7	7	6	6
0800	13	11	14	10	15	12	16	13	13	11	8	6	6	4	14	11	12	10
0900	13	8	12	9	13	9	15	11	14	10	14	8	7	5	13	9	13	9
1000	12	10	12	10	10	10	13	10	13	11	15	11	8	8	12	10	12	10
1100	11	11	11	11	12	11	12	12	13	12	11	12	10	10	12	11	11	11
1200	10	8	11	11	10	12	10	11	12	13	9	14	9	11	11	11	10	11
1300	11	9	12	10	10	11	11	13	11	14	9	10	8	9	11	11	10	11
1400	10	9	12	10	12	11	11	12	10	12	7	9	8	7	11	11	10	10
1500	11	11	12	11	12	11	12	13	11	13	7	7	8	7	12	12	10	10
1600	12	11	12	12	12	10	13	11	11	10	8	6	8	5	12	11	11	9
1700	10	8	11	8	12	9	12	10	9	10	7	6	7	5	11	9	10	8
1800	5	5	6	5	5	5	6	5	9	6	6	5	5	5	6	5	6	5
1900	3	3	3	4	3	4	3	4	4	4	4	4	2	3	3	4	3	4
2000	2	2	2	2	2	2	3	3	3	3	2	3	3	2	2	2	2	2
2100	1	2	2	3	1	2	2	3	3	3	2	2	1	1	2	3	2	2
2200	1	1	1	1	1	2	2	2	2	2	2	2	1	1	1	2	1	2
2300	1	1	1	1	1	1	1	1	1	2	1	2	1	1	1	1	1	1
Total	142	130	149	140	147	144	157	159	153	159	125	122	103	97	149	145	138	134

Peak Statistics

		Mon		Tue		Wed		Thu		Fri		Sat		Sun		Mon - Fri		Mon - Sun	
		N	S	N	S	N	S	N	S	N	S	N	S	N	S	N	S	N	S
AM	1/4 Hour	0845	0815	0815	1145	0845	0830	0845	0830	0945	0815	1030	1100	1100	1130	0845	0830	0845	1115
	1/4 Hr Vol	3	3	4	3	4	4	5	4	4	3	4	4	3	3	4	3	3	3
	1 Hour	0845	1100	0800	1130	0800	0800	0815	0800	0915	1145	1000	1145	1045	1145	0800	1100	0845	1100
	1 Hr Vol	12	10	14	11	15	12	16	12	14	12	15	13	10	10	14	11	13	11
	1 Hr Fact	.8876	.8929	.8876	.9343	.859	.7536	.8755	.85	.8707	.9623	.9284	.9364	.9155	.922	.9235	.9616	.9693	.9802
PM	1/4 Hour	1600	1530	1630	1630	1600	1615	1545	1300	1200	1300	1230	1245	1200	1230	1600	1515	1600	1245
	1/4 Hr Vol	3	3	4	3	3	3	4	4	3	4	3	4	2	3	3	3	3	3
	1 Hour	1545	1515	1430	1600	1515	1200	1545	1245	1545	1300	1200	1200	1200	1200	1545	1445	1545	1230
	1 Hr Vol	12	10	13	12	13	12	13	13	12	14	9	14	9	10	12	12	11	11
	1 Hr Fact	.9375	.8993	.9623	.9086	.9602	.9811	.877	.9208	.9871	.9201	.8827	.9015	.936	.922	.92	.9772	.9528	.9456

12.4 Lot 194 Robartson Road, Merredin and Lot 19444 Bruce Rock-Merredin Road, Merredin – Application for Development Approval – Solar Farm Facility

Development Services	
	
Responsible Officer:	Peter Zenni, EMDS
Author:	Paul Bashall, Planwest
Legislation:	Local Planning Scheme No. 6
File Reference:	A9516
Disclosure of Interest:	Nil
Attachments:	Attachment 12.4A - Development application
Maps / Diagrams:	Nil

Purpose of Report

☐

Executive Decision

☒

Legislative Requirement

Background

An application has been received for Development Approval (DA) on behalf of Stellata Energy for a 120MV solar farm on land about 5 kilometres south south-west of Merredin townsite. The site is composed of two lots Lot 194 (294.2ha) and Lot 19444 (237.77ha) with a total area of 532ha. Lot 194 is traversed by a series of easements for power lines.

These lots face Bruce Rock-Merredin Road with Lot 194 on the intersection with Robartson Road. Abutting the north-west corner of the property is the existing Merredin Power Station and 220/132kV Substation. Figure 1 provides a location plan in respect to Merredin townsite. The figure is sourced from Google Earth.

Existing landuse

The land is currently used for cropping and occasional grazing purposes and is almost completely cleared of vegetation. Figure 2 shows an aerial view of the property showing the few remaining areas of vegetation.

The areas surrounding the subject land are all used for similar purposes except the Reserve abutting the northern boundary of the site. This is a Reserve for Conservation (Reserve 19476) administered by the Department of Parks and Wildlife (DPaW).

FIGURE 1 – AERIAL VIEW OF SITE



Source: Landgate, Planwest

FIGURE 2 – AERIAL VIEW OF SITE



Source: Landgate, Planwest

Proposed Development

The proposed solar farm will have a generation capacity of approximately 120MW (AC) via the use of between 360,000 and 400,000 tracking solar panels and associated infrastructure, including:

1. Photo Voltaic modules;
2. Piles and framework;
3. Inverters (and associated housings);
4. Transformers (and associated housings);
5. Substations (including circuit breakers and metering);
6. Underground cabling;
7. Overhead wires;
8. Perimeter fence;
9. CCTV (at entrance and adjacent to substations);
10. Battery storage;
11. Spares storage building; and
12. Maintenance compound.

The DA application is for Stage 1 of the Merredin Solar Farm only. This Stage will consist of the 120MW (DC) of generation and up to 50 MWh of battery storage. It will cover the entirety of Lot 194 Robartson Road, and the north-western corner of Lot 19444 Bruce Rock-Merredin Road as shown on the Indicative Layout Plan (Figure 3).

Construction will possibly be in up to two phases. The generation equipment will all be constructed in one stage, with the battery storage in a subsequent stage.

Once fully operational, the landowner will have access to most the site for sheep grazing. This will assist in maintaining the ongoing agricultural use of the site and will also assist in keeping vegetation levels low for bushfire management purposes.

Part of the initial development includes some temporary development on site that will be required during the construction phase of the project. This includes the development of a construction compound and two or three site offices. The site offices spread across the site are likely to include meeting room, lunch room, toilets and ablution facilities.

Operations

The facility will be largely autonomous once operational. Local contractors/employees will be responsible for ongoing management of the site. It would be estimated that regular trips via vehicle would be required for routine maintenance, fire management, panel washing and grass cutting. The facility will be owned and operated by the Stellata Energy (or nominee).

In the longer term the proponents have allocated an area off Robartson Road for future possible battery storage.

FIGURE 3 – SITE LAYOUT



Source: Land Insights, 2017

Traffic and Transport

Shawmac completed a traffic impact assessment associated with the construction phase of the proposed solar farm. The assessment indicated the following:

1. during the construction period of the proposed solar farm, the predicted increase of traffic from the site is 140 vehicles per day. Truck deliveries will typically be from Perth using Great Eastern Highway and Robartson Road. Staff movements in and out is expected to split 80/20 to the north and south of Robartson Road;
2. expected average increase in traffic of both construction and operation of the solar farm will not adversely impact the operation of the existing road network;
3. no modifications are considered necessary to Great Eastern Highway / Robartson Road intersection and Bruce Rock-Merredin Road / Robartson Road intersection;
4. sight distances at the proposed crossover location are considered to be satisfactory and the crossover is expected to operate safely; and

5. the required car parking provision will be in accordance with Shire of Merredin Local Planning Scheme No. 6 and Australian Standards AS2890.1.

Visual Impact

Visual impact on the landscape is based on several factors which affect the perceived visual quality. The degree to which a solar farm development will impact on the landscape will depend upon:

1. siting, layout and design of the infrastructure, signage and ancillary facilities;
2. visibility of the development, having regard to the location, distance from which the development is visible, skyline and view sheds; and
3. significance and sensitivity of the landscape, having regard to topography, the extent and type of vegetation, natural features, land use patterns, built form character and community values. Methods to reduce impacts on visual amenity include:
 - a. siting the solar farm, ancillary buildings, access roads and transmission infrastructure to complement the natural landform contours and landform backdrop, including ridgelines;
 - b. ensuring the choice of materials and colour for the development complements the skyline and the backdrop of the view sheds;
 - c. minimising removal of vegetation and using advanced planting of vegetation screens as visual buffers where appropriate;
 - d. ensuring good quality vegetation and landform rehabilitation, onsite and off-site, where appropriate;
 - e. avoiding clutter, such as advertisements and apparatus; and
 - f. other amenity issues which can affect sensitive land uses including glint or glare, however this impact will be minimal as solar panels are specifically designed to absorb light instead of reflecting light.

Unlike a wind farm there are no large structures and minimal noise is produced.

The Land Insight report states that a visual analysis was undertaken using existing contour data, proposed heights of the solar panels, an average height of a person viewing the facility as being 1.75m, and a maximum horizontal viewing distance of 10 kilometres. The assessment concluded that the site will likely not be visible from the Merredin townsite at all. There may be some glimpses of small areas of the facility from the western approach to Merredin along Great Eastern Highway, but this is likely to be minimal.

Vegetation already existing around the perimeter of the site, particularly along the roads, provides some visual screening.

Environmental Assessment

An Environmental Management Plan (EMP) outlines each environmental feature, the potential impact and the environmental management proposals against each one.

The EMP has been prepared in accordance with the sequence of considerations designed to help manage adverse environmental impacts which includes avoidance, minimisation, rectification, reduction and environmental offsets. In this situation, avoidance of impact has been the priority, followed by minimisation of impact. The assessment shows that most potential environmental impacts have been avoided through careful site planning and management and minimisation of impact can also be achieved where impact cannot be avoided.

The types, locations and significance of flora and fauna, particularly endangered or threatened species in the development area can be mapped once the extent of clearing is known. Field surveys will help avoid highly sensitive areas of vegetation, including remnant native vegetation and enable roads and services to be placed appropriately.

During construction, disturbance and vegetation clearance can be avoided or minimised through careful siting and consideration of issues such as erosion, drainage run-off, habitat or food source destruction, dieback, weed hygiene, introduction of feral animals and contractor guidelines.

The land qualities across the site are relatively good, with low risk of salinity, low susceptibility of subsurface compaction, low water erosion hazard, low land instability and low flood risk and waterlogging risk. The wind erosion hazard is low across most the site, with some areas identified as having higher risk. The site drainage potential is poor to very poor across the site.

The drainage lines are not vegetated and are simply channels which offer the path of least resistance to water flow. Historic clearing and modification of the property for agriculture has most likely resulted in the alteration of natural watercourses and the formation of the existing drainage channels. They do not have any environmental value apart from their role in erosion control and movement of water throughout the landscape.

The site is relatively large and has good separation distances to sensitive land uses in the area. The nearest homestead is located approximately 150 metres to the south-east of the property (on the opposite side of Bruce Rock-Merredin Road). The proposed solar farm is separated from this homestead by approximately 100 metres of vegetation which provides an adequate visual buffer.

The next closest residence is located approximately 1 kilometre to the east of Lot 19444, with another two dwellings approximately 1.75 kilometres away. Another dwelling is located approximately 2.5 kilometres to the north-west of Lot 194.

Bushfire Management Plan

A Bushfire Attack Level (BAL) assessment was undertaken for the proposed development as part of a Bushfire Management Plan. The Plan concludes that the bushfire risk can be managed appropriately.

Heritage

No Registered or Other Heritage Sites have been identified on the site or on the Department of Aboriginal Affairs heritage database. If any heritage sites are identified during construction there are provisions for dealing with this under the *Aboriginal Heritage Act 1972*.

Comment

The value of the proposed development is in excess of \$160 million. As such the DA needs to be determined by the Joint Development Assessment Panel (JDAP), however the JDAP will seek the local government's views on the project.

The report states that construction and operation of the solar farm will aim to source as much local, regional, or Western Australian labour hire and materials as practicable. The construction period is expected to provide up to 200 jobs. There will be specific flow-on economic benefits and local employment for Merredin, including the requirement for housing during the construction period and a higher population in the area requiring goods and services during the construction period which will maximise benefits to the local community.

Policy Implications

The proposal will contribute to achieving the renewable energy targets set by the Australian Government and objectives of the Paris Climate Agreement.

Council has no direct policy on the establishment of a solar farm however it has been supportive of the establishment of sustainable energy sources through its approval of the Collgar Wind Farm.

Statutory Implications

State

The proposal is consistent with State objectives of encouraging the development of sustainable energy sources.

Local Government

The Local Planning Scheme No. 6 includes the land in the 'Rural' zone. Figure 4 provides an extract from the Scheme (source Land Insights/DoP).

The Scheme has no definition for a 'solar farm' and refers to the Model Scheme Text for the majority of its definitions. As a solar farm is an unlisted use it may be considered as a discretionary use for which the DA of local government is required and the public advertising procedures apply.

Clause 4.4.2 of the Scheme states that *'If a person proposes to carry out on land any use that is not specifically mentioned in the Zoning Table and cannot reasonably be determined as falling within the type, class or genus of activity of any other use category the local government may –*

- a) determine that the use is consistent with the objectives of the particular zone and is therefore permitted;*

- b) determine that the use may be consistent with the objectives of the particular zone and thereafter follow the advertising procedures of clause 9.4 in considering an application for planning approval; or
- c) determine that the use is not consistent with the objectives of the particular zone and is therefore not permitted.'

It is considered that sub-clause b) should apply as the development is a significant facility for the Shire and district and needs to be considered by all agencies and nearby neighbours.

FIGURE 4 – EXTRACT FROM LOCAL PLANNING SCHEME No 6



Strategic Implications

Local Planning Strategy

Council's Local Planning Strategy is silent on alternative energy production, including solar power, and includes no reference to any opposition to such facilities providing the loss to rural production is minimised. The proposal states that the land will continue to be grazed with sheep after construction is complete.

Strategic Community Plan

Vision Element: Developing
Strategic Goal: The population and economic base is expanding sustainably
Key Priority: Work with relevant agencies to actively encourage the adoption of efficient energy and water usage

Corporate Business Plan

Strategy: SP.D1.3 – Promote new commercial and industrial development through appropriate zoning of land, provision of suitable infrastructure and efficient business approval processes

Action#: 1
Directorate: Development Services
Timeline: Ongoing

Sustainability Implications

Strategic Resource Plan

There are no implications to the SRP stemming from the proposed development.

Workforce Plan

Directorate: Nil
Activity: Nil
Current Staff: Nil
Focus Area: Nil
Strategy Code: Nil
Strategy: Nil
Implications: Nil

Risk Implications

The development of this facility will be a minimal risk to Council. Initial construction traffic may require some maintenance of local roads however the longer-term benefits outweigh these short term costs.

Financial Implications

The applicant has paid the DA fee of \$34,196 (in addition to the JDAP fee – payable to JDAP).

Voting Requirements

☒ Simple Majority ☐ Absolute Majority

Officer's Recommendation / Resolution

Moved: Cr Boehme

Seconded: Cr Anderson

81939 That:

1. the Development Assessment Panel (DAP) Secretariat be notified that an application has been received by providing an electronic copy of the entire DAP application, including form, date received, date stamped plans and documents and receipt of DAP fees paid;
2. the Joint DAP be advised Council will advertise the Development Approval application for a period of 21 days, with neighbours and agencies being advised of the advertising period. These agencies are to include:
 - a. Main Roads WA (MRWA);
 - b. Department of Environment Regulation (DER);

- c. Department of Parks and Wildlife (DPaW);
 - d. Western Power (WP);
 - e. Department of Fire and Emergency Services (DFES); and
 - f. Department of Health (DoH); and
3. the applicant be advised Council will consider any submissions received during the advertising period, however Council is likely to request at least the following conditions:
- a. receipt of the necessary clearing permits from DER;
 - b. the submission and approval of a more detailed plan showing the proposed interim and longer term facilities including the building/structure setbacks, carparking facility, a drainage management plan for the administration facilities;
 - c. the design and location of on-site effluent systems for the construction phase as well as the longer term;
 - d. the removal of all construction infrastructure once the facility has been completed to the satisfaction of the local government; and
 - e. the approval of any crossovers required by the development.

Footnotes:

- 1. The applicant is advised that granting of development approval does not constitute a building permit and that an application for relevant building permits must be submitted to the Shire of Merredin and be approved before any work requiring a building permit can commence on site;
- 2. Effluent disposal facilities will require an application for the installation or construction of an apparatus for the treatment of sewage to be submitted to the Shire of Merredin;
- 3. The applicant is advised of the need for annual bushfire compliance; and
- 4. No structure or effluent disposal system is to be constructed across the boundaries of the two Lots.

CARRIED 9/o

The business of the meeting then returned to the normal order.

5. Officer's Reports - Development Services

5.1 Lot 194 Robartson Road, Merredin and Lot 19444 Bruce Rock-Merredin Road, Merredin – Application for Development Approval – Solar Farm Facility – Consideration of Public Submissions

Development Services	
Responsible Officer:	Peter Zenni, EMDS
Author:	Paul Bashall, PlanWest
Legislation:	Local Planning Scheme No. 6
File Reference:	A9516
Disclosure of Interest:	Nil
Attachments:	Attachment 5.1A – March Council Minutes Extract and Development Application Attachment 5.1B – Submissions and Comment
Maps / Diagrams:	Nil



Purpose of Report

☐

Executive Decision

☒

Legislative Requirement

Background

Land Insights (Planning Consultant) has applied for Development Approval (DA) on behalf of Stellata Energy for a 120MV solar farm on land about 5km south south-west of Merredin townsite. The site is composed of two lots Lot 194 (294.2ha) and Lot 19444 (237.77ha) with a total of 532ha. Lot 194 is traversed by a series of easements for power lines. These lots face Bruce Rock-Merredin Road with Lot 194 on the intersection with Robartson Road. Abutting the north-west corner of the property is the existing Merredin Power Station and 220/132kV Substation.

Determination by JDAP (Joint Development Assessment Panel)

As the proposal is over \$10m the JDAP is responsible for making the determination on the DA, however Council is required to provide a responsible authority report (RAR) to the JDAP. At its March 2017 meeting Council determined that, because the development is a significant facility for the Shire and district, it needs to be considered by all agencies and nearby neighbours prior to forwarding the proposal to JDAP (CMRef 81939).

Following Council's determination of the DA the RAR will be prepared and forwarded to JDAP by 5 June 2017.

Existing landuse

As previously reported, the land is currently used for cropping and occasional grazing purposes and is almost completely cleared of vegetation. Figure 1 shows an aerial view of the property showing the few remaining areas of vegetation.

FIGURE 1 – AERIAL VIEW OF SITE



Source: Landgate, Planwest

Summary of Proposed Development

The proposed solar farm will have a generation capacity of approximately 120MW (AC) via the use of between 360,000 and 400,000 tracking solar panels and associated infrastructure, including:

1. Photo Voltaic Modules;
2. piles and framework;
3. inverters (and associated housings);
4. transformers (and associated housings);
5. substations (including circuit breakers and metering);
6. underground cabling;
7. overhead wires;
8. perimeter fence;

9. CCTV (at entrance and adjacent to substations);
10. battery storage;
11. spares storage building; and
12. maintenance compound.

The DA application will consist of the 120MW (DC) of generation and up to 50 MWh of battery storage. It will cover the entirety of Lot 194 Robertson Road, and the north-western corner of Lot 19444 Bruce Rock-Merredin Road as shown on the Indicative Layout Plan (Figure 2).

Construction will possibly be in up to two phases. The generation equipment will all be constructed in one stage, with the battery storage in a subsequent stage.

Once fully operational, the landowner will have access to most of the site for sheep grazing. This will assist in maintaining the ongoing agricultural use of the site and in keeping grass levels low for bushfire management purposes.

Part of the initial development includes some temporary development on site that will be required during the construction phase of the project. This includes the development of a construction compound and two or three site offices. The site offices spread across the site are likely to include meeting room, lunch room, toilets and ablution facilities.

FIGURE 2 – SITE LAYOUT (Source: Land Insights, 2017)



Advertising

At its March 2017 Council agreed to advertise the proposed development for 21 days to gain comments from residents, ratepayers and agencies that have comments on the proposal (CMRef 81939).

During the advertising period (29 March 2017 to 19 April 2017) 4 submissions were received. The Department of Fire and Emergency Services (DFES) requested an extension to this period and its submission was received on 24 April 2017 (the 5th submission). The proposal was advertised in the West Australian and the Phoenix with neighbours and agencies being notified in writing of the proposal. The agencies included Main Roads WA, Department of Environment Regulation (DER), Department of Parks & Wildlife, Western Power, DFES and Department of Health.

Submissions

Attachment 5.1B provides a schedule of the submissions, including a summary of each submission, a comment and the action recommended, as well as a copy of each submission.

Briefly, the first submission from a neighbour raises concerns about drainage, reflection off the panels and increased traffic.

The second submission from DER raises concerns that no application had been received for the clearing of native vegetation, and that Lot 194 contains a wetland.

The third submission from Western Power advises the proposal is near a 'Danger Zone' of overhead power lines and other electrical network assets.

The fourth submission was received from the Department of Health raising no objections.

The fifth submission from DFES was received late and raised issues with the assigned Bushfire Hazard Level, the bushfire fighting provisions, the risk management plan and the need for on-going consultation. The submission recommends deferral of the application.

Policy Implications

The submissions received are not considered to be of significant magnitude to justify opposition to the development, however several conditions are warranted.

Statutory Implications

The proposal is consistent with State objectives of encouraging the development of sustainable energy sources.

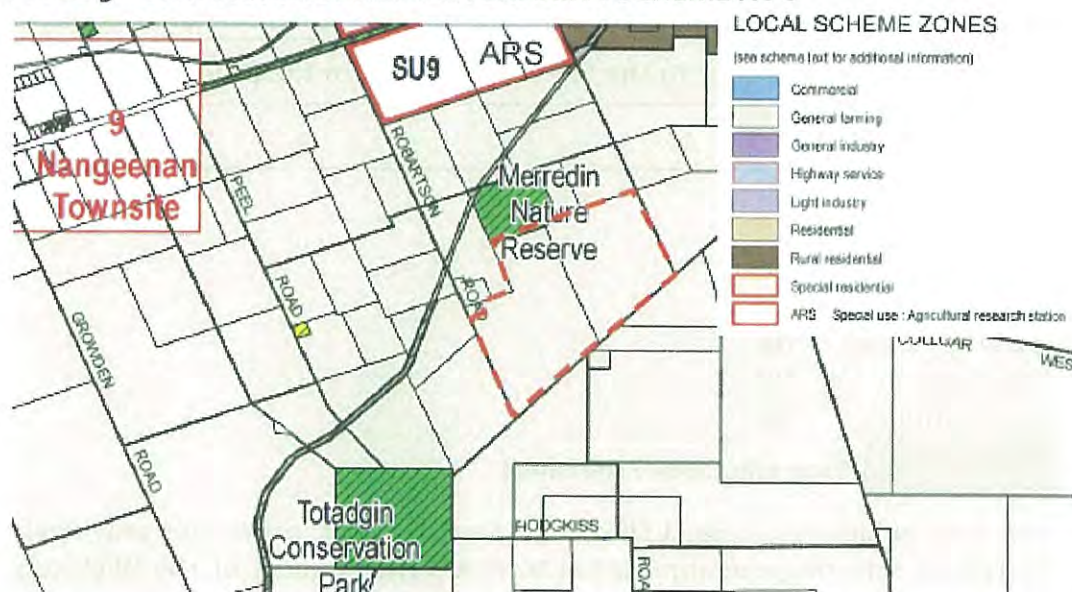
The LPS No. 6 includes the land in the 'Rural' zone. Figure 3 provides an extract from the Scheme (Source Land Insights/DoP). The Scheme has no definition for a 'solar farm' and refers to the Model Scheme Text for the majority of its definitions. As a solar farm is an unlisted use it may be considered as a discretionary use for which the DA of a local government is required and the public advertising procedures apply.

Clause 4.4.2 of the Scheme states that 'If a person proposes to carry out on land any use that is not specifically mentioned in the Zoning Table and cannot reasonably be determined as falling within the type, class or genus of activity of any other use category the local government may -

- (a) determine that the use is consistent with the objectives of the particular zone and is therefore permitted;
- (b) determine that the use may be consistent with the objectives of the particular zone and thereafter follow the advertising procedures of clause 9.4 in considering an application for planning approval; or
- (c) determine that the use is not consistent with the objectives of the particular zone and is therefore not permitted.

It was considered that sub-clause b) should apply as the development is a significant facility for the Shire and district and needed to be considered by all agencies and nearby neighbours.

FIGURE 3 – EXTRACT FROM LOCAL PLANNING SCHEME No 6



Strategic Implications

Local Planning Strategy

Council's Local Planning Strategy is silent on alternative energy production, including solar power, and includes no reference to any opposition to such facilities providing the loss to rural production is minimised. The proposal states that the land will continue to be grazed with sheep after construction is complete.

Strategic Community Plan

Vision Element: Developing
Strategic Goal: The population and economic base is expanding sustainably
Key Priority: Work with relevant agencies to actively encourage the adoption of efficient energy and water usage.

Corporate Business Plan

Strategy: SP.D1.3 – Promote new commercial and industrial development through appropriate zoning of land, provision of suitable infrastructure and efficient business approval processes.
Action#: 1
Directorate: Development Services
Timeline: Ongoing

Sustainability Implications

Strategic Resource Plan

There are no implications to the SRP stemming from the proposed development.

Workforce Plan

Directorate: Nil
Activity: Nil
Current Staff: Nil
Focus Area: Nil
Strategy Code: Nil
Strategy: Nil
Implications: Nil

Stop the Clock Provisions

The DAP guidelines suggest that the 'Stop the Clock' provisions only apply within 7 days of referring the application to JDAP. The content of the DFES submission suggests that the issues raised can be resolved through further consultation.

A delay of the responsible authority report can be requested to JDAP however it is suggested that the bushfire management issues can be resolved without needing to delay an approval – albeit conditioned.

Risk Implications

The development of this facility will be a minimal risk to Council. Initial construction traffic may require some maintenance of local roads however the longer-term benefits outweigh these short term costs.

Financial Implications

The applicant has paid the DA fee of \$34,196 (in addition to the JDAP fee – payable to JDAP).

Voting Requirements



Simple Majority



Absolute Majority

Officer's Recommendation / Resolution

Moved: Cr Young

Seconded: Cr Blakers

81966 That the JDAP Secretariat be advised that Council recommends that the Development Approval application for a solar farm facility at Lot 194 Robartson Road, Merredin and Lot 19444 Bruce Rock-Merredin Road, Merredin be approved subject to the following conditions:

1. receipt of the necessary clearing permits from the Department of Environment Regulation (DER);
2. clarification and protection (if appropriate) of the 'wetland' identified by the DER to the satisfaction of the DER;
3. the submission and approval of a more detailed plan showing the proposed interim and longer term facilities including the building/structure setbacks, carparking facility and the administration facilities;
4. the preparation of a Drainage Management Plan for the development to the satisfaction of Council;
5. the design and location of on-site effluent systems for the construction phase as well as the longer term to be in accordance with Council requirements;
6. the preparation of a Bushfire Management Plan to the satisfaction of the Department of Fire and Emergency Services to ensure that sites are appropriately classified and the necessary risk mitigation measures are in place;
7. the removal of all construction infrastructure once the facility has been completed to the satisfaction of Council;
8. Council approval of any crossovers required by the development; and
9. receipt of technical advice and evidence that the solar panels will not cause any harm to the nearest residences.

Footnotes:

1. The applicant is advised that granting of development approval does not constitute a building permit and that an application for relevant building permits must be submitted to the Shire of Merredin and be approved before any work requiring a building permit can commence on site.

2. Effluent disposal facilities will require an application for the installation or construction of an apparatus for the treatment of sewage to be submitted to the Shire of Merredin.
3. The applicant is advised that as the proposed work is near energised electrical installations and powerlines, the person in control of the work site must ensure that no person, plant or material enters the 'Danger Zone' of an overhead powerline or other electrical network assets. The 'Danger Zone' is set out in *Western Australian Occupational Safety and Health Regulation 1996* - specifically Reg 3.64. Any information provided by Western Power should not be used in isolation and reference to the *Occupational Safety and Health Act 1984* and *Occupational Safety and Health Regulations 1996* is required. These documents outline WorkSafe WA requirements for working near electricity.
4. The applicant is advised of the need for annual bushfire compliance.
5. No structure or effluent disposal system is to be constructed across the boundary of the two lots.

CARRIED 8/o

6.	Closure
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There being no further business the President thanked those in attendance and declared the meeting closed at 6.29pm.

SCHEDULE OF SUBMISSIONS

Sub #	Rec'd	Submittor	Address	Summary of Sub	Comment	Action
1	30/03/2017	R & R Robartson	549 Robartson Rd	Main concerns are; 1. stormwater runoff already occurs from the Western Power site; 2. Potential reflection from the solar panels; 3. Increased traffic on Robartson Road	1. The Council has already flagged the probability of imposing conditions to an approval relating to a drainage management plan; 2. The panels track the sun and are unlikely to reflect, however clarification will be requested; 3. Traffic is only likely to be increased during construction.	1. Condition to be imposed requiring a Drainage Management Plan to the Council's satisfaction; 2. Evidence that the solar panels will not cause injury through reflection; 3. No action required.
2	13/04/2017	DER	n/a	1. The information provided in the DA is not clear as to whether clearing of native vegetation will be required. No clearing application has been received; 2. Lot 194 contains a wetland that has not been addressed.	1. Applicant advises that DER prefers to have planning approvals in place before assessing clearing permits, however condition will be imposed. 2. The Wetland has yet to be located, however if it is found to be in need of protection this will be included in the responsible authority report to JDAP.	1. Condition requiring DER clearing permit approval required. 2. The location and significance of the wetland needs to be clarified through DER prior to the preparation of the responsible authority report.
3	6/04/2017	Western Power	Robartson Rd	1. The proposed works are near energised electrical installations and powerlines (a Danger Zone). No person shall enter the Danger Zone; 2. All work shall comply with 'WorkSafe' standards.	1. The applicant should be made aware of these factors.	1. These issues will be added as a footnote to the approval.
4	20/04/2017	Dept of Health	n/a	No objections.	No comment.	No action required.

5	24/04/2017	DFES	n/a	<p>1. The Bushfire Management Plan (BMP) incorrectly assigns Bushfire Hazard Levels (BHL) to certain areas - some should be 'extreme'. 2. The Bushfire Protection Criteria needs to demonstrate that the water storage capacity and location is adequate for the high-risk areas of the proposal. 3. The vegetation is not the only risk that needs to be assessed - the proposed infrastructure may have its own potential risk. 4. The BMP needs to demonstrate the high-risk areas can be safely managed, the battery storage areas are safe, and that the on-site intervention is able to protect the infrastructure rather than relying on external agency intervention. 5. Consultation with DFES is suggested. 6. The submission recommends deferral of the application.</p>	<p>It is evident that there are several issues that DFES has with the BMP. None of these issues have been flagged by DFES as being unresolvable. Although DFES recommends deferral of the application it is suggested that these issues can be resolved as a condition of the DA approval. If these issues are unresolvable the applicant has the option of an appeal to the State Administrative Tribunal (SAT).</p>	<p>That a condition be imposed on the approval for the preparation of a Bushfire Management Plan be prepared to the satisfaction of DFES.</p>
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Merredin Shire
Planning Proposal
Solar Farm

RO Robartson & Co
PO Box 109
Merredin
30th march 17

Dear Sir/ Madam,

Thank you the letter advising of the Solar farm proposal. As we have property adjoining and between the Proposal, I would like to make you aware of some concerns that we have.

I was contacted by Stella Energy just this week to advise me of their plans. The issue that I raised with them was about storm water run off. The current power station took no responsibility for their storm water even after I raised this problem with them. Currently the water is put onto Robartson Road and is cutting the shoulder of the road away. After heavy rain water washes straight over the road.

As Stella plans to cover some 400 hectare of their 535 hectare lease with solar panels, which is above the current power station, consideration must be made to at least have them follow the contour on the land where ever possible, so road way access won't increase the water flow onto our property causing wash a-ways and water logging. As the land purpose was use for agricultural purposes in the past, most of the water remained on the property except for a abnormal rain fall event, and a water wash on the west side facing Robartson Road. With access roads right across the property a huge amount of water will now find its way across our property and through the water way in the a joining paddock to cause increase flows down the hill . This will also impact the rail line and the sealed Robartson road.

Stella told me that they have not taken the water problem into consideration. The other concern was reflection off the solar panels. They said this would be minor but they couldn't guarantee that this would be the case.

Apart from these concerns and the increased traffic that will cause hardship handling stock along Robartson road, we will be happy to see the construction of the solar farm. The storm water problem will have to be address by Stella Energy and the Merredin Shire .

Thank you regards Ross Robartson
Rosa Robartson






Government of Western Australia
Department of Environment Regulation

Our ref: CEO1064/17
Enquiries: Teresa Gepp
Phone: 6467 5383
Email: advice.coordinator@der.wa.gov.au

Mr Greg Powell
Chief Executive Officer
Shire of Merredin

Via email: admin@merredin.wa.gov.au

Attention: Mr Peter Zenni

Dear Mr Powell

PLANNING APPLICATION – SOLAR FARM MERREDIN

I refer to the letter dated 24 March 2017 inviting comment from the Department of Environment Regulation (DER) on a proposed solar farm at Lot 194 on Plan 72840 Robartson Road and Lot 19444 on Plan 229756 Bruce Rock-Merredin Road, Merredin.

It is not clear from the information provided whether the proposal will involve the clearing of native vegetation. Under section 51C of the *Environmental Protection Act 1986* (EP Act), clearing of native vegetation is an offence unless undertaken under the authority of a clearing permit, or the clearing is subject to an exemption.

Exemptions for clearing that are a requirement of written law, or authorised under certain statutory processes, are contained in Schedule 6 of the EP Act. Exemptions for low impact routine land management practices are contained in the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* (the Regulations). Exemptions in the Regulations do not apply within environmentally sensitive areas (ESAs) declared by the Minister for Environment under section 51B of the EP Act.

An exemption from the requirement for a clearing permit is provided in the Regulations for clearing to construct a building (regulation 5, item 1), provided that the clearing is not located within an ESA:

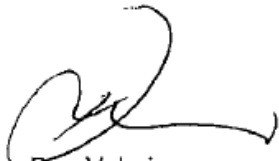
Clearing of a site for the lawful construction of a building or other structure on a property, being clearing which does not, together with all other limited clearing on the property in the financial year in which the clearing takes place, exceed 5 ha, if –
(a) *the clearing is to the extent necessary; and*
(b) *the vegetation is not riparian vegetation.*

According to available databases, both Lots contain areas of native vegetation, Lot 194 contains a wetland, and neither of the Lots contains an ESA.

DER has not received an application for a clearing permit from the proponent for the purpose of constructing a solar farm on the Lots.

Guidelines and fact sheets on the regulation of native vegetation clearing can be found on DER's website at www.der.wa.gov.au/your-environment/native-vegetation. Further information on the clearing permit process can be obtained by email (info@der.wa.gov.au) or by telephone on 9333 7469.

Yours sincerely

A handwritten signature in black ink, appearing to read 'Dan Volaric', with a stylized flourish at the end.

Dan Volaric
ACTING DIRECTOR GENERAL

13 April 2017

From: Tracey Weiss
Sent: Thursday, 6 April 2017 3:38 PM
To: Peter Zenni
Subject: FW: NOTICE OF PUBLIC ADVISERTISEMENT OF PLANNING PROPOSAL - LOT 194 ROBERTSON ROAD, MERREDIN & LOT 19444 BRUCE ROCK-MERREDIN ROAD, MERREDIN
Attachments: NOTICE OF PUBLIC ADVERTISEMENT OF PLANNING PROPOSAL.pdf

From: Customer Service Centre SSR [mailto:customer.service.centre.ssr@westernpower.com.au]
Sent: Thursday, 6 April 2017 2:20 PM
To: Tracey Weiss <adminofficer@merredin.wa.gov.au>
Subject: FW: NOTICE OF PUBLIC ADVISERTISEMENT OF PLANNING PROPOSAL - LOT 194 ROBERTSON ROAD, MERREDIN & LOT 19444 BRUCE ROCK-MERREDIN ROAD, MERREDIN

Dear Peter

Thank you for contacting us about your proposed work.

As your proposed work is near energised electrical installations and powerlines, the person in control of the work site must ensure that no person, plant or material enters the "Danger Zone" of an overhead powerline or other electrical network assets.

The "Danger Zone" is set out in Western Australian Occupational Safety and Health Regulation 1996 – Specifically Reg 3.64. ([Link](#))

Any information provided to you by Western Power should not be used in isolation and we recommend that you refer to the Occupational Safety and Health Act 1984 and Occupational Safety and Health Regulations 1996. These documents outline WorkSafe WA requirements for working near electricity.

For queries relating to these requirements, visit [WorkSafe](#) or contact WorkSafe on 1300 307 877.

To help you plan your works around Western Power's infrastructure, please follow the links below:

[Working Near Electricity](#)

[Dial Before You Dig](#)

If you require information about Western Power's infrastructure including plans, please complete a request for Digital Data attached.

If you require Western Power to complete work on your behalf, please complete the appropriate application form using the link below:

[Customer applications](#)

Should your project involve any changes to existing ground levels around poles and structures, or you will be working underneath power lines or around underground cables, please contact Western Power on 13 10 87.

We are obliged to point out that any change to Western Power's network is the responsibility of the individual developer.

Regards

Karen

Customer Service Centre Coordinator

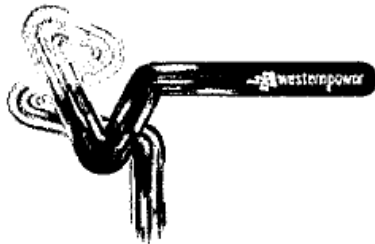
Customer Service

Western Power – 363 Wellington Street Perth WA 6000

T: 13 13 51 Emergencies and outages | **13 10 87** General Enquiries | **F: (08) 9225 2660**

E: enquiry@westernpower.com.au

W: westernpower.com.au



Electricity Networks Corporation, trading as Western Power
ABN: 18 540 492 861

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Government of **Western Australia**
Department of **Health**

SUBMISSION No 4

Your Ref: DA Solar Farm
Our Ref: EHB-01492 EHB17/403
Enquiries: Vic Andrich (08) 9388 4999

Mr Greg Powell
Chief Executive Officer
Shire of Merredin
PO Box 42
MERREDIN WA 6415

Attention: Peter Zenni, Executive Manager Development Services

Dear Mr Powell

**PROPOSED SOLAR FARM – LOT 194 ROBERTSON ROAD AND LOT 19444
BRUCE ROCK – MERREDIN ROAD, MERREDIN**

Thank you for your letter of 24 March 2017 requesting comment from the Department of Health (DOH) on the above proposal.

The DOH has no objection to the proposed development.

Should you have queries or require further information please contact Vic Andrich on (08) 9388 4999 or ehinfo@health.wa.gov.au

Yours sincerely

Jim Dodds
**DIRECTOR
ENVIRONMENTAL HEALTH DIRECTORATE**

10 April 2017

Environmental Health Directorate
All correspondence PO Box 8172 Perth Business Centre Western Australia 6849
Grace Vaughan House 227 Stubbs Terrace Shenton Park WA 6008
Telephone (08) 9388 4999 Fax (08) 9388 4955
www.health.wa.gov.au
28 684 750 332



Our Ref: D01686

Mr Peter Zenni
Shire of Merredin
emds@merredin.wa.gov.au

Dear Mr Zenni

**RE: LOT 194 ROBERTSON ROAD AND LOT 19444 BRUCE ROCK - MERREDIN ROAD
MERREDIN - PROPOSED SOLAR FARM - JDAP APPLICATION**

I refer to an email dated 31 March 2017 regarding the submission of a Bushfire Management Plan (BMP) dated 3 March 2017, prepared by Bushfire Prone Planning Pty Ltd (version 1.0) for the above development application. The Department of Fire and Emergency Services (DFES) provide the following comments with regard to *State Planning Policy 3.7 Planning in Bushfire Prone Areas* (SPP 3.7) and the *Guidelines for Planning in Bushfire Prone Areas* (Guidelines).

Assessment

- 1. Policy Measure – Information to accompany development applications**
 - i. Policy measure 6.5 of SPP3.7 and the relevant policy requirements apply.

2. Policy Measure 6.5 a) BAL Assessment

Issue	Assessment	Action
Bushfire Hazard Level Assessment	The BHL incorrectly assigns a low or moderate BHL rating for Plot 2, Plot 5, Plot 9, Plot 16, Plot 18, Plot 19 and Plot 20. These plots should be changed to an extreme-BHL rating to reflect the methodology of the Guidelines.	Modification required.

3. Policy Measure 6.5 c) Bushfire Protection Criteria

Element	Assessment	Action
Element 4 – Water	The BMP (page 4, paragraph 5) mentions two 50,000 litre water tanks for bushfire fighting (further details on the fittings are provided in Appendix 6.) It should be recognised that the acceptable solution for water is envisaged for domestic residential development, and the proposal has not assessed the risk to determine the optimal storage capacity and location of water supplies for this high-risk land use. It may be opportune to install the firefighting infrastructure prior to the construction phase.	Not demonstrated consideration of the complexity of the proposed high-risk land use and impact of bushfire hazard.

4. Policy Measure 6.6 - High-risk land uses

- i. Policy measure 6.6 of SPP3.7 and the relevant policy requirements apply.
- ii. SPP3.7 recognises that vegetation is not necessarily the only fuel in a bushfire event and that certain land uses may potentially ignite a bushfire, prolong its duration or increase its intensity.
- iii. High-risk land uses may also expose the community, firefighters and the environment to dangerous, uncontrolled substances during a bushfire event.
- iv. The BMP should outline a demonstrably significant reduction in the bushfire-related risk level to the community and facility through the introduction of this high-risk land use.

Issue	Assessment	Action
Risk Management Plan	6.6.1 – does not comply Submission of a Risk Management Plan for high-risk land uses is required.	Not demonstrated.
	The BMP has not considered that additional measures may be required for this high-risk land use to ensure the bushfire hazard is not increased and/or the ability to manage bushfire related hazards on adjoining lands is not otherwise adversely affected. The bushfire risk identified for the facility relies on external agency intervention, rather than any on-site intervention (e.g. sprinkler coverage) to protect the infrastructure.	Not demonstrated.
	There is insufficient information to address potential fire risk in the electrical equipment, inverters, panels, transformers and/or batteries. If the batteries used in the 50 MWh of storage are lithium ion, there is potential for a HAZMAT fire should cell failure occur. It is not clear what the scale of discrete electrical storage units are, whether there is any fixed fire suppression equipment to be incorporated into the design, or how sections of the plant may automatically or manually be isolated when an incident occurs. Will qualified electrical personnel be available locally who are able to isolate or de-energise sections of the facility in the event of an incident?	Not demonstrated.
Consultation	The DFES District Officer responsible for this region and the local fire and emergency services, should be consulted during the development, construction and leading up to the commissioning of the facility. It is critical for the local fire and emergency services to understand the hazards present in the facility and the measures required ensuring the safety of crews when working in or around different parts of the facility. This may impact on how the crews respond to a fire in the facility, which may in turn have ramifications in regard to the optimal number and location of water supplies. It should be noted that all responding units in the area are volunteer fire and emergency services.	Please forward any correspondence to advice@dfes.wa.gov.au to arrange this.

Recommendation – insufficient information

DFES has assessed the application including the supporting BMP, and has identified a number of critical issues that need to be addressed before DFES can support the application.

It is recommended that the application be deferred pending receipt of the additional information identified in the table(s) above.

Should you require further information, please contact Land Use Planning Officer Sandeep Shankar on telephone number 9482 1761.

Yours sincerely

A handwritten signature in blue ink, appearing to read 'M Neil', is positioned above the printed name.

Michelle Neil
DIRECTOR ADVISORY SERVICES

24 April 2017



Form 1 – Responsible Authority Report

(Regulation 12)

Property Location:	Lot 6 No.131 Northam-York Road, Muluckine
Development Description:	Proposed Power Generation
DAP Name:	Mid-West/Wheatbelt JDAP
Applicant:	Carnegie Clean Energy c/o Taylor Burrell Barnett Town Planning and Design
Owner:	DK West Investments Pty Ltd
Value of Development:	\$16 million
LG Reference:	A1149/P17031
Responsible Authority:	Shire of Northam
Authorising Officer:	Chadd Hunt (Executive Manager Development Services)
Department of Planning File No:	DAP/17/01197
Report Due Date:	6 th June 2017
Application Receipt Date:	17 th March 2017
Application Process Days:	90 Days
Attachment(s):	<ol style="list-style-type: none"> 1. Location Plan 2. Plans <ol style="list-style-type: none"> 2.1 NOR1-1-8-1 (Cadastral Map) 2.2 NOR1-1-1-1 REV 5 (Location Plan) 2.3 NOR1-1-2-1 REV 2 (Electrical Equipment Site Layout) 2.4 NOR1-1-5-1 (Site Access South Entry) 2.5 NOR1-1-6-1 REV 1 (Construction Facility) 2.6 NOR1-5-1-1 REV 2 (Overall Single Line Diagram) 3. Consultant Planning Report 4. Visual Analysis Photoset 5. Environmental Site Assessment Report 6. Technical Note – Noise Assessment for Northam PV Array 7. Technical Note – Light Reflection and Emissions from PV Arrays 8. Alternative Access Route Plan <ol style="list-style-type: none"> 8.1 NOR1-1-5-2 (Site Access North Entry) 8.2 NOR1-1-5-1 (Site Access South Entry) 9. Schedule of Submissions

Officer Recommendation:

That the Mid-West/Wheatbelt JDAP resolves to:

1. **Approve** DAP Application reference DAP/17/01197 and accompanying plans NOR1-1-8-1, NOR1-1-1-1 REV 5, NOR1-1-2-1 REV 2, NOR1-1-5-1, NOR1-1-6-1 REV 1 and NOR1-5-1-1 REV 2 in accordance with Clause 68 of the Planning and Development (Local Planning Schemes) Regulations 2015

Schedule 2 – Deemed provisions for Local Planning Schemes and the Shire of Northam Local Planning Scheme No. 6, subject to the following conditions as follows:

Conditions

General Conditions

1. This decision constitutes planning approval only and is valid for a period of 2 years from the date of approval. If the subject development is not substantially commenced within the 2 year period, the approval shall lapse and be of no further effect.
2. The development hereby permitted taking place in accordance with the stamped approved plans and supporting documentation.
3. All solar panels and ancillary infrastructures must be decommissioned and removed within 2 years of the cessation of operations, unless the local government agrees otherwise.
4. In relation to Condition 3, the site is to be rehabilitated to the satisfaction of the local government to enable broad-acre or other approved farming activities to resume/continue.
5. The stormwater shall be discharged in a manner so that there is no discharge onto the adjoining properties to the satisfaction of the local government.

Conditions to be met prior to the commencement of works

6. Prior to the commencement of works, the proponent shall prepare and implement an Operational Management Plan to the satisfaction of the local government that: -
 - Minimises the impact of the approved development on the amenity of the locality due to the transportation of materials to and from the site;
 - Details the temporary land uses, the built form of structures and the operation and management of those temporary uses;
 - Addresses the proponents' response to fire and emergency incidents;
 - Ensures the use of buildings, works and materials on the site do not generate unreasonable levels of noise, vibration, dust, drainage, wastewater, waste products or reflected light;
 - Manages weed and pest nuisances on the site and the locality; and
 - Addresses the post construction operations of the site and the removal of temporary structures
7. Prior to the commencement of works, a Construction Management Plan is to be submitted and approved in writing by the local government. The approved plan shall be adhered to throughout the construction period.
8. Prior to the commencement of works, the culvert over the Mortlock River which provides vehicle access to the site is to be repaired to the satisfaction of the local government.
9. Prior to the commencement of works, internal access to the site must be provided via an all-weather road with a minimum width of 3m to allow adequate access for emergency vehicles.
10. Prior to commencement of development, a detailed landscaping plan is to be submitted to and approved by the local government. The landscaping plan shall also address landscaping to be provided along the northern

perimeter of the subject site sufficient to provide a visual buffer to the adjoining property.

Conditions to be met prior to occupation

11. Prior to occupation, landscaping is to be completed in accordance with the approved plans or any approved modifications thereto to the satisfaction of the local government.
12. Prior to occupation, the site office shall be connected to an approved effluent disposal system.

Conditions requiring ongoing compliance

13. The on-site drainage system shall be maintained on an ongoing basis to the satisfaction of the local government.
14. All landscaped areas are to be maintained on an ongoing basis to the satisfaction of the local government.

Advice Notes

1. If the development the subject of this approval is not substantially commenced within a period of 2 years, or such other period as specified in the approval after the date of the determination, the approval shall lapse and be of no further effect.
2. Where an approval has so lapsed, no development shall be carried out without the further approval of the local government having first been sought and obtained.
3. If an applicant or owner is aggrieved by this determination there is a right of review by the State Administrative Tribunal in accordance with the *Planning and Development Act 2005* Part 14. An application must be made within 28 days of the determination.
4. A Building Permit being obtained prior to the commencement of any works.
5. The endorsed plans shall not be modified or altered without the prior approval of the Mid-West/Wheatbelt JDAP in accordance with Regulation 17 of the *Planning and Development (Development Assessment Panels) Regulations 2011*.
6. The Public Transport Authority have advised that vehicles in excess of 20m in length are not permitted to use the railway crossing.
7. The proponent is advised to liaise with the Department of Transport in regard to signage and line marking requirements for the railway crossing.

Details: outline of development application

Property Address:	Lot 6 No.131 Northam-York Road, Muluckine
Zoning	MRS: Not Applicable
	LPS: Rural
Use Class:	Power Generation - 'A'
Strategy Policy:	Shire of Northam Local Planning Strategy – July 2013
Local Planning Scheme:	Shire of Northam Local Planning Scheme No.6
Lot Size:	277.23 hectares

Zoning and Land Use

The proposal is for the construction of a 10MW Photovoltaic Solar Array and associated infrastructure which has been defined as a 'Power Generation' use under the Shire of Northam's Local Planning Scheme No.6 (the Scheme). Power Generation is defined in the Scheme as follows;

“power generation” means premises used predominantly to generate electricity for a commercial gain.

Lot 6 No.131 Northam-York Road, Muluckine is zoned 'Rural' under the Scheme. The objectives of the zone are as follows:

- *To provide for horticulture, extensive and intensive agriculture, agroforestry, local services and industries, extractive industries and tourist uses which ensure conservation of landscape qualities in accordance with the capability of the land.*
- *To protect the potential of agricultural land for primary production and to preserve the landscape and character of the rural area.*
- *To control the fragmentation of broad-acre farming properties through the process of subdivision.*
- *To protect land from land degradation and further loss of biodiversity by:*
 - *Minimising the clearing of remnant vegetation and encouraging the protection of existing remnant vegetation;*
 - *Encouraging the development of and the protection of corridors of native vegetation;*
 - *Encouraging the development of environmentally acceptable surface and sub-surface drainage works; and*
 - *Encouraging rehabilitation of salt affected land.*

Proposal

The proposed development would take place on a 35 hectare portion of the site which is 266 hectares in total. Refer **Attachment 1** – Location Plan. The proposal comprises:-

- Construction of four (4) solar arrays comprising of approximately 36,000 solar panels covering approximately 35 hectares of the subject site.
- The arrays are mounted to the ground with a horizontal axis tracking east to west allowing the panels to follow the sun throughout the day.
- Installation of a sea container to house a substation including transformer, inverter and control system
- Ancillary infrastructure including site office, control room and two laydown areas; and
- Connecting infrastructure including approximately 5 combiner boxes and above ground export cable to connect with the South Western Interconnected System (SWIS) via a 22kV feeder line to the north of the site.

Plans of the proposal are attached. Refer **Attachments 2.1 – 2.6**.

The remainder of the site which is not subject to this proposal will continue to be utilised for agricultural cropping activities. A full explanation of the proposal can be found in the applicant's report. Refer **Attachment 3** – Planning Report.

Background:

Lot 6 Northam-York Road, Muluckine (the site) is located approximately 300m outside of the Northam Townsite and approximately 100 km north east of Perth Central Business District.

Lot 6 is approximately 266 hectares in area and is zoned Rural. The site is currently used for agricultural cropping and contains ancillary farm sheds. The site also incorporates a section of the Mortlock River within the lot boundaries. The Kalgoorlie Pipeline severs the lot in an easterly direction. Refer **Attachment 1** – Location Plan.

The site does not have direct frontage to a legal road. Access to the site is obtained from the Northam-York Road via a railway crossing. Legal access is then obtained via a registered easement that runs through the adjoining Lot 7 Northam-York Road, Muluckine. Vehicles are also required to traverse a culvert over the Mortlock River once inside of boundary of Lot 6 in order to access the site. Refer **Attachment 2.4** – Site Access South Entry as well as **Attachment 8.2** – Site Access South Entry.

The proponent has investigated an alternative secondary access route should the primary access route become unavailable in an emergency such as a bushfire or flood. Alternative access may be obtained from the north of the subject site via Great Eastern Highway and other private land holdings. Refer **Attachment 8.1** – Site Access North Entry.

Surrounds

The site is land-locked and bound by adjoining privately owned land zoned 'Rural'. The surrounding land holdings are predominately utilised for agricultural cropping with the exception of the sand pit extractive industry to the southwest on Lot 7. Light and Service Industry zoned areas are located approximately 300m to the northwest and a residential area (Woodley Farm Estate) is located approximately 400m to the west of the site. Refer to **Attachment 1** – Location Plan for context.

Legislation and Policy:

Legislation

- *Planning and Development Act 2005*
- *Planning and Development (Local Planning Schemes) Regulations 2015*
- *Shire of Northam Local Planning Scheme No.6*
 - Clause 3.2.8 -Objectives of the Rural Zone
 - Clause 3.3 – Zoning Table
 - Clause 4.5 – Site and Development Standards and Requirements
 - Clause 4.8 – Outdoor Storage Areas
 - Clause 4.13 - Car Parking
 - Clause 4.14 – Traffic Entrances

State Government Policies

- Shire of Northam Local Planning Strategy
- Northam Regional Centre Growth Plan
- State Planning Policy 2.5 – Rural Planning

- State Planning Policy 3.7 – Planning in Bushfire Prone Areas

Local Policies

- LPP5 – Use of Sea Containers and Other Similar Storage Structures
- LPP20 – Advertising of Planning Proposals

Consultation:

Public Consultation

The application was advertised in accordance with Clause 64(1) of Schedule 2, Part 8 of the *Planning and Development (Local Planning Scheme) Regulations 2015* and Shire of Northam Local Planning Policy No.20 – Advertisement of Planning Proposals in the following manner:

- Publication of a notice in *The Advocate* of 29th March 2017;
- Displaying a notice on the Shire's website from 29th March 2017 until 12th April 2017 and;
- Notifying a total of 93 adjacent and nearby landowners in writing on 27th March 2017 and inviting comment.

The public submission period of 14 days ended on 12th April 2017. A total of 12 submissions were received including 2 late submissions. Of the submissions received, 11 of the submissions objected to the development proposal and 1 submitter made general comments.

Staff referred a copy of the submissions to the applicant on 17th April 2017, inviting a response. The applicant's responses have been incorporated into the Schedule of Submissions. Refer **Attachment 9** – Schedule of Submissions.

The objections received generally raised concerns in regard to the following issues:

Issue Raised	Officer's comments
Potential impacts to visual amenity and rural character including glare and visual bulk and scale impact.	<p>It is acknowledged that the solar arrays will be seen to varying degrees depending on location. However, it is considered that the solar arrays would not adversely impact the landscape and visual amenity values of the locality for the following reasons:</p> <ul style="list-style-type: none"> • Solar panels will be covered by glass with low reflectance for maximum absorption of sunlight to reduce glare. • Glare from the solar array will mostly be reflected upwards and not towards surrounding residents. • Solar panels will be a grey colour to ensure that the development blends in as much as possible with the surrounding landscape. • The development is situated in a low lying area and will be partially

Issue Raised	Officer's comments
	<p>obscured by native vegetation and other buildings in the view shed (as viewed from the Woodley Farm Estate).</p> <ul style="list-style-type: none"> The development would not obstruct overall views of the surrounding areas and ridgelines of the hills to the north-east.
Potential noise impacts to surrounding residents.	<p>Noise generated by the development will be consistent with normal rural background noise and will not exceed limits set by the <i>Environmental Protection (Noise) Regulations 1997</i>.</p> <p>The potential impact of noise during the construction phase of the project will be managed.</p>
Potential health impacts to surrounding residents including increased heat and electromagnetic fields (EMFs).	<p>It is unlikely that surrounding land owners will experience an increase in temperatures due to the development. There is no known evidence that EMFs can affect human health.</p>
Incompatibility of the proposal with the objectives of the rural zone	<p>The proposed development is consistent with the objectives of the rural zone due to the following reasons:</p> <ul style="list-style-type: none"> The proposal will provide for a new local industry that is compatible with existing rural uses. While there will be a loss of agricultural land, the proposal would not result in the loss of quality agricultural land or prevent other rural land uses from occurring in the area. The subject land has not been identified as priority agricultural land within the context of State Planning Policy 2.5 – Rural Planning. The area of agricultural land to be affected by this proposal is approximately 35 hectares. The development will not result in removal of native vegetation, loss of biodiversity or other environmental impact. The proposed development will not obstruct ridgelines which contribute to the character of the area.

Internal Consultation

The application was circulated internally and the development proposal discussed with key technical staff at a Development Control Unit (DCU) meeting. No major

concerns were raised, however the Council's Engineering Services department advised that a stormwater management plan is recommended to be implemented considering the potential of the development for significant runoff.

Consultation with other Agencies or Consultants

A total of eight (8) external government agencies were consulted in writing on 28th March 2017 in regard to this application, including;

- Main Roads Western Australia (MRWA);
- Western Power;
- Department of Water (DoW);
- Water Corporation;
- Brookfield Rail;
- Public Transport Authority (PTA);
- Department Environment Regulation (DER); and
- Department of Agriculture and Food.

Submissions were received from the following agencies:

- MRWA;
- DER;
- PTA; and
- DoW.

The submissions provided advice only and did not raise any concerns in relation to the proposal. Refer **Attachment 9** – Schedule of Submissions.

Planning Assessment:

Shire of Northam Local Planning Scheme No.6

The site is zoned 'Rural' and is currently used for agricultural cropping. The proposed 10MW Photovoltaic Solar Array has been assessed a 'Power Generation' land use as defined under the Scheme. The proposal has been considered against the objectives of the rural zone as outlined in Clause 3.2.8 of the Scheme in the table below.

Rural Zone Objective	Compliance
To provide for horticulture, extensive and intensive agriculture, agroforestry, local services and industries, extractive industries and tourist uses which ensure conservation of landscape qualities in accordance with the capability of the land.	Compliant The proposal would provide for a new local industry.
To protect the potential of agricultural land for primary production and to preserve the landscape and character of the rural area.	Compliant The proposal has been situated on land that is of lower quality for agricultural purposes. The proposal has been sited below ridge lines to preserve visual landscape quality. The development will be partially

Rural Zone Objective	Compliance
	screened from view by existing and proposed vegetation.
To control the fragmentation of broad-acre farming properties through the process of subdivision.	Not Applicable
<p>To protect land from land degradation and further loss of biodiversity by:</p> <ul style="list-style-type: none"> Minimising the clearing of remnant vegetation and encouraging the protection of existing remnant vegetation; Encouraging the development of and the protection of corridors of native vegetation; Encouraging the development of environmentally acceptable surface and sub-surface drainage works; and Encouraging rehabilitation of salt affected land. 	<p>Compliant</p> <p>No clearing of remnant vegetation is required.</p> <p>The development will be partially screened by the retention of existing vegetation and planting of new vegetation on site for screening purposes.</p> <p>The development will not result in drainage issues.</p> <p>The development will not result in any salinity impacts.</p>

The Scheme also contains general requirements applicable to the proposal, these requirements have been detailed in the table below.

Item	Requirement	Proposal	Compliance
Land Use Permissibility	Table 1 – Zoning Table Power Generation – ‘A’ use in the Rural zone.	Use it is not permitted unless special notice is given in accordance with clause 64 of the deemed provisions (minimum 14 days). LPP20 also applies.	Compliant Notice of proposal provided to agencies and local community in accordance with clause 64 and LPP20 (see ‘consultation’ section).
Setbacks	Table 2 – Site and Development Requirements Table Minimum front setback: 25m Minimum side and rear setback: 20m	The development is setback 100m to the nearest boundary.	Compliant
Outdoor Storage Areas	Clause 4.8.1 - Laydown areas should be sealed, paved and/or landscaped. Clause 4.8.2 – Laydown areas shall be screened	Two laydown areas proposed.	Compliant Laydown areas will be screened by existing vegetation

Item	Requirement	Proposal	Compliance
	from public view.		
Car Parking	Table 3 – Car Parking Guidelines – determined at the discretion of the local government.	Limestone covering will be provided for internal car parking and laydown area. Car parking bays will not be line marked.	Compliant The development does not generate a demand for car parking. Car parking can be accommodated within the laydown areas.
Traffic Entrances	Clause 4.14.3 Vehicles required to enter and leave the site in a forward direction	No further upgrades to the existing site access is proposed.	Compliant Existing vehicle access onto Northam-York Road provides ingress and egress in a forward direction.

Shire of Northam Local Planning Strategy

The proposal is consistent with the strategy which identifies that *there is a need to encourage and continue to support the development of alternative energy production in the Shire such as solar which have significant potential and environmental benefits.*

Northam Regional Centre Growth Plan

The Growth Plan identifies the need to encourage renewable energy options as a strategic goal of the Growth Plan. It is considered that the proposal is consistent with the growth plan.

State Planning Policy 2.5 – Rural Planning

State Planning Policy 2.5– Rural Planning (SPP2.5) applies to all lots zoned 'Rural'. The intent of SPP2.5 is to protect rural land and to encourage a diversity of compatible rural land uses. The proposal has been considered against Clause 5.1 which outlines the objectives of SPP2.5 in the table below.

Objective	Compliance
(a) requiring that land use change from rural to all other uses be planned and provided for in a planning strategy or scheme;	Compliant The proposal is a use that can be considered within the Rural zone under the Scheme.
(b) retaining land identified as priority agricultural land in a planning strategy or scheme for that purpose;	Compliant The site has not been identified as priority agricultural land within SPP2.5).
(c) ensuring retention and protection of rural land for biodiversity protection, natural resource management and protection of valued landscapes and views;	Compliant The proposal has been sited below ridge lines to preserve visual landscape quality. The development will be partially screened from view by existing and

Objective	Compliance
	proposed vegetation.
(d) protecting land, resources and/or primary production activities through the State's land use planning framework;	Compliant The proposal has been situated on land that is of lower quality for agricultural purposes.
(e) creating new rural lots only in accordance with the circumstances under which rural subdivision is intended in Development Control Policy 3.4: Subdivision of rural land;	Not Applicable
(f) preventing the creation of new or smaller rural lots on an unplanned or ad-hoc basis, particularly for intensive or emerging primary production land uses;	Not Applicable
(g) comprehensively planning for the introduction of sensitive land uses that may compromise existing, future and potential primary production on rural land; and	Not Applicable
(h) accepting the impacts of well-managed primary production on rural amenity	Compliant The proposed development would not result in any impact to surrounding primary production uses. The area underneath the proposed solar arrays can be utilised for livestock grazing.

State Planning Policy 3.7 – Planning in Bushfire Prone Areas

State Planning Policy 3.7 (SPP3.7) applies to development within the designated bushfire prone area. However, as the proposed development is for non-habitable structures that are considered to be 'infrastructure' the proposal is exempted from the requirement for a Bushfire Attack Level (BAL) assessment.

Local Planning Policy 5 - Use of Sea Containers and Other Similar Storage Structures

Local Planning Policy 5 (LPP5) applies to this proposal as one permanent sea container is proposed to house a substation which includes a transformer, inverter and control system. The proposal also details that up to ninety (90) sea containers may be placed on the site temporarily during the construction phase of the development.

Item	Requirement	Proposal	Compliance
Temporary Sea Containers	Clause 2.3.1 – Sea Containers located on private land during approved construction works are exempted.	Up to 90 sea containers would be placed on site during the construction phase.	Compliant All temporary sea containers are required to be removed upon completion of works.

Item	Requirement	Proposal	Compliance
Permanent Sea Container	Clause 5.3.1 – A maximum of 1 sea container 12m in length	1 permanent sea container to be used as a substation.	Compliant One 12m length sea container is proposed.
	Clause 5.3.2 – Sea containers shall be screened from view.	The sea container will be screened by the solar array and by existing native vegetation.	Compliant
	Clause 5.3.3 – Sea Containers must comply with the minimum boundary setbacks for the zone.	The sea container is setback more than 25m from the nearest boundary.	Compliant
	Clause 5.3.4 – Sea containers shall be painted a colour that is similar to existing buildings.	The sea container is proposed to be painted white.	Compliant There are no nearby buildings.

Local Planning Policy 20 - Advertising of Planning Proposals

In addition to Part 7 of the deemed provisions, advertising of planning proposals is required to be carried out in accordance with LPP20. LPP20 does not contain specific criteria for the advertisement of proposals for power generation, therefore, discretion was required to determine the appropriate level of advertising. Because the proposal is classified as an 'A' (Advertising) use under the Scheme, it was determined that advertising would be undertaken in accordance with Level 4.

Item	Requirement	Proposal	Compliance
Advertisement of application for Power Generation	Level 4 – All owners of properties located wholly and partly within a 1km radius of the centre of the proposed site.	Publication of a notice in <i>The Advocate</i> of 29 th March 2017; Displaying a notice on the Shire's website from 29 th March 2017 until 12 th April 2017 and; Notifying a total of 93 adjacent and nearby landowners in writing on 27 th March 2017 and inviting comment.	Compliant

Officer Comments

The submissions received raised concerns regarding potential impacts to human health including glare, heat, noise and electromagnetic fields (EMFs) as a result of

the development. Concerns were also raised in relation to the developments compatibility with the rural zone along with impacts to the visual amenity of the area.

Objectives of the rural zone

The proposal is consistent with the objectives of the rural zone. The proposal will provide an opportunity for a new industry (power generation) in a form that is compatible with existing rural uses. The portion of the lot where the development is proposed is already cleared land and no further removal of native vegetation is required.

The solar array is proposed on land that is low-quality agricultural land. However, the land may still be used for livestock grazing in conjunction with the development as livestock may be utilised to manage vegetation underneath the solar arrays. It should also be noted that the solar arrays can be easily removed at the end of the development's lifespan, and the land returned to its previous state.

Visual Amenity

It is acknowledged that the proposed development will be visible from surrounding properties, particularly those that are located at a higher elevation than the development. However, Shire staff are satisfied that the development has been sited in a location that seeks to avoid impacts to visual amenity. The proposed development is situated in a low lying area and does not obstruct overall views of the surrounding areas and ridgelines of hills to the north. Furthermore, the development is partially obscured by existing mature vegetation.

Glare

Many of the submissions received cited glare resulting from the sun hitting the solar panels as a concern. In order to minimise glare nuisance, the solar panels will be designed to reflect minimal light and will be covered by glass with low reflectance for maximum absorption of sunlight to reduce glare. Glare reflection would also differ throughout the year due to changes in the altitude of the sun throughout the seasons.

The occurrence of glare for surrounding land owners would also be restricted to certain times of the day as the solar array has been designed on a single axis system which means that the panels move throughout the day to follow the sun. The applicant has advised that glare resulting from the solar panels is likely to be less than other forms of glare such as glare from parked cars, which are more likely to cause a nuisance.

Glare from solar panels will be mostly reflected upwards and not towards surrounding residents. Potential glare impacts to pilots has also been considered as part of this proposal. The applicant has detailed in their report that glare resulting from the solar panels is considered to be minor and similar to that of a smooth body of water when viewed from above. Other components of the development including the structures that the panels are affixed to are not expected to cause glare.

Noise

Whilst some noise is anticipated during the construction phase of the development, it is not expected to exceed the limits set by the *Environmental Protection (Noise) Regulations 1997*. Once operational, an ongoing humming noise may be generated by development, however it is unlikely to be audible by any adjoining land owner and will be consistent with normal rural background noise.

Heat

According to the applicant's report, solar panels are designed to both absorb sunlight and to offload excess heat in order to maintain efficient temperature range. It is possible that the solar arrays may cause the ambient air temperatures at the site to rise by up to 4 degrees on warm days. However, evidence suggests that heat dissipates over short distances and may be absorbed by the ground. In addition to this, nearby vegetation may have a cooling effect. It is therefore considered to be unlikely that surrounding residents will notice any increase in temperature as a result of the development.

Electromagnetic Fields

There is no known evidence that EMFs resulting from solar panels can affect human health. Furthermore, the site will be fenced for security purposes to prevent people from entering close EMF range of the solar arrays. Potential health impacts relating to EMFs is not a matter that is required to be considered when making a determination in regard to a development application.

Vehicle Access

Access to the site is obtained via an easement over adjoining Lot 7 and also requires the crossing of the railway line and Mortlock River. Upon receipt of the current application, Officers conducted a site visit and found that the culvert had been severely damaged by a recent flooding event and is not passable for heavy vehicles. It is therefore recommended that a condition be imposed requiring that the culvert be repaired to a standard suitable for heavy vehicles prior to the commencement of works.

The Public Transport Authority (PTA) have also raised concerns about the safety of the level crossing over the railway line. The PTA has recommended that conditions be imposed requiring that new signage and line marking be installed and that a traffic management plan be implemented during the construction stage of the development. The recommendations of the PTA have been incorporated into the recommendations of this report.

Should the primary access route become inaccessible in emergency events such as bushfire or flood, the proponent has demonstrated that an alternative access route can be obtained from the north via Great Eastern Highway and other private land holdings Refer **Attachment 8.1** – Site Access North Entry (Alternative Access Route Plan). The northern entry point on Great Eastern Highway is existing and are used by the landowners for their farm.

Carnegie are consulting with key stakeholders on access, including the landowners (who are supportive), Main Roads WA, the PTA and WaterCorp.

Options/Alternatives:

N/A

Council Recommendation:

N/A

Conclusion:

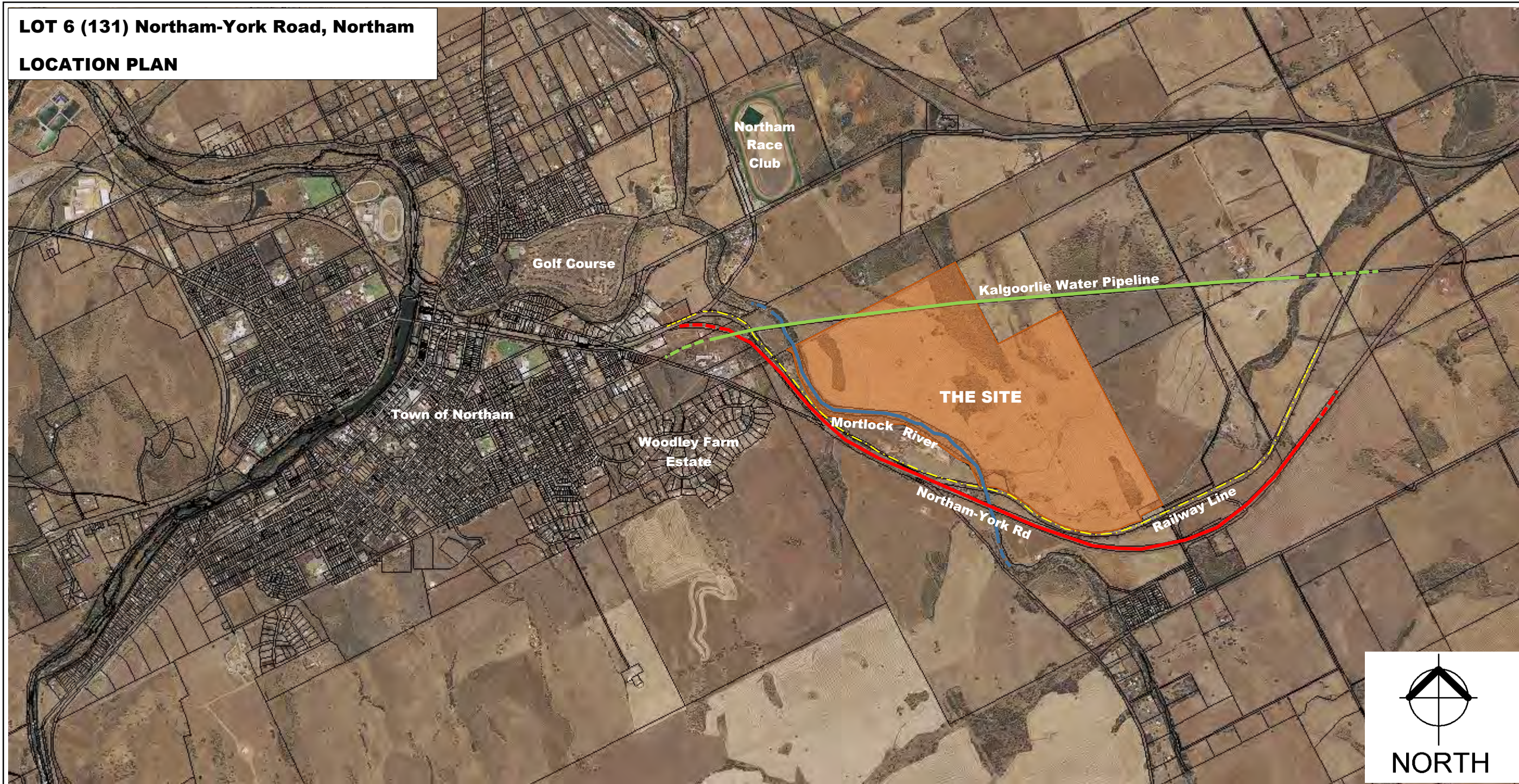
The proposed development is considered to comply with the Shire of Northam's statutory and strategic planning requirements.

Whilst it is acknowledged that the development will be visible, it is considered that the development would not have a detrimental impact upon the visual amenity of the surrounding area. An appropriate condition is recommended to ensure that additional landscaping as screening and the vehicles access arrangements over the railway line and Mortlock River are addressed by the applicant. The applicant has demonstrated that other impacts such as glare, heat, noise will be minimal and will not result in a nuisance for nearby residents.

It is considered that the proposal is consistent with the objectives of the Rural zone including the relevant development requirements under the Scheme. Officers are therefore satisfied that the development would not compromise the agricultural viability of the land, or prevent agricultural uses from taking place on the remaining areas of the site.

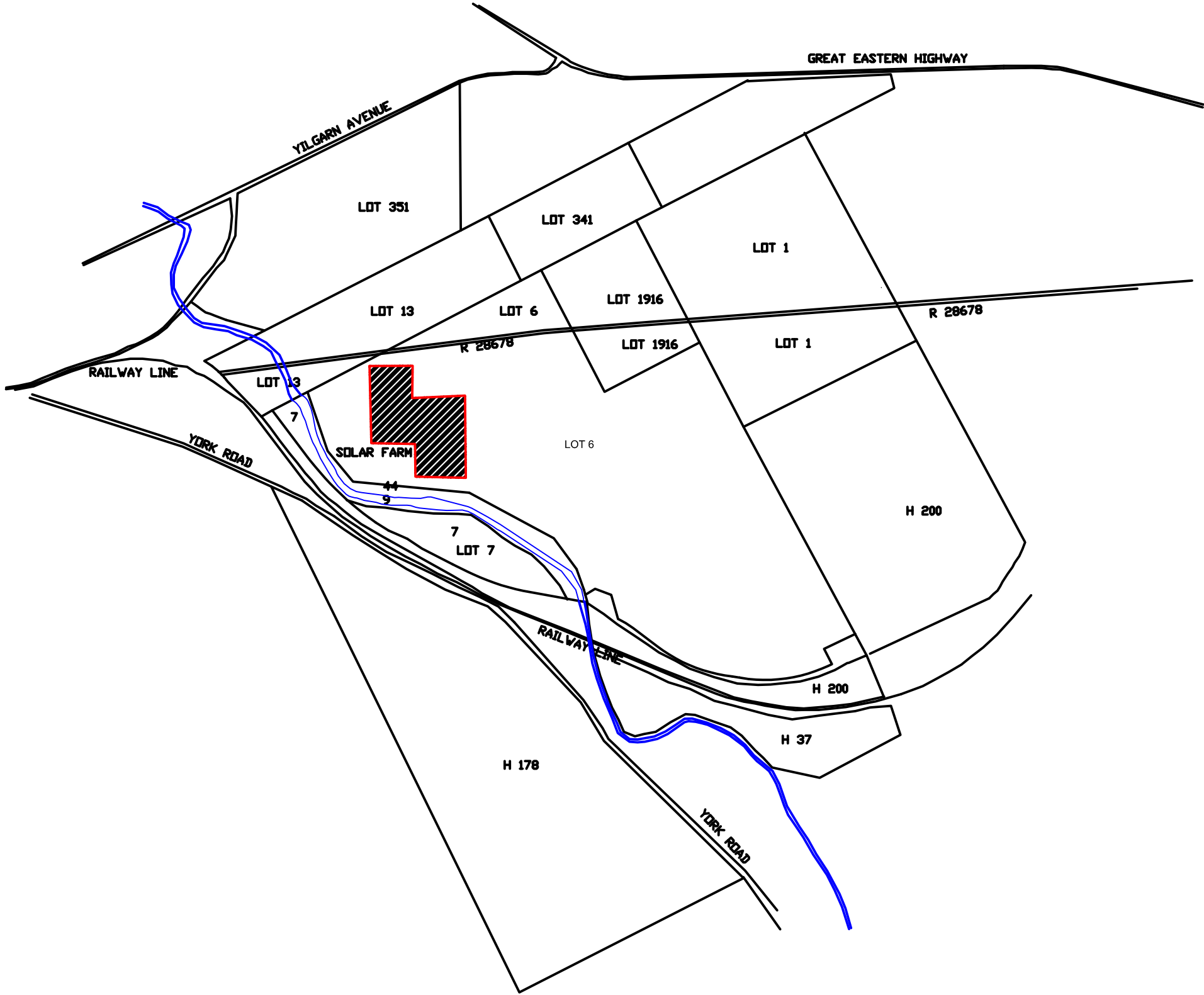
It is recommended that the Mid-West/Wheatbelt JDAP grant development approval to the proposed power generation development on Lot 6 Northam-York Road, Muluckine subject to conditions.

LOT 6 (131) Northam-York Road, Northam
LOCATION PLAN



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ATTACHMENT 2.1



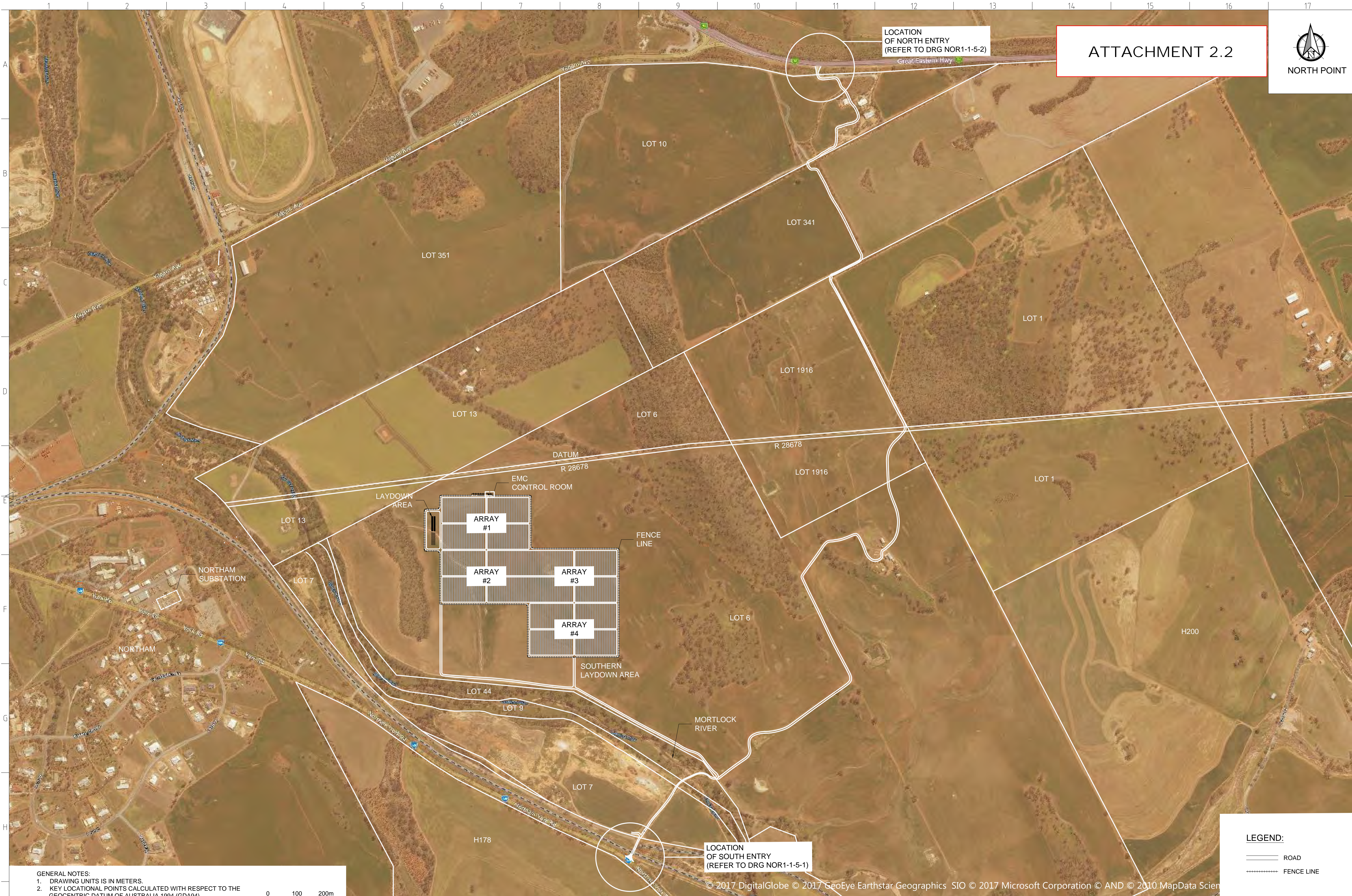
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-	-	-	-	-	-
NUMBER	TITLE	REV.	DATE	NAME	DESCRIPTION
REFERENCE DRAWINGS		REVISION HISTORY			

NORTHAM SOLAR FARM
CADASTRAL MAP



CLIENT		EPC CONTRACTOR		ENERGY MADE CLEAN		
				Name:	Date:	EMC Drawing No.
				Design:	JJ	7/3/2017
				Drawn:	APM	7/3/2017
				Checked:	BC	8/3/2017
				Approved:	AS	8/3/2017
				Revision:		
				Scale:	A1	

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GENERAL NOTES:
1. DRAWING UNITS IS IN METERS.
2. KEY LOCATIONAL POINTS CALCULATED WITH RESPECT TO THE GEOCENTRIC DATUM OF AUSTRALIA 1994 (GDA94).
PROJECTED CO-ORDINATE SYSTEM MGA ZONE 50.









		5	23.05.17	APM	RE-ISSUE FOR APPROVAL - CADASTRAL LOTS ADDED
		4	15.05.17	APM	ISSUE FOR APPROVAL - PRELIMINARY DESIGN
		3	15.03.17	APM	ADDED SOUTHERN LAYDOWN AREA
NOR1-1-5-2	SITE ACCESS NORTH ENTRY	2	08.03.17	APM	NEW ARRAY LAYOUT
NOR1-1-5-1	SITE ACCESS SOUTH ENTRY	1	03.03.17	APM	NOW 330W MODULES, ACCESS ROAD ADDED, 15kV
NUMBER	TITLE	REV.	DATE	NAME	DESCRIPTION
REFERENCE DRAWINGS			REVISION HISTORY		

NORTHAM SOLAR FARM
LOCATION PLAN
GENERAL

CLIENT:		ENGINEERED BY:		ENERGY MADE CLEAN			
					Name:	Signed:	EMC Drawing No.
				Design:	BJC	-	NOR1-1-1-1
				Drawn:	JTB	-	
				Checked:	APM	-	Revision: 5
				Approved:	AS	-	Scale: 1:6000
							A1

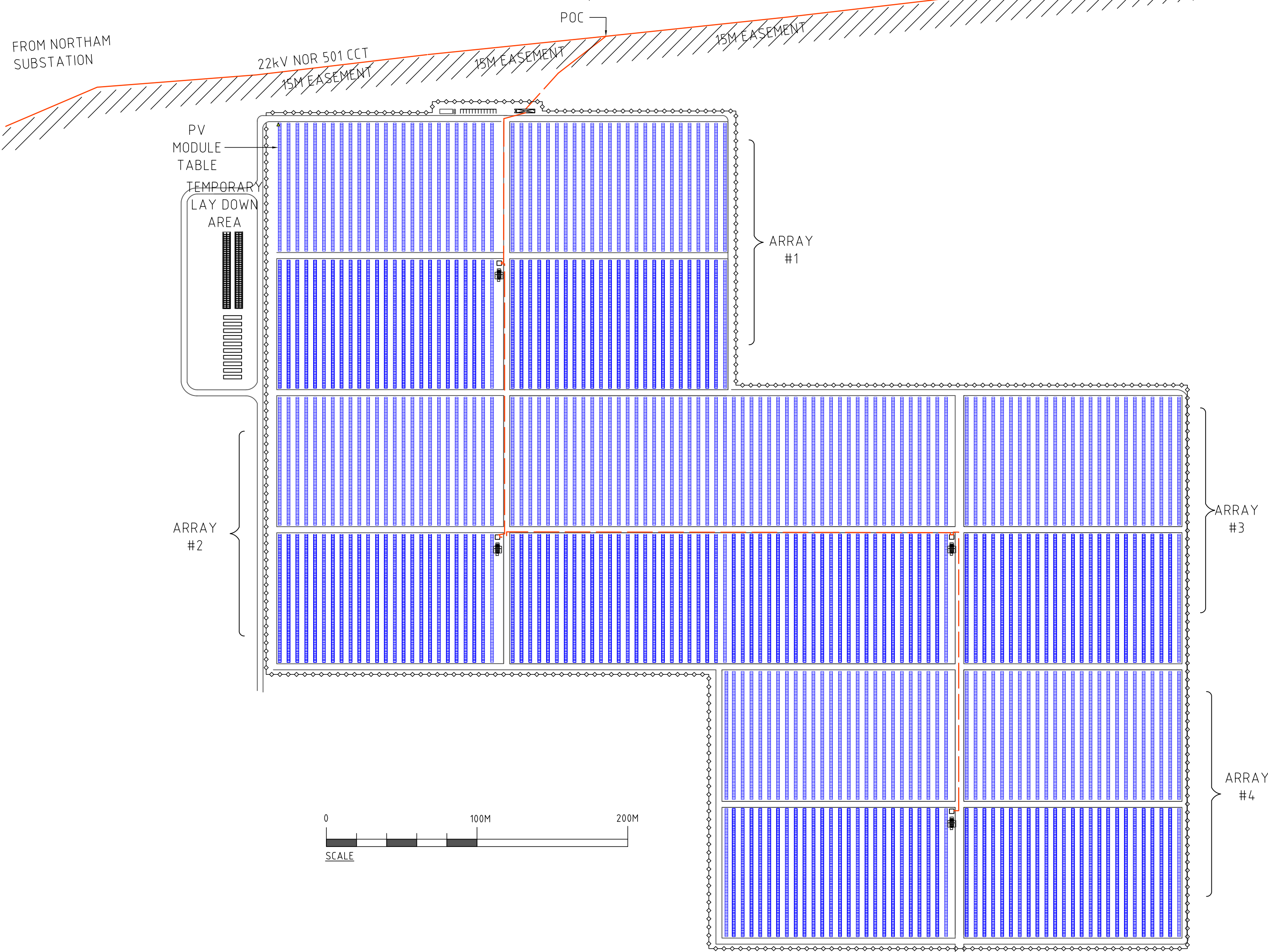
[illegible]

LEGEND

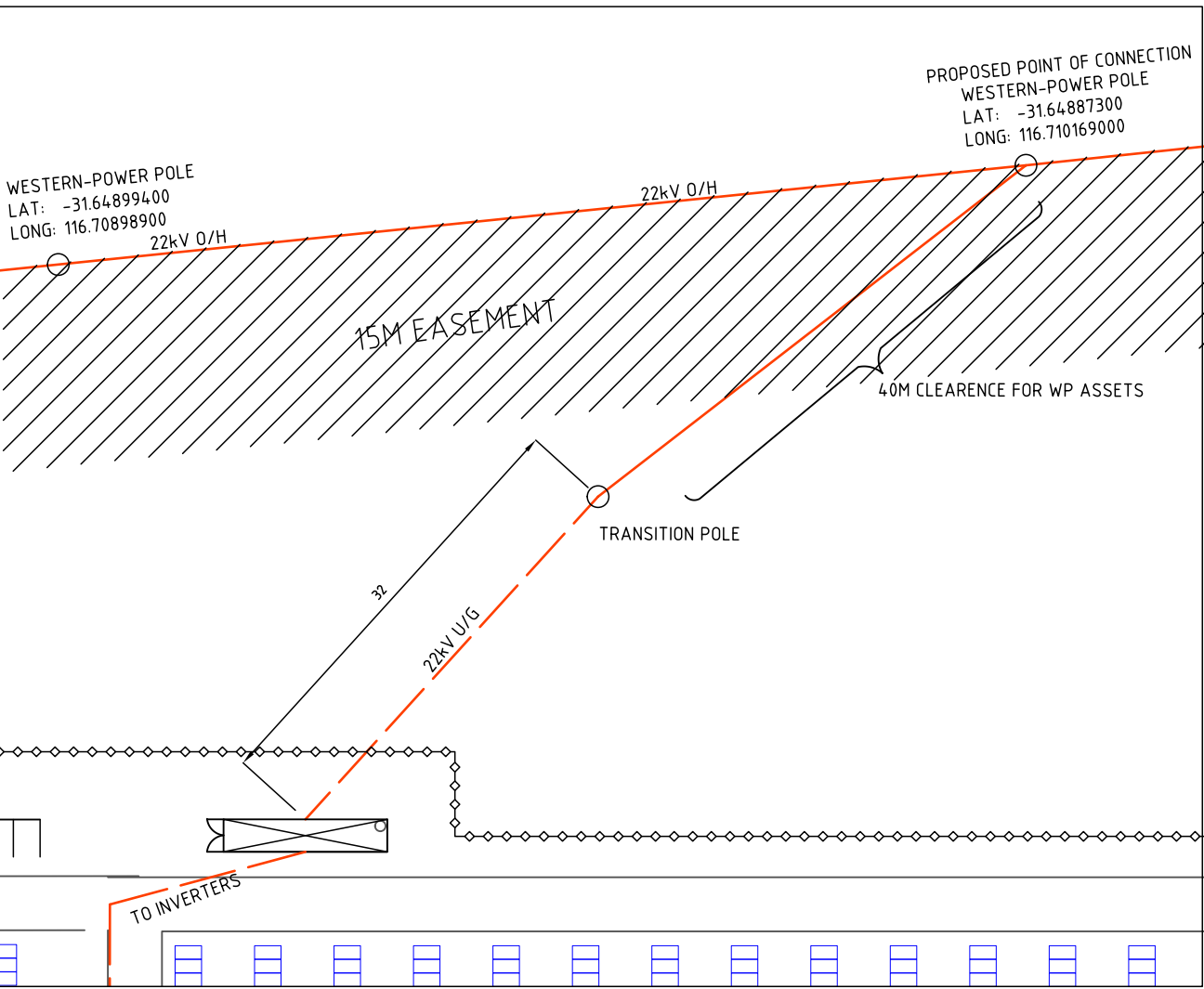
	22kV UNDERGROUND		FENCE LINE
	22kV OVERHEAD		40FT CONTAINER
	ROAD		INVERTER STATION
	PIT		CONTROL-SWITCHROOM

EMC DATUM

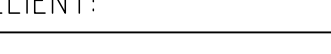

▲ LATITUDE:	-31° 38 MIN. 58.016 SECONDS
LONGITUDE:	116° 42 MIN. 28.77 SECONDS
EASTING (ZONE 50):	47231988
NORTHING (ZONE 50):	6498382.136



POINT OF CONNECTION DETAIL
2:1 SCALE



ISSUED FOR PLANNING APPROVAL

CLIENT:		DESIGNER:		ENERGY MADE CLEAN				
					Name:	Date:	EMC Drawing No.	
				Design:	APM	22.11.16	NOR1-1-2-1	-
				Drawn:	BC	23.11.16		
				Checked:	MM	02.12.16		
				Approved:	AS	02.12.16	Scale: 1:2000	A1

NORTHAM SOLAR FARM ELECTRICAL EQUIPMENT SITE LAYOUT

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GENERAL NOTES:
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2. KEY LOCATIONAL POINTS CALCULATED WITH RESPECT TO THE GEOCENTRIC DATUM OF AUSTRALIA 1994 (GDA94)

LEGEND
22kV UNDERGROUND
22kV OVERHEAD
ROAD
RAIL TRACK
FENCE LINE

NORTHAM SOLAR FARM
SITE ACCESS
SOUTH ENTRY

CLIENT:		DESIGNER:		ENERGY MADE CLEAN			
				Design:	Name: BC	Date: 02.03.17	EMC Drawing No.
				Drawn:	BC	02.03.17	NOR1-1-5-1
				Checked:	APM	09.03.17	Revision: 0
				Approved:	AS	-	Scale: 1:2000 A1

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ATTACHMENT 2.5



TOP HALF OF ARRAY

MAIN
ACCESS GATE

DETAIL A

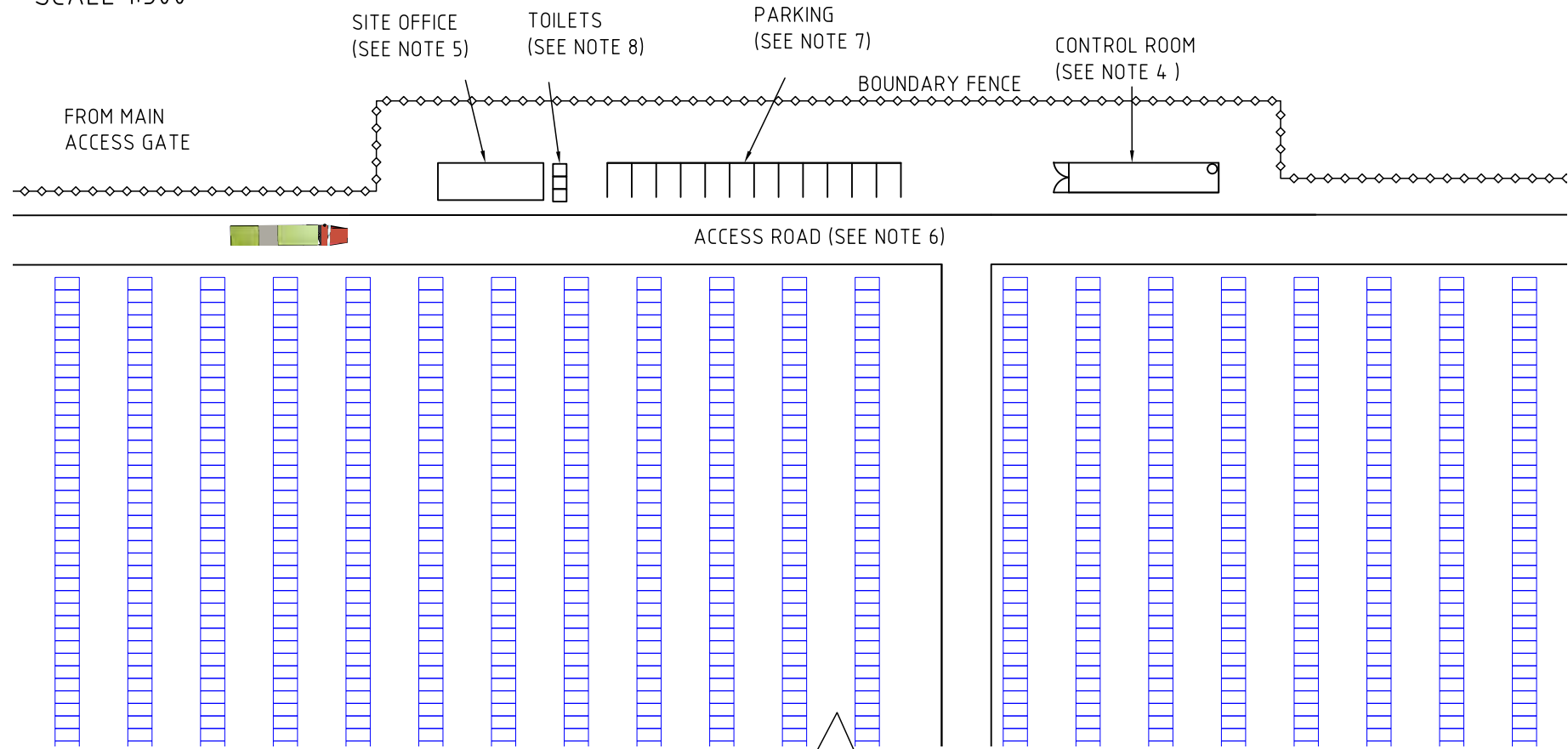
ACCESS ROAD

STORAGE AREA
(SEE NOTE 3)

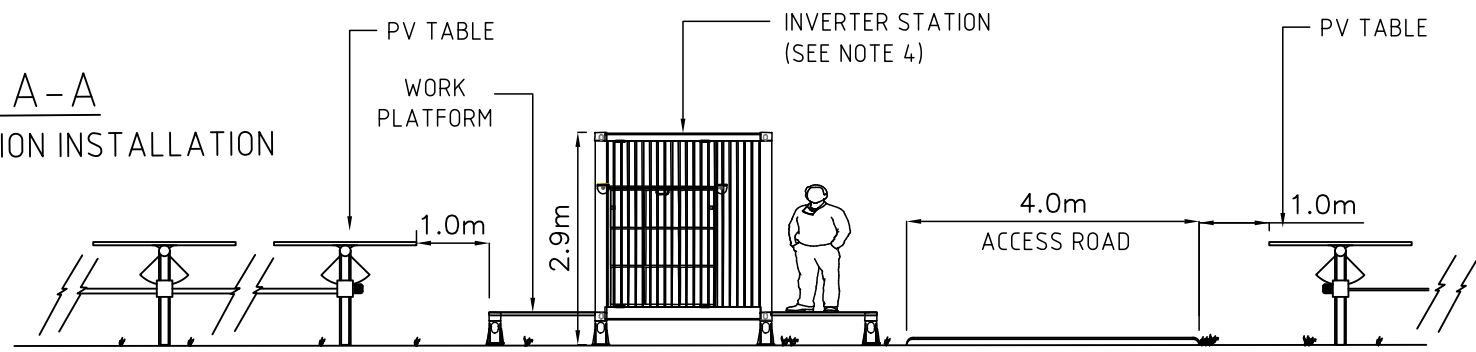
140M

50M

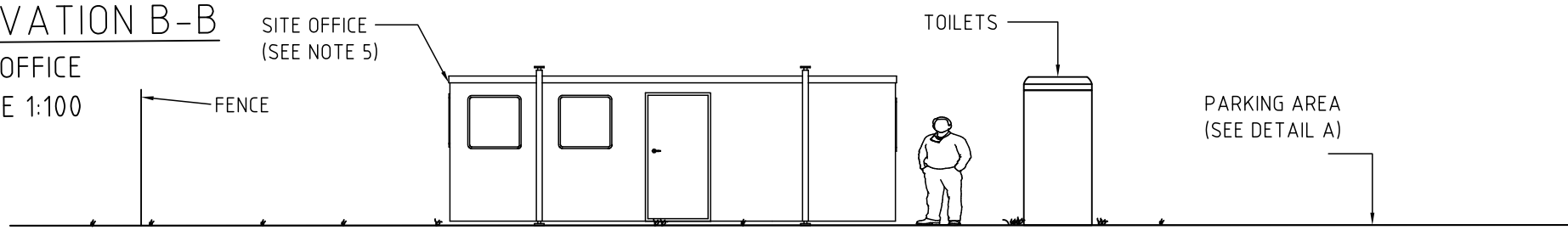
DETAIL A
PLAN VIEW
SCALE 1:500



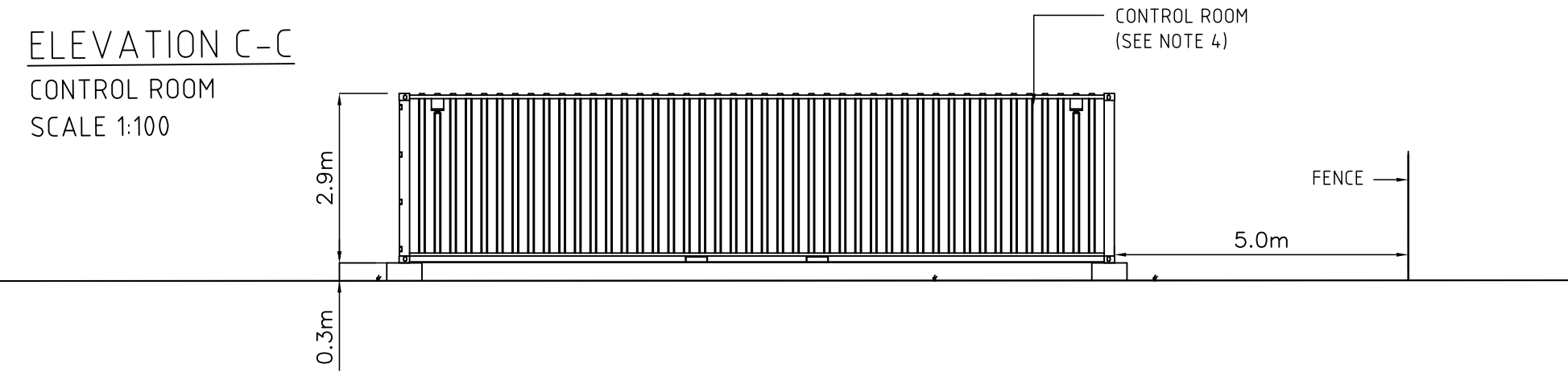
ELEVATION A-A
INVERTER STATION
SCALE 1:100



ELEVATION B-B
SITE OFFICE
SCALE 1:100





ELEVATION C-C
CONTROL ROOM
SCALE 1:100



- GENERAL NOTES:
- DRAWING UNITS IS IN METERS.
 - KEY LOCATIONAL POINTS CALCULATED WITH RESPECT TO THE GEOCENTRIC DATUM OF AUSTRALIA 1994 (GDA94)
 - NO PERMANENT STRUCTURES IN STORAGE AREA
 - CONTROL ROOM AND INVERTER STATIONS BUILDINGS TO BE SEA-CONTAINERS, PAINTED WHITE.
 - OTHER BUILDINGS TO BE PAINTED WHITE
 - ROADS TO BE LIMESTONE ROADBASE MIX, 4M WIDTH
 - SITE IS PROVIDED WITH TEN (10) CAR PARKING BAYS (5.4MX2.5M)
 - CHEMICAL TOILETS TO BE INSTALLED ON SITE

EMC DATUM
▲ LATITUDE: -31° 38' 58.07027''
LONGITUDE: 116° 42' 29.14782''
EASTING (ZONE 50): 472323.731
NORTHING (ZONE 50): 6498380.515

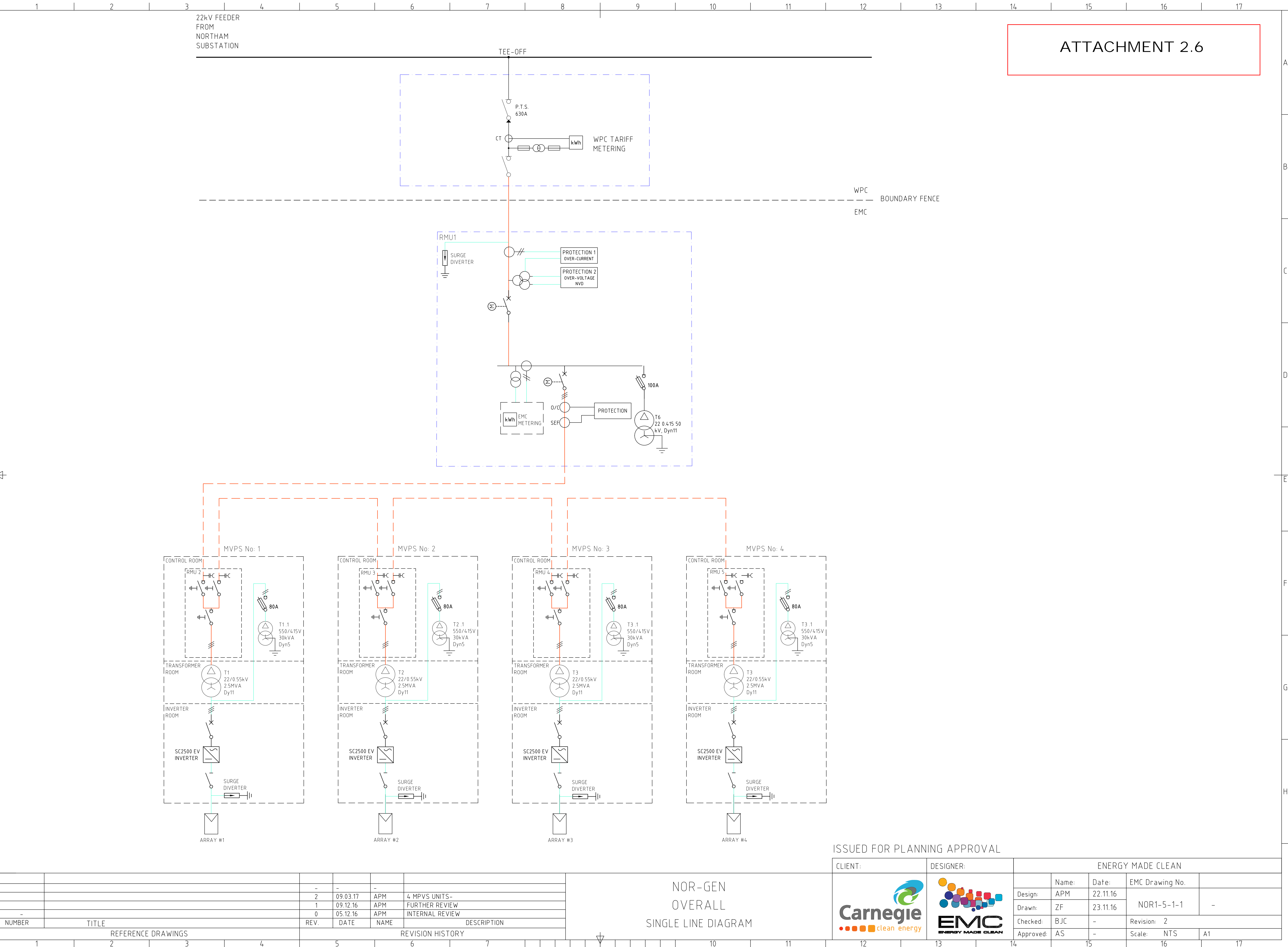
ISSUED FOR PLANNING APPROVAL

CLIENT:		DESIGNER:		ENERGY MADE CLEAN			
 clean energy		 ENERGY MADE CLEAN		Name:	Date:	EMC Drawing No.	
				Design:	BC	03.03.17	
				Drawn:	BC	03.03.17	NOR1-1-6-1
				Checked:	APM	03.03.17	Revision: 1
				Approved:	AS	-	Scale: AS SHOWN A1

NORTHAM SOLAR FARM
CONSTRUCTION FACILITY

NUMBER	TITLE	REV.	DATE	NAME	DESCRIPTION
-	-	-	-	-	-
1	10.03.17	APM	NEW ARRAY LAYOUT		
0	03.03.17	APM	INITIAL RELEASE		
REFERENCE DRAWINGS		REVISION HISTORY			

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ISSUED FOR PLANNING APPROVAL

CLIENT:	DESIGNER:	ENERGY MADE CLEAN			
		Name:	Date:	EMC Drawing No.	
		Design:	APM	22.11.16	
		Drawn:	ZF	23.11.16	NOR1-5-1-1
		Checked:	BJC	-	Revision: 2
		Approved:	AS	-	Scale: NTS



Lot 6, 131 Northam-York Road
Muluckine

Development Application —
Power Generation
Northam PV Solar Array



1 INTRODUCTION

1.1 PROPOSAL

This Report outlines Carnegie Clean Energy's (the **Proponent**) development for a 10 megawatt photovoltaic solar array (**Development**), on Lot 6, No. 131 Northam-York Road, Muluckine (**Lot 6**). The 10MW PV Solar Array is proposed to be developed in one stage, with a construction timeframe of approximately 6 months. The land on which the 10MW PV Solar Array will be constructed (**Development Area**) will be leased from the landowner for a period of 25 years.

The project is summarised in the following **Table 1**. Additional detail on the specific components of the application are provided further in this report, together with justification against relevant State Planning Policies, the *Shire of Northam Local Planning Strategy (LPS)*, and the Shire of Northam Local Planning Scheme No. 6 (**LPS 6**).

Table 1 Summary of Development Application

Proposal	Details
LPS 6 – Land Use Definition	'Power Generation'
Zoning Table – Land Use Permissibility	'A' discretionary use in the 'Rural' zone (requires advertising)
Land Details	Lot 6, No. 131 Northam-York Road, Muluckine
Land Tenure	Freehold ownership by landowner; leased to the Proponent for 25 years
Vehicle Access	From Northam-York Road (existing crossover and vehicle access)
Operator	Carnegie Clean Energy Ltd (incorporating Energy Made Clean)
Type of system and facility	Photovoltaic solar array with single-axis tracking modules Balance of System – Inverters, Control Switchroom, controls and communications Connecting infrastructure to Western Power's '501' 22kV feeder line Site office and Chemical toilet 10 parking bays Limestone roads and 1.8m high perimeter site fencing
System Size (Power Generation)	10 MW
Development Area	Approximately 25 ha (fenced area)
Solar Panels & Inverters	33,600 polycrystalline photovoltaic modules on 400 module tables 4 inverters
Dimensions of PV modules	W: 1,956mm x H: 992mm (overall height 2.4m) x D: 40mm
Dimensions of inverters	W: 6,058mm x H: 2,591mm x D: 2,438mm
Grid connection	22kV overhead distribution line (existing Western Power infrastructure) approximately 70m north of the Control Switchroom
Period of Construction (estimated)	6 months
Expected Lifespan of Facility	25 years

1.2 LEGAL DESCRIPTION

The Development Area is contained within Lot 6. The property details and tenure of the land are described in **Table 2**. A copy of the Lot 6 Certificate of Title is enclosed in **Appendix A**.

The proposed access is taken from an existing unsealed road that traverses across Lot 6, through to a crossing over the Mortlock River via a culvert on Lots 44 and 7 (same landowner as Lot 6) and the track continues across Lot 7 (via registered easement, Landgate document G786714) to an intersection at Northam-York Road. The access is shown on Drawing No. NOR1-1-5-1.

Table 2 Legal Lot Descriptions

Lot No.	Volume	Folio	Diagram	Area	Landowner
6	2132	842	P1164	285.4045 ha	D.K. West Investments Pty Ltd & Dale Kenneth West
44	2132	842	P1520	9.7802 ha	D.K. West Investments Pty Ltd & Dale Kenneth West
9	2132	841	P1164	7.2250 ha	D.K. West Investments Pty Ltd & Dale Kenneth West
7	2132	840	P1164	27.233 ha	Cox, Julie Ann & Cox, Kevin Gregory (easement in favour to Lot 9)

1.3 LOCATION

As part of considering this Development Application, the location of Lot 6 is strategically important:

- Generally, the Wheatbelt region is highly suitable for solar development, due to large areas of clear flat land being able to accommodate solar equipment.
- Lot 6 is advantageous by being readily able to connect to the South-West Interconnected System (SWIS) and within 800 metres to Western Power's Northam sub-station. The SWIS supplies the bulk of electricity for the South-West region, extending from Albany to the south, Kalgoorlie in the east, and up to Kalbarri in the north.
- Lot 6 is immediately adjacent to an existing 22kV feeder line and Western Power has indicated that a connection to the feeder line can be made available.
- An existing crossover to Northam-York Road (refer **section 3.1.1.3**) provides convenient vehicle access with the crossing over the Mortlock River capable of carrying large agricultural/freight vehicles up to the size of road trains. This provides benefits for the efficient delivery of materials during the construction period.
- The Development Area is on low-quality, frost-affected agricultural land.

1.4 SITE FEATURES

Lot 6 is over 245 hectares in land area, and notwithstanding some areas of native vegetation, is predominately cleared for agricultural purposes (generally wheat, canola and barley). **Figure 1** gives a panoramic impression of the proposed Development Area. The landowner recently burned off the paddock. What is notable is the majority of the Development Area was generally left un-burnt as it is low-quality agricultural land, and does not contribute towards the landowner's crop yields.



Figure 1 Panorama Aspect of Proposed Development Site (looking towards Northam Townsite)

1.5 SURROUNDING CONTEXT

1.5.1 SURROUNDING LAND USES AND DEVELOPMENT

Surrounding land uses and development identified within 2 kilometres of the Development Area are described as follows:

North

- Immediately north of the Development Area is the Water Corporation Mundaring-Kalgoorlie water pipeline (within its own managed Crown Reserve) and the Western Power 22 kilovolt (22kV) and 66kV overhead distribution lines (refer **Figure 2**).
- Dwelling on 'Rural' zoned land – Lot 13, Northam-Cranbrook Road. The dwelling is situated approximately 350 metres to the north and upslope, and has views through a line of trees over the Development Area. This is the closest dwelling to the Development Area. The Proponent would propose additional trees within Lot 6 to provide visual relief to the dwelling.
- Northam Caravan Park on 'Rural Residential' zoned land – Lot 500, No. 150 Yilgarn Avenue. The caravan park is approximately 1 kilometre to the north-west and has no views of the Development Area due to vegetation and topography.
- Northam Racecourse situated over 1 kilometre to the north-north-west.
- 'Rural' zoned properties used for agriculture, with some remnant vegetation.



Figure 2 Aspect of the 22kV and 66kV Overhead Distribution Lines and Mundaring-Kalgoorlie pipeline (looking north/north-west)

West

- Dwelling on 'Rural' zoned land – Lot 8, No. 1 Northam-York Road. The dwelling is situated approximately 500m to the west of the Development Area. The dwelling is low lying on the western side of the Mortlock River and has no views of the Development Area.
- Western Power electricity substation – Lots 14 and 61, No. 93 York Road. The substation is zoned 'Industry' under the LPS 6.
- Reserve 43739 vested to the Western Australian Agriculture Authority for a 'biological station' and 'office'. The land is zoned 'Industry' under the LPS 6. Whilst a portion of the reserve is within 1 kilometre, the buildings are further away and positioned towards York Road.
- The Eastern Goldfields Railway also runs generally following the Mortlock River on the western bank. The standard gauge railway starts in Perth and heads east through to Kalgoorlie, before heading east across to the Eastern States. The railway carries both freight and passenger trains. Services include:
 - AvonLink which runs from Midland to Northam and operates 14 return services per week;
 - MerredinLink which operates a return service every Wednesday between East Perth and Merredin; and
 - Prospector service runs from East Perth to Kalgoorlie at least once per day; and
 - Freight trains as required.
- Approximately 30 properties within the Woodley Farm Estate would be wholly or partly within 1 kilometre of the Development Area. These properties are zoned 'Residential R2.5' under the LPS 6. In addition, these lots are down-slope and are at an elevation such that the existing trees on Lot 6 and along the Mortlock River contribute to screening the Development Area from view. The remainder of the Woodley Farm Estate is within 1 and 2 kilometres west of the Development Area.
- Based on a visual analysis, approximately 30 dwellings throughout the Woodley Farm Estate are visible from the eastern perimeter of the Development Area.

East

- Land and outbuildings in the same ownership as Lot 6. The topography of the land means that the landowner's outbuildings do not have views of the Development Area.

South

- Land and outbuildings in the same ownership as Lot 6. The topography of the land means that the outbuildings have no views of the Development Area.
- The Mortlock River is contained within Lots 44 and 9, which are within the same ownership as Lot 6.
- Lot 7 is between the Mortlock River and Northam-York Road and no dwelling is on-site. Lot 7 is recognised in the *Local Planning Strategy* as an 'Extractive Industry Area'.
- Farmland on the south side of Northam-York Road – Lot 55 on Plan 17625 and Lot 1, No. 178 Northam-York Road. A house is adjacent to Northam-York Road approximately 1 kilometre south of the Development Area. The dwelling does not have views of the Development Area due to distance, topography and trees.
- To the south-east, within 2 kilometres from the Development Area, is a collection of properties zoned 'Residential R10' and 'Rural Smallholding'. The properties do not have views of the Development Area due to distance, topography and trees.

1.5.2 NORTHAM-YORK ROAD

Northam-York Road (State Route 120) is under the care and control of Main Roads WA. It provides connections between Northam and York before continuing on as part of the Great Southern Highway.

Northam-York Road is at a comparable elevation to that of the Development Area. Potential visibility of the Development Area from Northam-York Road has been considered and is discussed in **section 3.3.1**. In summary, there are limited opportunities for glimpses of views through to the Development Area when travelling along the road.

1.5.3 NORTHAM AIRPORT

Northam Airport is located north-west of Lot 6. Northam Airport is an unlicensed general aviation facility owned by the Shire of Northam and operated by the Northam Aero Club. Other users include the West Australian Balloon and Airship Club, Northam Air Services and Taurus Aviation. The Northam Aero Club has a Cessna 172 P four-seat aircraft available for navigation training and private hire. The airport does not have scheduled commercial flights.

The south-western end of Runway 14/32 is approximately 2.7km from the approximate northern extent of the Development Area. The draft *Northam Airport Master Plan* (June 2015) includes a draft obstacle limitation surface and approach surface. The approach surface for Runway 14/32 generally is to the north of the Development Area.

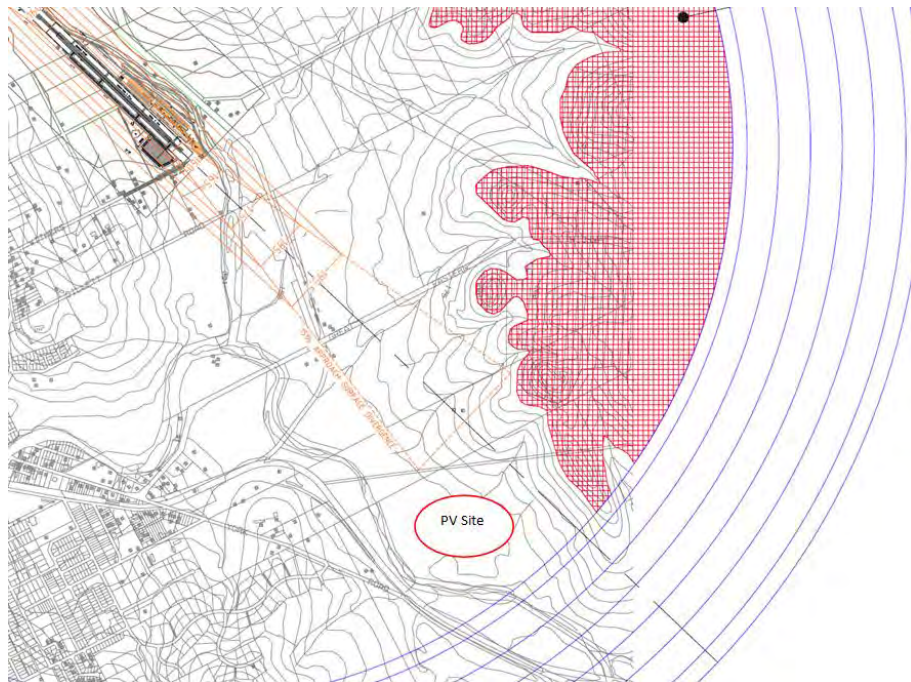


Figure 3 Indicative Location of Development Site in context to Northam Airport Approach Surface (June 2015)

Consideration of glare as a hazard is discussed in **section 3.3.2**. In summary, it is noted that PV solar arrays are found in the vicinity of airports. Glare from PV solar arrays is comparable to that of smooth water and is not considered to be a glare hazard for aviators.

2 PLANNING FRAMEWORK

2.1 STATE PLANNING POLICIES (SPP)

2.1.1 SPP 2.5 RURAL PLANNING

The SPP 2.5 *Rural Planning* was published in December 2016 and provides guidance for the development, protection and preservation of rural land. The SPP 2.5 provides for protection of rural land and land uses and the development demonstrates compliance as outlined in **Table 3**.

Table 3 Compliance against Section 5.1 of SPP 2.5

Section 5.1 Protection of rural land and land uses	Proposed 'Power Generation' development
(a) requiring that land use change from rural to all other uses be planned and provided for in a planning strategy or scheme;	Consistent with the <i>Shire of Northam Local Planning Strategy</i> , refer to section 2.2 of this report.
(b) retaining land identified as priority agricultural land in a planning strategy or scheme for that purpose;	Not identified as priority agricultural land in the <i>Shire of Northam Local Planning Strategy</i> or LPS 6.
(c) ensuring retention and protection of rural land for biodiversity protection, natural resource management and protection of valued landscapes and views;	Low to negligible impact. Siting of the development avoids areas of environmental importance (including the TEC Woodland to the west and south). Development is within a low lying area and surrounding topography and vegetation provides visual relief, refer to section 3.3.1 of this report and Appendix C .
(d) protecting land, resources and/or primary production activities through the State's land use planning framework;	The identified location is low-quality, frost affected, land that does not contribute to crop yields for the landowner.
(e) creating new rural lots only in accordance with the circumstances under which rural subdivision is intended in Development Control Policy 3.4: Subdivision of rural land;	No lots are proposed, Development Area is proposed to be leased.
(f) preventing the creation of new or smaller rural lots on an unplanned or ad-hoc basis, particularly for intensive or emerging primary production land uses;	No lots are proposed, Development Area is proposed to be leased.
(g) comprehensively planning for the introduction of sensitive land uses that may compromise existing, future and potential primary production on rural land; and	No sensitive land uses are proposed.
(h) accepting the impacts of well-managed primary production on rural amenity.	The development does not prevent the landowner from undertaking their agricultural pursuits.

2.2 LOCAL PLANNING STRATEGY

The LPS was endorsed by the Western Australian Planning Commission (**WAPC**) in July 2013. Lot 6 is identified on Map 4 - Northam Townsite within the 'Avon East Precinct' and is classified for 'rural' purposes (refer **Figure 4**). Portions of the Development Area fall within an 'Extractive Industries Buffer'. This buffer is not shown in the LPS 6 and is not considered to be a constraint to the development occurring.

What is notable, the LPS provides a 'townsite boundary' whereby there is no identified residential expansion in areas in proximity to the proposal. 'Future Residential' is primarily to the west and south-west of the town centre.

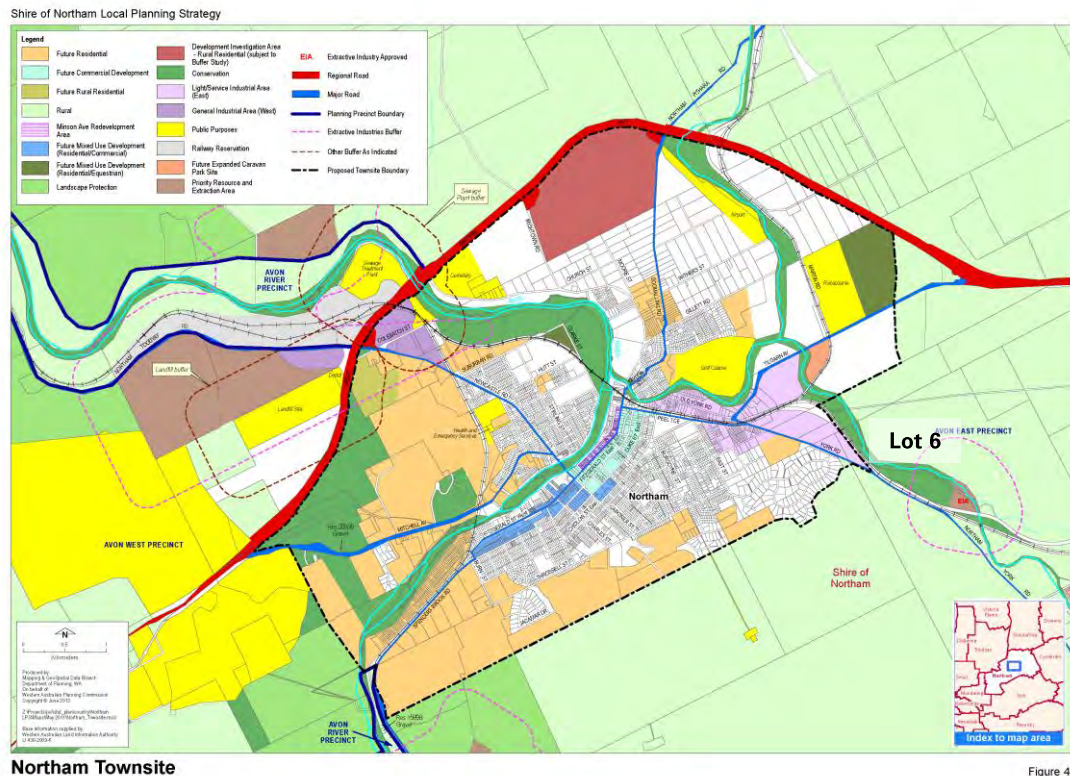


Figure 4 Extract of Map 4 – Northam Townsite (Shire of Northam 2013)

Under the LPS section 3.1 Agriculture of the Economic Development Strategy it notes that, in 2006, there were 193 farms within the Shire of Northam, using approximately 106,226 hectares for agricultural production purposes. In this regard, the proposal will utilise 25 hectares of agricultural land for the ‘Power Generation’ development. This is the equivalent to 0.024% of the total amount of land in the Shire used for agricultural production purposes. Further, the development is expected to operate for around 25 years, after which, if no longer required for the solar array, the land could be returned to agricultural purposes.

The LPS notes that the land west of the Avon River is generally more suited to extensive grazing and pastures. In contrast, the proposal is on land east of the Avon River. The landowners have indicated that the land is sandy, low lying, frost affected and low yielding. The land immediately to the south and adjacent to the Avon River is currently used for sand extraction. As such, it is an appropriate location for the ‘Power Generation’ development.

The proposal is consistent with the LPS Strategies for Agriculture, as shown in **Table 4**.

Table 4 Agriculture Strategies (LPS)

3.1.4 Agriculture Strategies	Proposed ‘Power Generation’ development
<i>Encourage the continued use of the Shire’s agricultural areas for predominately grazing and cropping and identify and protect productive agricultural land from ad hoc subdivision, incompatible development and further land degradation.</i>	<p>Consistent with Strategy.</p> <p>The development is proposed to operate via a 25-year lease period, after which the land could be returned to agricultural purposes. The development is compatible with the continued longer-term use of the land for agriculture.</p> <p>No ad hoc subdivision is proposed – the Development Area will be leased from the landowner.</p> <p>The development can be managed (i.e. managing on-site</p>

3.1.4 Agriculture Strategies	Proposed 'Power Generation' development
	drainage and maintaining vegetation cover) so as to not contribute to land degradation.
<i>Recognise and maintain the distinction between the Precincts for all agricultural land east and west of the Avon River whilst combining all agricultural areas into one uniform 'Rural' zone under Local Planning Scheme No 6 and continue to apply appropriate development controls.</i>	<p>Consistent with Strategy.</p> <p>The subject land is zoned 'Rural' under the LPS 6, and 'Power Generation' is an 'A' discretionary land use.</p> <p>The zoning table under LPS 6 is sufficiently flexible to facilitate diversification of land use for opportunities such as this proposal.</p>
<i>Promote the diversification of the Shire's economy by encouraging the development of intensive agriculture, downstream processing of primary produce, diversified industries and further tourism opportunities including farm stay accommodation and ecotourism subject to adequate buffers being maintained between such uses and surrounding broadacre agricultural activities in order to minimise potential land use conflicts.</i>	<p>Consistent with Strategy.</p> <p>No buffers are required for the development.</p> <p>The development will be fenced off and therefore can operate in a compatible manner whilst the remainder of Lot 6 is used by the landowners for agricultural purposes.</p>

Under the LPS section 4.4 Power & Energy of the Infrastructure & Community Services Strategy, it notes that electricity in the Shire is provided by Western Power via substations at Wundowie and on the eastern outskirts of the Northam townsite. Sub-stations receive 66kV and 132kV power transmission lines. Power is then distributed throughout the Shire by a network of 22kV to 11kV overhead lines. The LPS recognised the need to "encourage and continue to support the development of alternative energy production in the Shire such as solar, wind and integrated wood processing which have significant potential and environmental benefits".

The proposal is consistent with the LPS Strategies for Power and Energy, as shown in **Table 5**.

Table 5 Power and Energy Strategies (LPS)

4.4.4 Power & Energy Strategies	Proposed 'Power Generation' development
<i>Facilitate and support any necessary upgrades to existing power supply infrastructure in the Shire to ensure the provision of sufficient supplies of power to satisfy current and future anticipated demand and ensure integrity of the system, given the bush fire risks.</i>	<p>Consistent with Strategy.</p> <p>The adjacent 22kV overhead transmission lines have the capability and capacity for a proposed connection to the 'Power Generation' development.</p> <p>The Proponent and Western Power will ensure the integrity and reliability of the power supply can be maintained.</p>
<i>Encourage and support the development and use of alternative power supply options.</i>	<p>Consistent with Strategy.</p> <p>The proposal is an alternative power supply option and will directly contribute to renewable energy distribution through the SWIS.</p>
<i>Promote energy conservation in the design and development of new urban areas and housing throughout the Shire.</i>	<p>May have indirect positive influences on the Strategy.</p> <p>The proposal will not directly promote energy conservation throughout the Shire. However, Northam residents may positively associate this investment in renewable energy with ways to reduce their own carbon footprints. Some 800 houses in Northam currently have solar PV on their roofs.</p> <p>It is recognised that in the next couple of years, deregulation of the electricity market will occur. A direct benefit for Northam residents will be the ability to choose their electricity providers in order to reduce their household power bills. The outcome would be the ability to choose to buy electricity from a locally sourced, renewable energy source that arguably would be produced at a lower cost per kilowatt hour.</p>

4.4.4 Power & Energy Strategies	Proposed 'Power Generation' development
<p><i>Encourage and support the conversion of overhead power lines to underground distribution lines in the Shire's established settlements, urban gateways, scenic routes and tourism/heritage precincts.</i></p>	<p>Not applicable.</p> <p>The development requires connections to the existing distribution line.</p> <p>The location of the site is screened with remnant vegetation and is not likely to be visually obtrusive.</p>

3 THE DEVELOPMENT PROPOSAL

3.1.1 DEVELOPMENT OVERVIEW

3.1.1.1 DESCRIPTION OF THE DEVELOPMENT

The PV modules have been selected based on the manufacturer's proven experience with modules for similar site conditions (i.e. for the duration of the lifespan of the facility, and comparable environmental conditions).

Four arrays will be installed, each with an inverter station. The arrays are mounted on the ground, with a horizontal axis tracking east to west. It will have a tracking operating range of up to 52° east/west, will require minimum maintenance, and will be able to operate within wind region A without special stowing measures being implemented. A meteorological station will be installed within the Development Area to communicate with the system so that array performance can be measured against actual environmental conditions.

The inverters and control room will be in sea containers, proposed to be painted white. The site office is proposed to be painted white.

Telecommunication links are required. A UHF radio link will be through to the Northam sub-station. Western Power will need control of the solar farm main switch and the setpoints for each inverter. Control of the equipment by the Proponent or Western Power will be through remote signalling.

3.1.1.2 ANTICIPATED CONSTRUCTION PROGRAMME

The Proponent will manage the delivery of containers brought to site to minimise construction traffic where possible. It is anticipated that the construction programme will be undertaken within a 6 month time period and would have an average of 6 truck deliveries per day. It is anticipated that a capacity equivalent to a total of 90 containers would be delivered to site. Containers will be emptied in Perth and palletised equipment will be shipped to site.

Construction is relatively straight-forward. Trucks will deliver equipment on pallets to the proposed Laydown Areas. The equipment will then be installed on-site.

3.1.1.3 ACCESS

Lot 6 is accessible to Northam-York Road by an existing gravel road incorporating a crossover at Northam-York Road and a sign-posted railway crossing. The landowner of Lots 6, 9 and 44 has a registered easement in benefit, over Lot 7, for vehicle access. The access road is used by the landowner of Lot 6 for large agricultural vehicles and freight vehicles (which can be as large as road-trains).

The access road will be suitable for the delivery equipment on pallets (loaded with frames, modules and inverters). The access road will be 4m wide proposed as limestone roadbase mix, and with a 2% slope from the centre line for drainage purposes.

3.2 COMPLIANCE AGAINST LOCAL PLANNING SCHEME 6

3.2.1 RURAL ZONE OBJECTIVES

Lot 6 is zoned 'Rural' under the LPS 6. The development is consistent with the 'Rural' zone objectives as outlined in **Table 6**.

Table 6 Rural Zone Objectives

Rural Zone Objectives	Proposed 'Power Generation' development
<i>To provide for horticulture, extensive and intensive agriculture, agroforestry, local services and industries, extractive industries and tourist uses which ensure conservation of landscape qualities in accordance with the capability of the land.</i>	Consistent with Objective. The proposal is a utility service, producing renewable energy that will be fed into the electricity grid. This will provide a local benefit through contributing a greater share of renewable solar energy within the local electricity market.
<i>To protect the potential of agricultural land for primary production and to preserve the landscape and character of the rural area.</i>	Consistent with Objective. The proposal will be leased from the landowner. A lease will enable the land to be used in the future for agricultural purposes. Solar arrays are becoming more common in rural areas, particularly in the Mid West and the Wheatbelt, where large areas of flat land are available. The proposed location is on an area of low-lying land, thus inhibiting the visual prominence of the site. This is explained further in section 3.3 of this report.
<i>To control the fragmentation of broad-acre farming properties through the process of subdivision.</i>	Not applicable. No subdivision is proposed, as the Development Area will be leased from the landowner.
<i>To protect land from land degradation and further loss of biodiversity by:</i> (i) <i>Minimising the clearing of remnant vegetation and encouraging the protection of existing remnant vegetation;</i> (ii) <i>Encouraging the development of and the protection of corridors of native vegetation;</i> (iii) <i>Encouraging the development of environmentally acceptable surface and sub-surface drainage works; and</i> (iv) <i>Encouraging rehabilitation of salt affected land.</i>	Consistent with Objective. i. The proposal is on land that has historically been cleared of remnant vegetation. No clearing of native vegetation is proposed or required. ii. The adjacent trees will screen a portion of the Development Area from residences on elevated areas within the Northam townsite. This reduces the visual appearance of the proposal. iii. The development will not have an impact on the drainage regime on-site. Rainwater will be capable of infiltrating on-site. iv. The Development will not contribute towards salinity.

3.2.2 LAND USE PERMISSIBILITY

The development is defined under LPS 6 as 'Power Generation', which "*means premises used predominately to generate electricity for a commercial gain*". The 10MW PV solar array neatly fits into this land use definition.

Under the zoning table, 'Power Generation' is an 'A' discretionary use, which "*means that the use is not permitted unless the local government has exercised its discretion by granting development approval after giving special notice in accordance with clause 64 of the deemed provisions*".

Pursuant to clause 64(3) of the deemed provisions, an application can be advertised for a minimum 14 days in the form of a newspaper advertisement, sign(s) on-site, and letters sent to neighbours. In this regard, the Shire of Northam's Local Planning Policy No. 20 *Advertising of Planning Proposals* indicates that advertising may be undertaken for 21 days in some circumstances.

Once operational, the solar array can be remotely operated so there will be minimal need for vehicles to access the site – mainly for security, maintenance and operational management purposes. Vehicles would typically be four-wheel drives or similar.

3.3 ASSESSMENT OF POTENTIAL IMPACTS

3.3.1 VISUAL ANALYSIS

A visual analysis was undertaken on Wednesday, 1 March 2017. The visual analysis involved driving around the general perimeter of the Development Area, to understand the extent of visibility of the site in context to neighbouring dwellings, other residential areas with views over the property, and from Northam-York Road.

Photos were taken:

- Plates 1-7: on-site, generally along the northern and eastern perimeters of the Development area, to understand what extent of the site could be visible to the dwelling on Lot 13 Northam-Cranbrook Road, dwellings within the area referred to as Woodley Farm Estate, the dwellings further north-west near Fairway Bend;
- Plates 9-10: the access track on Lot 7 Northam-York Road, near the railway crossing into the subject lot; and
- Plate 8: vantage points from Woodley Farm Estate; and
- Plate 11: vantage points from streets near to Fairway Bend.

The photos are compiled and referenced as enclosed in **Appendix B**.

3.3.1.1 BASELINE VISUAL ENVIRONMENT

The baseline visual environment considers the existing land use, development and other characteristics that make up the current context of the Development Area.

The Development Area on Lot 6 is relatively flat with a gentle change in topography from the north down to the south, and from the east down to the west. The topography is representative of a broad valley. The Mortlock River generally flows in a south-east to north-west direction and has generally defined the western boundary of Lot 6.

The northern perimeter of the Development Area is a short distance from three overhead transmission lines that traverse the Lot 6 and Lot 13, linking through to Western Power's substation. The Mundaring-Kalgoorlie water pipeline runs parallel to the transmission lines where in proximity to Lot 6, and the water main and transmission lines run in a straight line over the hill to the east of the Development Area.

The eastern perimeter of the Development Area is on gently sloping land with an approximate elevation of 160m. The eastern perimeter has managed to avoid impacts on three individual trees, although a dam will need to be removed.

The western perimeter of the Development Area is on lower lying land in proximity of existing woodland located within Lot 6. The solar array has been positioned to avoid overshadowing by the eucalypt woodland.

The hill summits on the western and eastern sides of the Mortlock River contribute as prominent features in the local landscape. The summits are both considered to be at an approximate elevation of 200m.

The western hillside is partially developed for low residential development, characterised by dwellings on larger lots, with outbuildings. Trees and residential landscaping in the form of garden beds and lawn is evident. From a distance, the Woodley Farm Estate gives an impression of residential encroachment onto rural land, and lines of trees provide some level of demarcation between the land zoned 'Residential R2.5' and land zoned 'Rural'.

In reviewing the LPS 6 and the *Local Planning Strategy* the Woodley Farm Estate represents the south-eastern extent of residential development within Northam. The lots along Marshall Place and Loton Drive are effectively backing up to a 'townsite boundary', thus the remainder of the western hillside would be retained within the 'Rural' zone. These dwellings therefore would have views over a rural landscape, which in this instance, has been characterised by activities such as:

- Broadacre farming and other agricultural pursuits;
- One identified extractive industry area (understood to be for sand);
- Remnant eucalypt vegetation within particular pockets within rural properties, along fencelines or roads, along the Mortlock River and as scattered trees along the hillside of the hill on Lot 6.
- The Avon-Merredin railway which is used for passenger and freight train movements.
- Northam-York Road which handles car and truck traffic.
- A 132 kV overhead transmission line which connects the Northam substation to the east-west transmission lines that run between the Perth metropolitan region and Merredin.

As a result of the topography, the houses within the Woodley Farm Estate to the west would have the nearest views of the subject site. The properties in the Estate at lower elevations have limited views of the Development Area, or no views at all. A number of dwellings at higher elevations within the Estate have more expansive views over the valley itself, of which Lot 6 forms a part of the overall viewshed. These more elevated areas from the Estate are further away from the Development Area. By being low lying and obscured by vegetation, the Development Area is visible but does not otherwise detract from the rural character of the area.

Land to the immediate north of the Woodley Farm Estate is adjacent to Northam-York Road (also named York Road), and is used by the WA Agricultural Authority and Western Power. The Western Power substation is positioned close to York Road, behind a chain mesh and barbed wire fence. A number of dwellings are located opposite the substation. The substation is prominently visible from passing motorists and would be visible to parts of the Estate, with sparse trees existing within the road reserve. The existing 132kV high voltage overhead transmission lines run from the substation in a south-easterly direction, and run between Northam-York Road and the Woodley Farm Estate and would also be visible from dwellings.

It would be anticipated that, over time, more of the vacant lots within Woodley Farm Estate will be built on. An outcome of the construction of more dwellings on vacant lots within the Estate will contribute in some way to further obscuring visible portions of the Development Area as more houses provide additional screening of views.

3.3.1.2 VISIBILITY OF THE DEVELOPMENT AREA

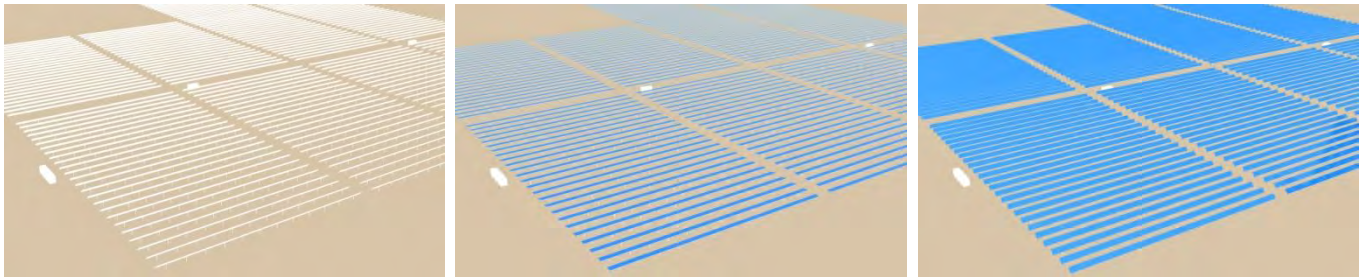
The following cameos (looking generally from the north-west over the solar array towards the south-east) aim to demonstrate the visual appearance of the solar array at different times of day:

- **Cameo 1** indicates the panels tilted east at 9am, shown at a maximum angle of 60 degrees from horizontal;
- **Cameo 2** indicates the panels horizontal at midday; and
- **Cameo 3** indicates the panels tilted west at 5pm, shown at a maximum angle of 60 degrees from horizontal.

Cameo 1: 60 degree pitch at 9am

Cameo 2: panels horizontal at midday

Cameo 3: 60 degree pitch at 5pm



This indicates at a rudimentary level that during the day, as the panels track to follow the sun's path, 'visibility' of the PV modules will vary. At times during the day, the panels will appear less visible and the ground below will become more visible. During the afternoon, from Woodley Farm Estate it would appear that the panels obscure the ground beneath.

Visibility from Lot 13 Northam-Cranbrook Road

The existing dwelling on Lot 13 Northam-Cranbrook Road has views over the Development Area. Existing trees surround the dwelling. The existing dwelling is identifiable on 'Plate 1' and 'Plate 7' in the **Appendix B** and is approximately 350 metres to the north of the Development Area. Whilst access to the dwelling on Lot 13 was not possible, the following **Figure 5** gives an indication of the existing view of the Development Area.



Figure 5 Indicative view from near fenceline of Lot 6 and Lot 13 (not taken from house on Lot 13)

The Proponent has investigated the planting of trees towards the northern perimeter of the Development Area. Given the length of time that the solar array will be in place, trees will have an opportunity to grow and provide visual relief for the residents at Lot 13. Planting of trees could also contribute to providing a wind break.

Visibility from Northam-York Road – Limited to Nil

Photos from Northam-York Road are referenced as 'Plate 9' and 'Plate 10' in the **Appendix B**.

The Northam-York Road is low-lying, at a comparable elevation to the Development Area. Intervening vegetation and the slightly higher elevation of the railway significantly limit views to the site.

The Development Area is located on low-lying land of a comparable elevation to the western side of the Mortlock River (due to the landform representing a wide shallow valley). Motorists travelling on Northam-York Road are only able to catch glimpses of the Development Area due to:

- The height of solar arrays is approximately 2.4m metres and would appear as dark grey objects.
- The posted speed limit is 110 kph at the location where glimpses between trees are potentially possible.
- The railway line is at a higher elevation compared to the lower elevation of the road surface of Northam-York Road. The railway tracks obscure views for some types of vehicles.
- Trees along the Mortlock River and within the woodland on the property provide screening of the Development Area.
- Given the distance of the Development Area from the road, it is unlikely to cause distraction to drivers heading north along the road towards Northam.

Visibility from Woodley Farm Drive & Loton Drive – Partial

The residential development fronting Woodley Farm Drive and Loton Drive is on an elevated hillside, affording dwellings some views over the valley, and over Lot 6. Photos from the residential area are referenced as 'Plate 8' in the **Appendix B**.

Based on photos taken from the site (refer photo DSC00043, Plate 5 in **Appendix B**), approximately 30 houses were identified, notwithstanding that there are a number of vacant lots in the locale.

Dwellings are only able to see parts of the Development Area due to:

- The height of solar arrays being approximately 2.4m metres, and will appear as dark grey objects.
- Even with conservative approximations of distance, the Development Area is between 800m (measured from the house on 56 Loton Drive) and 1,600m (measured from the house on 10 Marshall Place) from the nearest dwellings.
- Lots are generally oriented north-west to south-east to account for topography, whereby sides of houses have opportunities to look east towards Lot 6. Given typical house designs, it is highly likely that neighbouring houses are going to block views from houses immediately upslope.
- Some views may be taken from front or back yards, or from streets or from more prominent houses towards the hill summit. Notwithstanding, views are partially obscured by houses, trees, fences, etc in the immediate locale.
- The woodland on Lot 6 blocks views of the lower-lying parts of the Development Area.

The following **Figure 6** illustrates the extent of visibility of Lot 6, when viewed from Woodley Farm Drive (in this instance, near the intersection of Loton Drive and Marshall Place). **Figure 7** illustrates a photomontage of the PV solar array to give an indication of its level of visibility from the same position.



Figure 6 Perspective of Lot 6, from Loton Drive (date: 1 March 2017)



Figure 7 Photomontage illustrating proposed PV Solar Array

Visibility from Fairway Bend & Putting Rise – Partial, Distant

The residential development is on a low hillside to the immediate north of Northam Country Club, affording some distant and partial views over the valley, and over Lot 6. Photos from the residential area are referenced as 'Plate 11' in the **Appendix B**.

Based on photos taken from the site, approximately 38 houses were identified in the distance, notwithstanding that there are a number of vacant lots in the locale.

Dwellings are only able to see distant parts of the Development Area due to:

- The height of solar arrays being approximately 2.4m metres and will appear as dark grey objects.
- Even with conservative approximations of distance, the Development Area is between 2,200m (measured from the house on 54 Wood Drive) and 2,700m (measured from the vacant land on 54 Fairway Bend) from the nearest dwellings.
- Lots are generally oriented south-west to north-east to account for topography, whereby sides of houses have opportunities to look south-east towards Lot 6. Given typical house designs, it is highly likely that neighbouring houses are going to block views from houses immediately upslope.
- Some views may be taken from front or back yards, or from streets or from more prominent houses. Notwithstanding, views are partially obscured by houses, trees, fences, etc in the immediate locale.
- The woodland along the rivers, within the Northam Country Club and on Lot 6 all help to obscure views of the Development Area.

3.3.2 GLARE

The PV cells absorb sunlight in order for the cells to convert solar energy to electricity. The glass covering the cells is selected for low reflectance to maximise absorption and therefore efficiency in electricity generation. They are generally visible as dark grey panels that have less reflectance than a grassy field.

Like with all reflective surfaces and materials, including grassy fields and smooth water, there is a potential for glare from reflection at particular angles. Research from a study in Nevada on a fixed-plate polycrystalline solar array indicated that the nuisance of glare for pilots could not be completely avoided; however the potential for *post-flash glare after-image* potential was equivalent to that of smooth water.

In addition, the study noted that pilots mitigate glare by using darkened visors, sunglasses, and glare shields, which can reduce intensity of retinal irradiance by roughly 70 percent (Riley & Olson 2011). As such, the study concluded that flat-plate PV systems are not a hazard to air navigation.

Whilst the Nevada study referred to a fixed system, the proposed single axis system rotates the panels from east to west so that they face the sun as it passed through the sky during the day. A single axis system captures more sunlight than a fixed system. Importantly, a single axis system results in less potential for glare than a fixed-position system. This is because the single-axis system positions the panels directly (or as direct as possible) at the sun throughout the day. This is demonstrated further within the Technical Note prepared by Matters of Environment (2017), contained in **Appendix E**. The Technical Note concludes that glare from the PV solar array will not be seen from ground level as reflectance of sunlight will in all cases be upwards and not towards residents and other users of the surrounding areas.

There are fixed-system photovoltaic systems installed at a number of airports in Western Australia, such as Onslow Airport and Newman Airport (refer **Figure 8**) and, more recently, Karratha Airport. Whilst Northam Airport is near to the Development Area, there is sufficient evidence that airports and solar arrays are compatible forms of development. The reflected sunlight is subdued and diffused due to the characteristics of the materials used in the panels as described further within the Technical Note contained in **Appendix E**, and would not contribute to glare as a hazard for aviators.

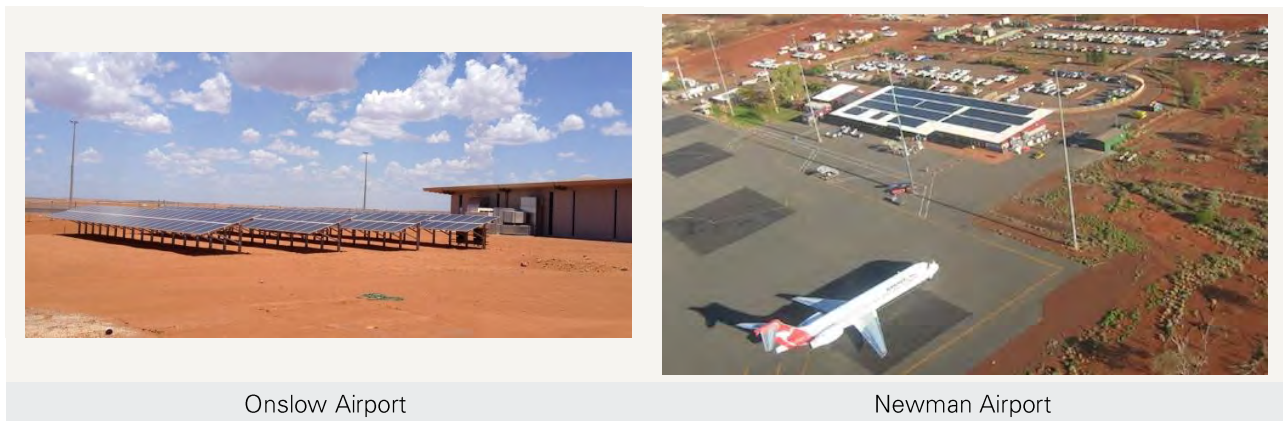


Figure 8 Demonstrated Application of PV Solar Arrays at Western Australian regional airports

3.3.3 NOISE

During installation, noise will mainly occur through vehicles bringing the components to the Site. Construction noise will be similar to that noise created during agricultural activities and by traffic along Northam-York Road. Noise from construction and unlikely major maintenance is expected to comply with the requirements of the *Environmental Protection (Noise) Regulations 1997* and is outlined further in the Technical Note contained in **Appendix D**.

During daylight hours, the equipment on-site will emit low-moderate noise of near constant levels in the form of a 50 Hz hum. The four inverters that will be installed have been subject to acoustic assessments by the manufacturer, and produce the equivalent of 79 dB(A) at a distance of 1 metre. The single axis tracking motors produce approximately 64 dB(A) at a distance of 1 metre.

Noise levels reduce by approximately half (6 dB) every doubling of distance in accordance with the inverse-square law. Assuming the sound of the four inverters is not reflected or absorbed, the noise levels from the inverters will be at or below 30 dB and the tracking motors at or below 15 dB when measured approximately 300m from the source. This is documented in detail within the Technical Note in **Appendix D**. These noise levels are comparable to rural background levels or that of a quiet bedroom at night. The facility is unlikely to be audible by dwellings and even if it is audible, it would be perceived as a distant, dull hum and substantially below the limits set by the *Environmental Protection (Noise) Regulations 1997*.

At night, the facility is expected to produce little or no sound since the four inverter stations go to 'stand-by' mode waiting for the sun to rise and the tilting motors are idle. At night, dwellings are highly unlikely to hear any noise as sound levels will have reduced to below 25 dB. Local residents are not likely to experience any level of disturbance from noise.

The following **Table 7** outlines examples of noise sources in comparison to the anticipated noise levels for the facility. Operational noise generated by the Development is highly unlikely to disturb residents and falls within the acceptable noise limits contained in the *Environmental Protection (Noise) Regulations 1997*.

Table 7 Comparative Noise Source Examples to the Proposal

Equivalent Noise Source Examples	Decibel	Decibel Effect
Car wash at 6 metres (89 dB); propeller plane flyover at 300 metres (88 dB); diesel truck 65 kph at 15 metres (84 dB); diesel train at 72 kph at 30 metres (83 dB). Food blender (88 dB); milling machine (85 dB); garbage disposal (80 dB).	80	2 times as loud as 70dB. Possible damage in 8 hour exposure.
Passenger car at 105 kph at 7.5 metres (77 dB); freeway at 15 metres from pavement edge 10 a.m. (76 dB). Living room music (76 dB); radio or TV-audio, vacuum cleaner (70 dB). Inverters 79 dB at 1 metre.	70	Arbitrary base of comparison. Upper 70's are annoyingly loud to some people.
Conversation in restaurant, office, background music, Air conditioning unit at 30.5 metres. Tracking motors <64 dB at 1 metre.	60	Half as loud as 70. Fairly quiet.
Quiet suburb, conversation at home. Large electrical transformers at 30.5 metres.	50	One-fourth as loud as 70 dB.
Library, bird calls (44 dB); lowest limit of urban ambient sound	40	One-eighth as loud as 70 dB.
Quiet rural area. Acceptable night-time noise level for noisy domestic equipment (air conditioners, heat pump water heaters, pool and spa pumps) within 2 metres of sensitive areas of a house. Inverters at/below 30 dB during the day at 300 metres.	30	One-sixteenth as loud as 70 dB. Very quiet.
Whisper, rustling leaves Inverters at/below 25 dB at night at 300 metres.	20	
Breathing Tracking motors at/below 15 dB at 300 metres.	10	Barely audible.

3.3.4 ELECTROMAGNETIC FIELDS

The operation of the PV modules and inverters will generate electromagnetic fields (EMFs), which are known to be generated by all electrical equipment and cabling, including domestic solar panels installed on houses. EMFs are known to naturally occur around organisms and are experienced during thunderstorms.

EMFs have not been known to have threats to human health, although prudent avoidance of extremely low frequency EMF is recommended. What is notable is that a UK study into EMF and substations, determined that EMF could not be detected above background levels, within 5 metres. A USA study found that EMF at commercial PV arrays were lower than EMF for domestic applications, and were indistinguishable from background levels when measured at the perimeters of commercial PV arrays. EMFs are described in further detail within the Technical Note in **Appendix E**.

The Development Area is on private property, is proposed to be fenced off, and will not be accessible to the general public. Electrical standards require all components and installations to meet electromagnetic compliance (EMC), which includes shielding and other controls that prevent interference with other electrical appliances and communications. The inverters are insulated and earthed. The proposed Development will adhere to applicable Australian Standards.

Whilst noting that EMFs are not known to threaten human health, the site's location and distance to houses would ensure it does not present as a hazard to the public.

3.3.5 HEAT

The operation of the PV panels requires absorption of sunlight, and therefore the solar array will absorb heat from the sun. The panels are designed to offload heat into the atmosphere to ensure that panels operate at their most efficient temperature range. The PV Panels will shade the ground directly below.

The agricultural fields surrounding Northam are arguably most productive during cooler months and have stubble or bare soil as a result of harvesting during October-December (and subsequent burning off for the next crop season). Bare soil would absorb more heat, and the lack of vegetation would have an influence on the local temperatures.

A number of studies have investigated the 'heat island effect' for PV panels and are described in more detail in the Technical Note in **Appendix E**. More relevant to Northam, the heat island effect is influenced by the PV Panels, which will release heat energy into the air, instead of the sun's thermal energy being absorbed by the ground.

Vegetation can have localised cooling effects as it can shade the ground and lead to less thermal absorption, and releases water vapour into the air through evapotranspiration. The Development does not require clearing of significant vegetation, and only some earthworking of the low-quality agricultural land. It is anticipated that some regrowth of vegetation may occur inside the Development Area yet this will be managed to be kept low to the ground (as documented in the Site Management Measures in **Table 8**). The Technical Note (refer **Appendix E**) considers that the cooling effects of vegetation around the Development Area, and around the residences in the area, will be the dominant influence on temperatures rather than the PV array heating the surrounding vegetated areas.

It is unlikely that residents will detect any change in temperature as result of the installation of the solar array, due to the dominant influences of the surrounding environment.

3.3.6 DRAINAGE

Installation of the solar array will involve drilling or driving short piles into the ground. The sandy soils generally hold water well and there is underlying clay. Piles are unlikely to affect or alter the current hydrology.

The land is not known to readily flood, and the subject site was not affected by a recent 1:100 ARI flooding event that occurred in February 2017.

3.3.7 FLORA AND FAUNA

The installation of the development will not require clearing of native vegetation. To the east of the Development Area, two isolated York gums are within the paddock. These have been examined by a qualified environmental consultant, with the conclusion that they are not significant.

A small number of bird species, invertebrates and small mammals (generally rodent pests) may occur within the field. Construction of the development may displace some visiting fauna, however there are significant areas of arable habitat for foraging and hunting.

Once operational, the development is not considered to generate noise or nuisance for fauna species any more than existing agricultural activities, train use on the nearby railway line, or vehicle traffic on Northam-York Road.

3.3.8 SITE MANAGEMENT

Site management will be determined as part of the construction and operation of the facility. As a guide, a number of management measures can be considered to ensure that potential impacts can be managed, as per **Table 8**.

Table 8 Suggested Site Management Measures.

Matters	Suggested Management Measures
Car Parking	10 parking bays. Bays are dimensioned at 5.4m x 2.5m as per AS2890.
Earthworks	Some levelling of site and compaction to minimum levels and requirements for the tracking modules. No bulk earthworks are proposed.
Managing vegetation cover within the Development Area	Vegetation may regenerate and need controlling within the Development Area. Sheep could be grazed to control vegetation; alternatively, appropriate herbicides (such as glyphosphate) can be applied through small-scale wands to reduce spray drift. Vegetation along tracks trimmed back, but not removed.
Soil erosion	Soil monitoring on an annual basis to control erosion through revegetating bare land with more robust species (where required), placing geotextiles on soil, and drip controls on panels to reduce kinetic energy of rain drops. Maintaining vegetation over the soil will minimise erosion from wind and/or water.
Oil	Vehicles for construction and maintenance will be maintained to manufacturers' recommendations to reduce the risk of hydrocarbon spill. If mineral oil is within the inverter stations, a sump catchment tray of sufficient size to contain all the oil will be installed.
Bush Fire Management	A suite of bush fire management measures to be developed in consultation with Department of Fire and Emergency Services to consider matters including: <ul style="list-style-type: none"> • Fire breaks around the outside of the proposed Perimeter Site Fence, to the specifications of the Shire of Northam; • Selection, maintenance and operation of plant, vehicles and tools; • Reduction of vegetation fuel loads within the Development Area; • Control of vegetation under overhead export cables in accordance with State requirements; • Control of hot work, considering ambient conditions and fire risk; • Control of flammable liquids and combustible materials stored on-site; • Remote monitoring of switchgear and loading; • Fire breaks around components of higher risk and adjacent woodland habitat; • Fire fighting equipment appropriate to the most credible fire risks on-site; • Awareness and training of site staff in minimising fire risk and fire response actions.
Effluent Disposal	Proposed Chemical Toilet with appropriate on-site effluent treatment/disposal system in accordance with Shire of Northam and Department of Health requirements.
Insulation	Inverters have factory fitted lightning protection. Insulation and earthing of equipment and structures will comply with relevant standards and requirements.
Perimeter Fencing, Gates and Bollards	<ul style="list-style-type: none"> • 1.8m wire mesh fencing with galvanised steel posts and 3 strands of barbed wire at the top. • Double leaf gate with a personnel gate installed at the north end of the Development Area. • Protective bollards installed at access gates, turning corners of the road around the array frames, vehicle access ways.

4 PRE-LODGEMENT CONSULTATION

4.1 OFFICE OF THE ENVIRONMENTAL PROTECTION AUTHORITY

In February 2017, the Proponent presented summary information to the Office of the Environmental Protection Authority (OEPA). The OEPA confirmed that the proposal does not trigger a referral due to the development being proposed on agricultural land and the potential risks and impacts are too low for a referral.

No clearing permit is required due to the land being used for agricultural purposes. No significant vegetation is proposed to be cleared.

4.2 SHIRE OF NORTHAM

The Proponent met with the Shire CEO and Executive Manager of Development Services on 17 November 2016. Teleconferences were also held with the Manager Planning Services in December 2016 to introduce the project and discuss whether the land could be retained as 'Rural' zoning. Project summary documentation was provided to the Shire in February 2017 outlining the proponent, project, site, environmental matters and proposed planning approach. The Shire provided advice in relation to the planning process for a Development Application of this nature, including advertising processes.

The Proponent has made a presentation to the Council on 15 March 2017. The purpose of the presentation was to provide a project overview and to take questions from Elected Members.

4.3 LANDOWNER

A 25-year lease has been secured with the landowner. The selection of low-yield agricultural land has been undertaken in consultation with the landowner, to minimise disruption to their agricultural pursuits.

4.4 NEIGHBOURS

Immediate landowners have been approached by the Proponent. Landowners have verbally indicated their support for the project.

4.5 WESTERN POWER

It is a standard Western Power procedure to work with energy providers in order to connect sources of energy to the network. The proponent has liaised with Western Power for determining the export cable route to connect into the existing 22kV overhead distribution line.

4.6 POST-LODGEMENT CONSULTATION

In addition to the Shire's advertising of the DA in accordance with its Scheme and local planning policy, the Proponent undertook their own informal consultation in order to engage with neighbours and residents.

The Proponent distributed letters to landowners within Woodley Farm Estate inviting them to take an opportunity to meet with two representatives of Carnegie Clean Energy, at the Riverside Hotel between 5-7pm on 10 April 2017. A total of 7 people representing three groups attended. The Proponent also spoke with about five generally interested parties from around Northam that also visited the Riverside Hotel.

The matters raised and discussed were primarily in relation to visual amenity, glare, noise, heat, lifestyle and site access arrangements. These matters were also noted to have been raised in submissions received by the Shire during the advertising period. These matters have been addressed in section 3.3 of this report and in more detail in **Appendix B** on visual analysis, **Appendix D** on noise and **Appendix E** on glare, heat and electromagnetic fields.

The Proponent's letter and the matters raised by stakeholders during the meeting at the Riverside Hotel have been summarised in a schedule, contained in **Appendix F**.

5 CONCLUSION

The application proposes the development of a 10MW PV Solar Array on a low-lying portion of unproductive farm land that is generally obscured from view from the townsite and the nearest major road and within a location that enjoys convenient electricity connection points to the South-West Integrated System. The appearance of the development will not be obtrusive, given the low reflectivity of materials and the visual appearance of the arrays as dark grey on the landscape.

As demonstrated, the application is compliant with the relevant aspects of the Shire's planning framework. It is an 'A' (discretionary) use under the LPS 6 and can be determined following advertising in accordance with the Deemed Provisions and the Shire's Local Planning Policy No. 20.

Approval and implementation of the proposal will be a positive step towards the production of local renewable electricity, consistent with the Commonwealth Government's Renewable Energy Target. Renewable energy contributions to the overall energy mix will continue to increase as PV solar array projects become more viable and new locations are secured and given approval. This proposal will assist Western Australia in meeting growing energy demand whilst reducing overall reliance on fossil fuel sources.

APPENDIX B

Visual Analysis Photoset





Site Inspection 1 March 2017

Report Date: 21 March 2017

- 1 DSC00030 | DSC00035
- 2 DSC00031 | DSC00032 | DSC00033 | DSC00034
- 3 DSC00036 | DSC00037 | DSC00038 | DSC00039
- 4 DSC00040 | DSC00041 | DSC00042
- 5 DSC00043 | DSC00044 | DSC00045 | DSC00046 | DSC00047
- 6 DSC00048 | DSC00052 | DSC00049 | DSC00050 | DSC00051
- 7 DSC00053 | DSC00054 | DSC00056 | DSC00055
- 8 DSC00057 | DSC00058 | DSC00059 | DSC00060 | DSC00061
- 9 DSC00062 | DSC00063 | DSC00065 | DSC00066
- 10 DSC00064
- 11 DSC00067 | DSC00068 | DSC00069 | DSC00070 | DSC00071 | DSC00072
- 12 Photomontage



PLATE 1



| DSC00030



| DSC00035

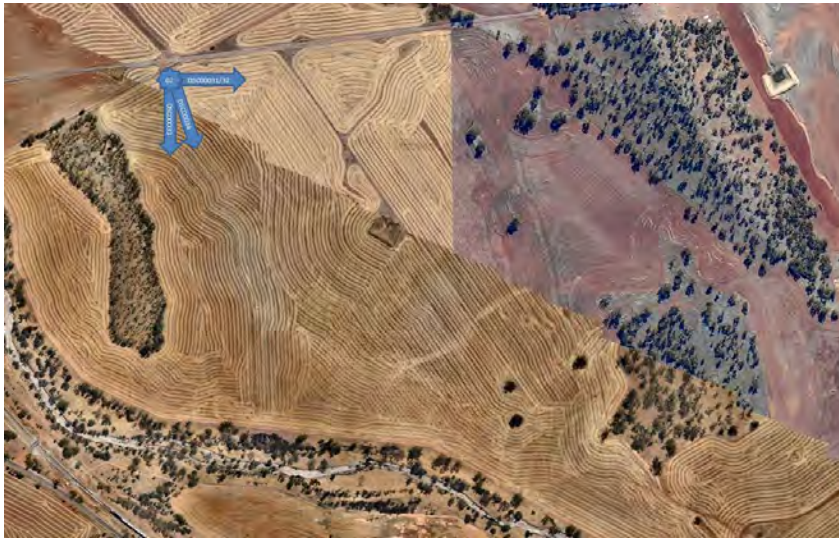


PLATE 2



| DSC00031



| DSC00032

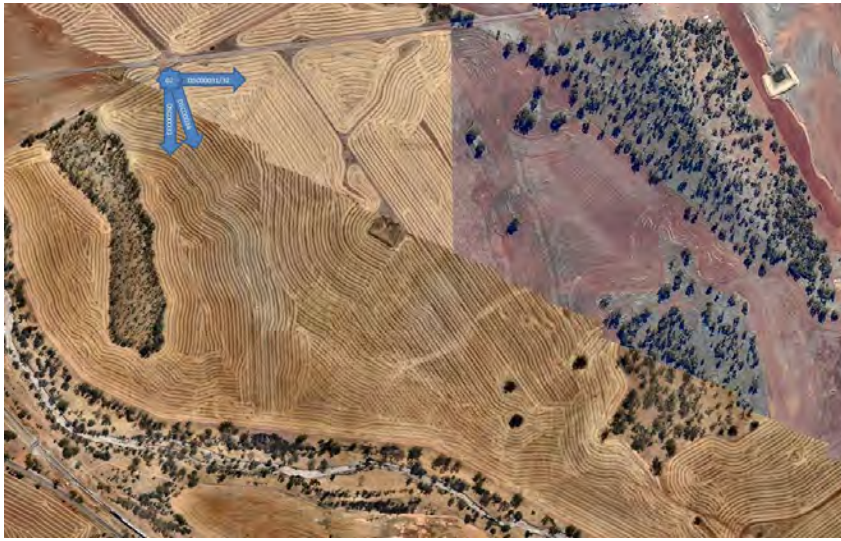


PLATE 2



| DSC00033



| DSC00034



PLATE 3



| DSC00036



| DSC00037



| DSC00038



PLATE 3



| DSC00039



PLATE 4



| DSC00040



| DSC00041



PLATE 4



| DSC00042



PLATE 5



| DSC00043



| DSC00044



PLATE 5



| DSC00045



| DSC00046



PLATE 5



| DSC00047



PLATE 6



| DSC00048



| DSC00049



PLATE 6



| DSC00050



| DSC00051



PLATE 6



| DSC00052



PLATE 7



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| DSC00054



PLATE 7



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PLATE 8



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| DSC00058



PLATE 8



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PLATE 8



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PLATE 9



| DSC00062



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PLATE 9



| DSC00065



| DSC00066



PLATE 10



| DSC00064



PLATE 11



| DSC00067



| DSC00068



PLATE 11



| DSC00069



| DSC00070



PLATE 11



| DSC00071



| DSC00072



PLATE 11



| DSC00073



| DSC00074



PLATE 11



| DSC00075



PHOTOMONTAGE

Location of Photo to Western Perimeter Fence of Development Area
Approximate Distance – 1.2 kilometres



| DSC00061



| Photomontage

APPENDIX C

Environmental Site Assessment Report







Carnegie Clean Energy

Northam PV Array

Contract No. 17011201

Environmental Site Assessment Report

0	2-Mar-17	BS	BS		BS	Issued for Use
Rev No	Date	By	Checked		Approved	Issue Purpose

	PROJECT NO: MP16004		
	Document No: MP16004-REP-1001	Rev. 0	

VERSION RECORD SHEET

Revision	Revision Date	Purpose	List of updated/modified sections if any
A	1-Feb-17	Issued for Client Review	NA
B	9-Feb-17	Issued for Client Review	Incorporate Client comments provided on 9-Feb-17
C	20-Feb-17	Issued for Client Review	Incorporate updated figure from Client and include removal of trees.
0	2-Mar-17	Issued for Use	Incorporate Client comments of 28 Feb and additional information provided in email dated 28 Feb.

TABLE OF CONTENTS

1. INTRODUCTION	4
1.1 SITE DESCRIPTION	4
1.2 PROJECT ENVIRONMENTAL CONSULTANT	5
2. DESK STUDY AND SITE INSPECTION	6
2.1 METHOD	6
2.2 DESK STUDY FINDINGS.....	6
2.3 SITE SURVEY RESULTS.....	7
2.3.1 <i>Arable Paddock</i>	7
2.3.2 <i>River Banks and Woodland</i>	8
2.3.3 <i>Woodland Habitat</i>	8
2.3.4 <i>Cultural Aspects</i>	9
3. ENVIRONMENTAL ASSESSMENT	9
3.1 HUMAN CULTURE AND SOCIAL	9
3.2 VEGETATION.....	10
3.3 FAUNA	10
3.4 MORTLOCK RIVER SOUTH	11
3.5 TEC EUCALYPT WOODLAND OF WA WHEATBELT	11
3.6 SOILS	12
3.7 SOIL AND RIVER POLLUTION.....	12
3.8 BUSHFIRE.....	12
4. SUGGESTED MANAGEMENT MEASURES	13
5. CONCLUSIONS	14
REFERENCES	15
PLATES.....	16
APPENDIX 1: SMA WHITE PAPER BU-U-019 SOUND POWER MEASUREMENTS.....	20
APPENDIX 2: EMAIL RESPONSE FROM THE OEPA.....	23

1. INTRODUCTION

Carnegie Clean Energy Pty Ltd (Carnegie) proposes to develop a 10 MW (maximum designed output) photovoltaic (PV) solar array on the outskirts of Northam in Western Australia as shown in Figure 1. Carnegie has contracted Matters of Environment Pty Ltd (MoE) to conduct an environmental and cultural desk study, site survey and assessment to support a planning application for the development.

This Environmental Assessment Report provides a description of the environmental and cultural aspects of the Site and its surrounds. It conducts a risk and impacts assessment and considers necessary management measures based on the risks and impacts. This preliminary assessment will determine whether the proposed development will need to be referred to State and Commonwealth authorities.

The PV array will comprise of:

- approximately 36,000 solar panels mounted on single axis tracking frames covering approximately 35 ha
- the single axis frames will be fastened to small diameter driven piles of approximately 2 m length
- substation consisting of a containerised transformer, inverter and control system
- connecting infrastructure and approximately five combiner boxes
- above-ground export cable to connect to the South Western Interconnected System (SWIS) via a 22 kV feeder line to the north of the site.

The site already has vehicular access to the south-east suitable for the installation of the PV Array which can carry large agricultural and freight vehicles up to the size of road trains. Maintenance of culverts used to cross the river may be required ahead of the installation but does not form part of the proposed development.

Construction is currently scheduled to occur between April and November 2017, and is expected to last six months. The solar array will be operational for an intended period of 20 years.

Figure 1: Site Location Plan, red diamond shows location of the Site.



1.1 Site Description

The proposed development site (the Site) as shown in Figure 2, covers 38 ha and is contained wholly within agricultural land designated as 'Rural' in the Shire of Northam's Local Planning Scheme 6 (LPS6). The site is

currently under arable management and has one agricultural field pond within the site boundary. There are several stands of vegetation on adjacent and nearby land and the Mortlock River South lies immediately south. A site access track exits off Northam-York Road and crosses the Mortlock River South before traversing approximately 900 m of existing track along the edge of arable land.

Figure 2: Site Layout Plan showing woodland habitat either side of the Mortlock River South and small stands of woodland adjacent to the Site. The Site Boundary (shown in red) is indicative only with the final site boundary being described within the final planning application. (Contour lines in yellow have been estimated from <http://www.maphill.com/australia/western-australia/northam/detailed-maps/terrain-map/>)



1.2 Project Environmental Consultant

MoE is an independent environmental consultancy formed in 2016. It is run by Dr Barry Shepherd who has been an ecologist and independent consultant spanning more than 20 years. Nine of these years have been spent in Western Australia servicing various industries in support of many developments including wind energy, housing, marinas and oil and gas. Barry Shepherd has a Ph.D. in Ecology and B.Sc. (hons) in Environmental Biology.

The conclusions and recommendations contained in this document reflect the professional opinion of MoE, using the data, information and records acquired. MoE has used reasonable care and professional judgment in its interpretation and analysis of the data.

2. DESK STUDY AND SITE INSPECTION

2.1 Method

GIS data were acquired from Western Australia's Department of Parks and Wildlife for threatened and protected flora, fauna, communities, reserves and environmentally sensitive areas. In addition, a search was conducted for the area on the Department of Energy and Environment's (DEE) Protected Matter Search Engine.

The AHIS database was queried to identify if any sites of Aboriginal Heritage are located on or near the Site. In addition, the Aboriginal Heritage Places Dataset was downloaded from the Department of Aboriginal Affairs (DAA) website. Information on European cultural heritage was obtained using the Australian Places Inventory (<http://www.environment.gov.au/heritage/places/wa/index.html>).

Other information such as wind erosion, weeds, managed lands, bush fire prone areas and world heritage etc. was obtained using spatial information available from data.wa.gov.au.

All data can be made available on request.

2.2 Desk Study Findings

Data acquired through the desk study shows that no existing protected or threatened environmental or cultural features are known to exist within the development boundary shown in Figure 2.

The Mortlock River South is a tributary of the River Avon. The Government of Western Australia (2008) identify that significant challenges face the ecological condition of the River Avon and its tributaries with inputs of sediments and nutrients significant factors threatening the condition of the rivers.

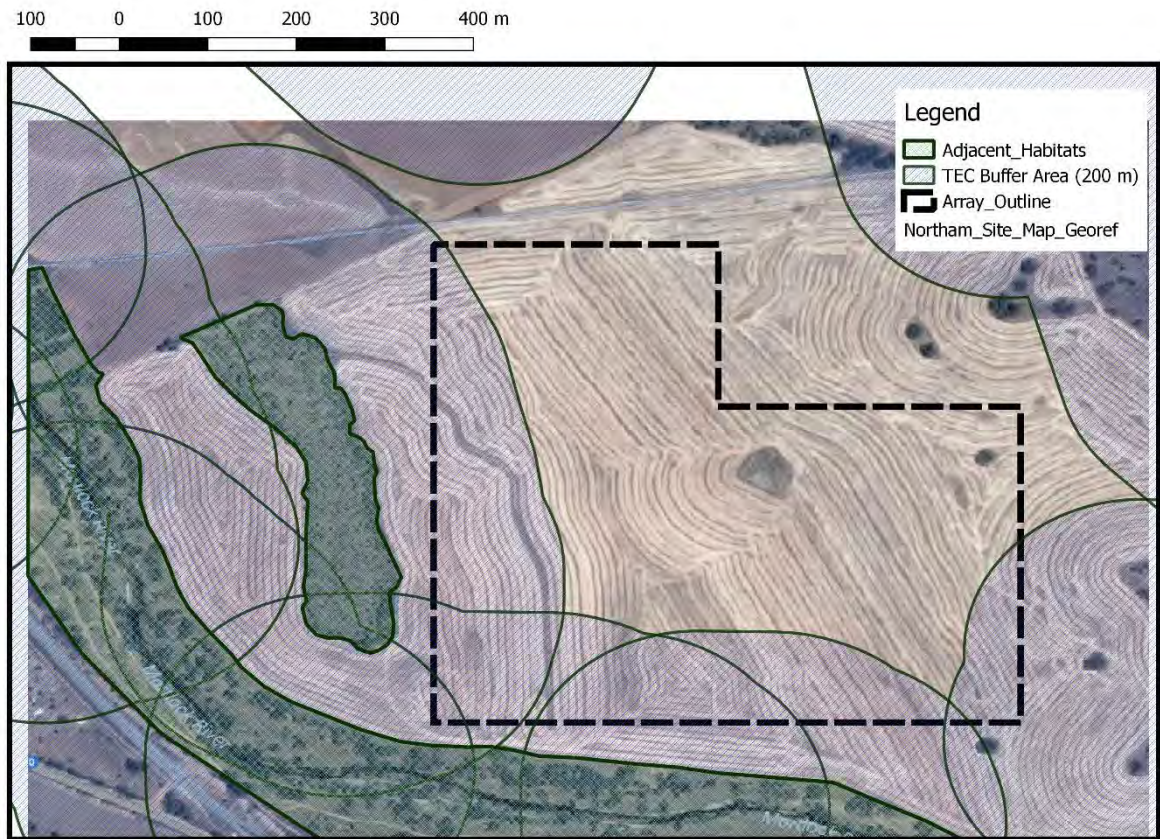
The DPAW data show that several stands of "Eucalypt Woodland of the Western Australian Wheatbelt" lie immediately south and west of the Site. This is classed as a critically endangered, threatened ecological community (TEC) under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and therefore a matter of National Environmental Significance (MNES). It has been designated Priority level 3 in Western Australia. The DPAW includes a 200 m buffer around TECs to draw attention to any proposed development that occurs close to TECs. The PV array falls within the buffer for the woodland adjacent the river and the stand to the west as shown in Figure 3. The PV Array will be located at least 30 m from the woodland to the south and at least 35 m from the woodland to the west.

Five records of aboriginal culture lie within two kilometres of the Site. Four of these are findings of scattered artefacts and the Mortlock River South is part of the Swan River which has mythological meaning for the Nyoongar peoples. None of these are likely to be affected by the proposed development.

There are no areas of public amenity value close to the Site or overlooking it.

The Site is not mapped as "bush fire prone" but the woodland habitats either side of the Mortlock River South are, as are stands of woodland to the north and east of the Site.

Figure 3: Site plan showing the outline of the PV Array, outline of the TEC “Eucalypt Woodland of the Wheatbelt” and a 200 m buffer around this TEC.



2.3 Site Survey Results

A site visit was conducted by Dr Barry Shepherd of Matters of Environment Pty Ltd (MoE) on 24 January 2017 to identify the aspects on site and adjacent to the site especially along the site access route and the proposed cable export route. Habitats were inspected to identify the broad vegetation types present and the potential or actual use by protected fauna. Topography and amenity values were also considered.

2.3.1 Arable Paddock

The proposed location of the PV Array is comprised wholly of arable land falling gently from north-east to the south-west (see Plate 1). Part of the access route and the export cable route also lie within the arable paddock and its tracked boundary. The arable land was covered in wheat stubble at the time of survey but canola, oats and other crops have been grown. An artificial field pond is located towards the north of the Site and a low runoff control berm and ditch was formed within the south-western half of the Site.

Soils vary across the site with red granite loams on the higher ground to the north and sand across the southern lower ground. The area along the western edge near the runoff control berm is comprised of stronger clays (pers. comm. D. West farmer/landowner).

During the survey a nankeen kestrel (*Falco cenchroides*) was observed hunting within the stubble area and five Richard's pipits (*Anthus novaeseelandiac*) were observed foraging in the stubble on the northern boundary of the Site.

Several isolated York gums (*Eucalyptus loxophleba*) were located within the arable paddock outside the Site and uphill from the north-eastern boundary. The access track from the Northam-York Road has a small number of isolated eucalypts and acacia on each side but is generally fenced. Where it crosses the Mortlock River South, several steel culverts form the crossing (see Plate 5).

2.3.2 River Banks and Woodland

The Mortlock River South lies approximately 15-30 m south of the arable paddock. The area between the river bank and arable paddock was formed of woodland (circa 30% cover) with sparse understorey and ground cover dominated by agricultural weeds (see Plate 2). The woodland was dominated by flooded gum (*Eucalyptus rudis*), salmon gum (*Eucalyptus salmonophloia*), swamp she-oak (*Casuarina obesa*) and one other eucalypt that is possibly a hybrid between *E. camaldulensis* and *E. rudis* as described by French (2012). The understorey was formed of swamp paperbark (*Melaleuca raphiophylla*), infrequent needlebush (*Hakea preissii*) and occasional *Acacia* spp.. Occasional plants of the dominant species listed above were also present. The ground cover was dominated wholly by wild oats. No signs of native plant species were found but it is acknowledged that January is not the optimum period for sampling native ground flora. The woodland was fenced off from the arable paddock using sheep fencing in good condition. The woodland habitat immediately south of the PV Array has been designated as Eucalypt Woodland of the Wheatbelt and a TEC.

The river was in a “dry with isolated ponds” state and showed signs of salinity with areas of salt crystal formation and frequent stands of samphire (*Halicornia* spp.) present (see Plate 3). There were also signs of eutrophication in the form of dried algal matting. Swamp paperbark (*C. obesa*) and swamp she-oak (*M. raphiophylla*) overhung the river banks occasionally and the bank flora was comprised of wild oats on the higher ground and rush and reed on the lower sections.

The habitat to the south of the river was not inspected but was of similar appearance to that on the north side and is also designated the TEC Eucalypt Woodland of WA Wheatbelt.

Two or three families of rainbow bee-eater (*Merops ornatus*) were observed hawking for insects along the river bank and over the woodland. The rainbow bee-eater is classified as Listed under the EPBC Act and a priority Level 3 species under the *Environmental Protection Act 1986* (EP Act). No other threatened or protected species were observed. Common bronzewings (*Phaps chalcoptera*) and one crested pigeon (*Ocyphaps lophotes*) were observed along the river. Several trees had hollows that were probably too small at this time to be of use by Carnaby's black cockatoos (*Calyptrorhynchus latirostris*) but may provide suitable nesting hollows in future. Two tree hollows spotted during the site inspection had feral honeybee colonies inside.

2.3.3 Woodland Habitat

Two other stands of woodland lie adjacent the Site. A stand of young woodland/scrub (circa 40% canopy cover) and approximately 4.7 ha lie to the west of the Site. This stand is comprised of salmon gum (*E. salmonophloia*) and hybrids between *E. rudis* and *E. camaldulensis*, and mostly of young plants with trunks of around 200-300 mm diameter (see Plate 4). A small number of older trees with trunks of circa 600 mm are present towards the southern end of this stand. The larger trees appear to be of the hybrid gum. It is speculated that this stand has generated naturally having been removed from tillage because its soil is not so suited to arable than surrounding soils (pers. comm. D. West farmer/landowner).

There is no distinction between the canopy and understorey because of the uniformity of age of most of the trees. One large needlebush (*H. preissii*) was recorded within this wood. The ground flora was formed entirely of arable weeds and in particular wild oats. Again, it is acknowledged that January does not allow sampling of native ground flora. This stand of woodland habitat is also designated TEC Eucalypt Woodland of the Wheatbelt in the threatened and protected communities database.

This stand of woodland was not fenced off from the arable paddock.

A smaller stand of woodland lies to the north of the site comprised almost exclusively of York gum (*E. loxophleba*). This stand lies on the opposite side of the Mundaring-Kalgoorlie Pipeline and overhead feeder

cables to the north of the site boundary. A small fragment of Eucalypt Woodland of the WA Wheatbelt (approximately 60 m across) is also present 130 m to the east of the PV Array within the same agricultural paddock, and a large stand 240 m north east.

2.3.4 Cultural Aspects

There were no records of aboriginal or European cultural features on the open farmland or in the adjacent woodlands.

Whilst there were no look-outs or areas of public amenity value overlooking the Site, houses on the higher ground in the south-east area of Northam (around Woodley Farm Drive) are likely to see the northern edge of the array. It is possible that the containerised transformer, inverter and control system will also be visible from certain locations in the Woodley Farm Drive area. The visible part of the PV array will be approximately 1 km to 1.5 km from the housing that overlooks the Site.

3. ENVIRONMENTAL ASSESSMENT

The construction of the array, access activities and export cable route will occur only on an arable paddock and the existing access track to this paddock from Northam-York Road as shown in Figures 2 and 3. The field pond is proposed to be filled in and the berm and ditch flattened. As such the only direct (negative) impacts from the proposed PV Array will be on existing arable land.

An early proposed export cable route was located through the woodland and across the river to the south of the Site. However, CCE and Western Power have opted to locate the export cable to the north of the site to avoid impacting the woodland and riparian habitats. Instead, the export cable will be located on the northern boundary of the Site to an existing 22 kV overhead feeder cable ("501 Feeder"). Similarly, the location of the PV Array has been adjusted to ensure the development is not overshadowed by the eucalypt woodland to the west of the site and thus avoid the need to consider clearing areas of a TEC.

The potential aspects and environmental impacts and risks have been identified and are discussed in the following.

3.1 Human Culture and Social

There are no aboriginal or European cultural features on the Site or surrounding area that will be impacted by the PV Array.

Some housing will be able to see the PV Array from a minimum distance of approximately 1 km. How much of the array will be visible depends on how far up the Site it is finally located. It is estimated that less than half of the array will be visible and will be seen as a thin, dark-grey band nestled between the woodland in the south and arable paddock to the north-east. Households to the south-west of the Site would not be affected by reflection because the panels are facing away from the housing and are fabricated with non-reflective glass, as described by Spaven Consulting (2011). Approximately half of the panel frames would be hidden by the woodland adjacent the river and to the west of the Site. It is unlikely the PV array would be visible from the single dwelling 290 m north of the Site due to the lay of the land, the Mundaring to Kalgoorlie Pipeline and trees surrounding the property.

The PV panels are not likely to cause glare that would affect aircraft using Northam Airport because the glass covering the PV cells are selected for low reflectance to maximise absorption of photons and maximise electricity generation (Spaven Consulting, 2011). Instead they are visible generally as dark grey panels that have less reflectance than a grassy field (Spaven Consulting, 2011).

Noise from installation activities will mainly occur through transportation vehicles bringing the array components to the Site. Construction noise will be similar to that created during agricultural activities and by the traffic along the Northam-York Road, but spread over the installation period of six months. It is likely to result in up to an average of six extra truck journeys per day using the Northam-York Road and access track.

Therefore, it is concluded that noise audible to households on the south-west side of Northam-York Road will not be noticeably greater than current levels or result in higher levels of disturbance.

During periods of daylight, the equipment on site will emit low-moderate noise of near constant levels in the form of a hum. If this noise were audible to nearby dwellings it could cause disturbance to the inhabitants and therefore needs to be assessed as follows. Carnegie is most likely to use inverters from SMA Solar Technology AG (SMA). SMA undertook an acoustical assessment of its inverters which provided sound power levels during normal operating conditions of 94 L_{WA} which equates to 79 dB(A) @ 1 m (see SMA report provided in Appendix 1). This is approximately equivalent to noise at a kerbside of a busy road (NOSHC, 2004). In the simplest form, sound levels reduce by approximately half (6 dB) every doubling of distance in accordance with the inverse-square law. This simpler model is considered adequate to demonstrate likely noise levels at nearby housing due to the relatively large distances involved.

Assuming the sound from the inverters is not reflected or absorbed, noise levels from the PV Array will be at or below 30 dB approximately 300 m of the source and below rural background levels or that of a quiet bedroom at night (NOSHC, 2004). The PV array is therefore unlikely to be audible at the nearest dwelling approximately 290 m to the north. The Mundaring-Kalgoorlie Pipeline, trees and lie of the land will all absorb or reflect some of the sound energy and thus reduce the amount of noise that would otherwise travel north. At night when noise is more likely to be a nuisance, little or no sound will be produced from the PV array. The dwellings to the south-west of the Northam-York Road are more than 500 m from the nearest part of the array and highly unlikely to hear any noise from the PV Array as sound levels will have reduced to below 25 dB. The local inhabitants are not likely to experience any level of disturbance from noise emanating from the PV Array.

3.2 Vegetation

The installation or operations of the PV Array will not require any native vegetation clearance but it is expected that one isolated York gum (*E. loxophleba*) on the east side of the Site will need removing. To allow for flexibility in the PV Array layout, this assessment allows for the removal of two additional isolated York gums on the eastern side of the Site depending on the final layout of the PV Array. The York gums are not intrinsically important features and their loss will not cause significant impact in isolation. Their potential impact on fauna that may use them however is discussed in the next section.

3.3 Fauna

The use of arable land in the wheatbelt by native fauna is limited to low-density use by a small number of bird species such as kestrels, pipits and pigeons among others that take advantage of seed, invertebrates and small mammals (generally rodent pests) that occur in the arable environment. However, the pasture or other vegetation that will grow around the PV panel frames will still provide seed and prey items to support the birds that currently utilise the Site. Construction activities may displace these species by several hundred metres but they will have the remaining extensive arable habitat in the region on which to forage and hunt. No significant impacts are expected to occur on these common species.

The three trees that lay within or very close to the development footprint are mature York gums of between six to eight metres high (see Plate 1). The one tree that lies within the development footprint has no signs of tree hollows and is unlikely to support threatened or protected species at this stage due to its location in an agricultural paddock. One of the other trees that may need to be removed has two small hollows of around 75 mm diameter and too small at present to be used by Carnaby's black cockatoos. While York gum is not a tree species most commonly associated with Carnaby's black cockatoos (http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=59523), they are known to nest and roost in York gums when hollows are large enough. York gums are considered Low in value for Carnaby's black cockatoos when considered for replanting (DEC, 2011) and therefore the loss of three isolated trees will not have a significant impact on this threatened species.

Installation of the PV Array is unlikely to affect the use of the surrounding habitats or the fauna that presently rely on it. Noise and vibration during construction may have a short term but reversible impact on behaviour of sensitive fauna using the adjacent habitats. However, agricultural machinery currently traverse the land to

apply seed, fertilisers, pesticides and undertake cropping; construction activities are not likely to generate more noise than existing activities on the arable paddock or the nearby road or railway line.

Operational noise will be of lower levels than that caused by current agricultural activities, construction or from the nearby railway line. As described in Section 3.1, during periods of daylight, the inverters will emit moderate noise at source of near constant levels in the form of a hum. The distance between the nearest inverter and the woodland habitat adjacent the river is approximately 140 m. Assuming a halving of noise level every doubling of distance, the noise from the inverters will be around 37 dB at the edge of the woodland habitat to the south or west. These levels are equivalent to a quiet bedroom at night (NOSCH, 2004) and normal daytime rural environments. These levels are unlikely to disturb the fauna (e.g. bee-eaters) that use the woodland along the river or to the west of the Site.

3.4 Mortlock River South

Once the PV Array has been installed the land can no longer be managed as arable due to the presence of the panel frames. It is likely instead to be left to naturally vegetate and left fallow or be used for grazing sheep. Because of this, the relatively high levels of fertiliser and pesticide applied to arable crops will stop from within the final footprint of the Site. In time, this will lead to a small reduction in nutrient and pesticide loading that would otherwise enter the Mortlock River South. Nutrients and pesticides enter river systems either as spray drift, percolation/throughflow or runoff. Once in the river, nutrients and pesticides cause unnaturally high nutrient levels or have secondary toxicological effects on fauna within the river respectively. Similarly, in turning over the land to pasture from arable, the soil will no longer be tilled and, together with a more uniform ground cover and continuous sward, the potential for sediment runoff and the nutrients they carry, will be reduced. Nutrient enrichment and pesticides pollution are key stressors of the habitats along the Avon River (Wheatbelt NRM 2013) and any reductions of these two inputs must be considered positive. Pastoral land with low volume grazing of sheep will not require any fertiliser or pesticides. Control of weeds may be required if the ground is left fallow rather than pasture and would be achieved either mechanically or chemically using herbicides such as glyphosate. Herbicides would be applied either by personnel on foot or using quad bikes or small tractors that could fit between the panel frames. The risk of spray drift over the native habitats around the Site is therefore unlikely.

The PV array will introduce a large area of hard surface impervious to rain. There is potential that during high rainfall events, rainwater running off the PV panel frames could cause localised erosion of the soil and create channels, runnels and gulleys which could in turn elevate runoff to the river. However, the area of the Site on which the PV array is to be constructed has only a shallow rise to the north. The slight slope and vegetation covering that the soil will have will help reduce the risk of runoff. To ensure soil erosion does not occur to any significant degree, it is proposed that vegetation and exposure of soil to erosion can be monitored during installation and operation. If erosion is found to occur during operations, management measures can be prescribed that will control erosion and gully formation. Furthermore, average rainfall in Northam is relatively low at just over 400 mm per year mainly between March and November (BOM website, 2017). This further reduces the risk of erosion caused by rain off the PV panel frames.

Unconstrained sheep grazing could result in the sheep entering the river and adjacent habitat and causing a small amount of poaching (trampling of vegetation and exposure of soils to erosion). If sheep grazing is implemented simultaneously with the PV Array, the sheep would need to be constrained by fencing to prevent escape and therefore poaching is unlikely to happen intentionally. The site of the PV array will require a surrounding fence of a given specification due to it being a site of electrical generation. This fencing type will be suitable to control sheep movement.

3.5 TEC Eucalypt Woodland of WA Wheatbelt

Installation of the panel frames will involve drilling or driving short piles on which each frame will be mechanically fixed. The issue of changes to the hydrological regime as a result of pile installation need to be addressed to ensure the adjacent TEC woodlands are not impacted.

The sandy soils across the southern part of the Site generally hold water well, as the presence of swamp sheoak and flooded gum suggests. This is probably because of underlying clay known to form in alluvial areas

under sand (Department of Agriculture and Food, 1992). Conversely, it is not known to readily flood (pers. comm. D. West). Red loamy soils are known to store water but drain well (Department of Agriculture and Food, 1992). Flooding is only known to occur near seeps in this soil type (Department of Agriculture and Food, 1992) which are not present at this location. The clay soils along the western edge of the Site naturally absorb and hold water well and can flood (Department of Agriculture and Food, 1992), as indicated by the runoff berm and ditch.

Piles on the low areas of the slope will be driven into either clay or sand at first and underlying clay as well if shallow enough for the short piles. Piling in this area is unlikely to cause new preferential flow paths and alter the current hydrology.

On the red granite loams where the underlying geology is likely to be clay or bedrock and potentially shallow, the piles could penetrate through the topsoil and cause localised changes in drainage. However, because the soil already drains well, new preferential and significant pathways are unlikely to occur. Furthermore, the piles are spaced well apart leaving the majority of soil intact and water throughflow unchanged for most of the development footprint.

It is considered highly unlikely that the piles will result in changes to the movement of water through any of the three soils types found on the Site due to the soil types, relatively small areas affected by piling, short diameter and length of the piles. Consequently, the ground water supplying the TEC woodlands immediately south and west of the site, or to the east and north-east is unlikely to be altered.

3.6 Soils

The Site lies in an area of moderate wind erosion risk with a code of M1 (10-30% high to extreme) according to the Department of Agriculture's (DAFWA) wind erosion mapping. PV panels and frames have the potential to alter the micro-conditions close to the ground and raise the risk of wind erosion if susceptible soil is left exposed (Yuan Fang et al., 2016). Wind erosion risk is significantly reduced by ground vegetation cover as advised by DAFWA (<https://www.agric.wa.gov.au/fire/wind-erosion-management>). Because the soil will become vegetated either by being left fallow or sown for sheep grazing, it is expected that the risk of increased wind erosion due to the proposed development will be eliminated. However, soil cover and erosion risk can be monitored as part of the site management measures suggested in Section 4.

3.7 Soil and River Pollution

The substation will be comprised of a transformer of a size suitable to the designed load generated by the array. Transformers contain mineral oil to maintain uniform heat distribution around the coils they contain and acts as an insulant against circuit leakage. However, the transformer will be contained within a shipping container or other housing and therefore will be protected from damage. In the remote instance of a leak during maintenance for example, the container in which it will be housed will have the capacity to contain most if not all the oil held within the transformer. Small volumes of oil that spill to the soil will not be sufficient to cause a pollution event in the river some 700 m away.

3.8 Bushfire

Construction and operation of the PV array could increase the risk of bush fire on or adjacent to the Site. Bush fire could be caused by:

- Carelessly discarded cigarettes
- Hot work
- Use of petrol powered tools and vehicles
- Mechanical equipment and plant
- Electrical faults or risk of shorts through proximity of vegetation to live overhead cables
- Storage of flammable liquids and combustible solids
- Lightning strike.

Although the Site itself has not been mapped as an area prone to bush fire, the habitats along the riverbank to the south are (Department of Fire and Emergency Services, 2016). Some installation and operation

activities could therefore elevate fire risk. A fire on the Site could spread to adjacent woodland and threaten flora, fauna and properties in the area.

To minimise the risk of electrical faults, expensive downtime and potential fire, reliability has been uppermost in the design strategy and selection of materials used in manufacturing the PV array and associated equipment. Similarly, lightning strike mitigation will also be incorporated through the design and installation. It is therefore concluded that the operational PV array will pose little risk of causing bush fire. The otherwise low risk of fire is likely to be highest through installation and maintenance activities and therefore management measures are considered in Section 4 which could be developed and agreed with the relevant authorities prior to commencement of construction.

4. SUGGESTED MANAGEMENT MEASURES

The above assessment indicates that the proposed solar PV Array will have very low impacts on the environmental features around the Site principally removal of between one to three isolated York gum trees in paddocks. Conversely, the removal of a section of arable land is likely to result in a small reduction in nutrients and pesticides that currently enter the Mortlock River South. Together with the reduction in carbon emissions due to the generation of electricity from solar power, the overall impact of the development can be considered negligible to low.

Despite the relatively low level of impact of the development, several management measures are suggested to ensure identified impacts do not exceed those predicted.

- If sheep grazing is adopted for the ongoing agricultural use of the Site, and sheep were to access the river banks, poaching could occur resulting in damage to the riparian habitats and increased risk of erosion. Therefore, sheep would need to be restricted from entering the stands of woodland by the maintenance of existing sheep fencing along the southern boundary and installation and maintenance around the remaining site boundary.
- If sheep grazing is not adopted, the vegetation would be allowed to regenerate naturally. If the vegetation needed controlling it could be conducted either mechanically or chemically. If herbicides are used they would be selected for a short environmental half-life such as glyphosate. Application would be through small-scale wands and thus reduce risk of spray drift.
- Vegetation under the array panel frames is to be established once installation is complete and soil monitored for erosion on an annual basis. If signs of erosion are identified, measures should be taken to control erosion and can be in one or more of the following forms:
 - revegetating with more robust species
 - placing geotextiles to protect the soil
 - drip controls from the panels to the soil to reduce the kinetic energy of the water.
- Vegetation along the access track will occasionally be trimmed back but not removed.
- Vehicles for construction and maintenance will be maintained to manufacturers recommendations to reduce the risk of hydrocarbon spill.
- If large quantities of transformer oil are held on site, it should be contained in a bunded area or in reinforced housing. Oil spill clean-up kit(s) can also be considered if deemed necessary.
- Bush fire risk is considered a potential threat to surrounding habitats, fauna and property if management measures are not identified and adopted ahead of construction. A suite of fire management measures will therefore be developed in consultation with the Department of Fire and Emergency Services (DFES) that will ensure the risk of bush fires is low. These measures will include consideration of the following:

- selection, maintenance and operation of plant, vehicles and tools
- reduction of vegetation fuel loads across the site
- control of vegetation under overhead export cables in accordance with state requirements
- control of hot work considering ambient conditions and fire risk
- control of flammable liquids and combustible materials stored on site
- remote monitoring of switchgear and loading?
- fire breaks around components of higher risk and adjacent woodland habitats
- fire fighting equipment appropriate to the most credible fire risks on site
- awareness and training of site staff in minimizing fire risk and fire response actions.

5. CONCLUSIONS

Using a small number of management measures, the environmental impacts identified for this proposal are likely to be negligible and therefore acceptable. No impacts on features of cultural heritage or social values have been identified. Notwithstanding agreement and implementation of the environmental management measures, no further environmental or cultural heritage actions are considered necessary.

It is considered that this low-impact development does not need to be referred to the Department of Energy and Environment under the EPBC Act because it does not pose a significant risk to a matter of national environmental significance. It also does not need to be referred to the Environmental Protection Authority under Section 38 of the EP Act as the risks and impacts identified are too low to trigger this.

Carnegie has presented summary information contained in this report to the Office of the Environmental Protection Authority (OEPA). The OEPA has confirmed that the proposal does not trigger a referral under the EP Act due to it being on agricultural land (see Appendix 2).

The proposed PV Array will be submitted for planning approval under planning legislation.

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PLATES

Plate 1: View of the southern half of the Site looking from the higher land on the north-east corner. The Site lies on the other side of the York gum in the middle right of the view.



Plate 2: Typical view of woodland between the Site and Mortlock River South. Note existing sheep fencing at bottom of plate.



Plate 3: Typical view of Mortlock River South.



Plate 4: Typical view of woodland stand to the south-west of the Site.



Plate 5: View of the access track across the Mortlock River South.



APPENDIX 1: SMA WHITE PAPER BU-U-019 SOUND POWER MEASUREMENTS



White Paper BU-U-019: Sunny Central

Sound Power Measurements on SC 2200 (-US), SC 2500-EV central inverters

Performed by:

SMA Solar Technology AG - Sonnenallee 1 - 34266 Niestetal, Germany - EMC Environment Laboratory (EMV- und Umweltlabor)

Summing up of the Situation

Measurements were taken for one central inverter each of the models SC 2200, SC 2200-US and SC 2500-EV. The sound power measurements were performed in accordance with the DIN EN ISO 9614-2:12/1996 standard, "Determination of sound power levels of noise sources using sound intensity".

The measurements were taken under nominal operating conditions for the inverters, with all inverter fans operating at maximum speed.

Inspection Reference According to EN ISO 3744:2011-02

EN ISO 3744 is used as the basis for determining the noise emissions of the unit under test according to EN ISO 12001:05-2007.

As part of the acoustics, it includes the determination of the sound level of noise sources using the enveloping surface method of accuracy class 2 for essentially free field conditions over a reflective plane. Measurements must be carried out in compliance with IEC 551 and DIN EN 45645-1 according to DIN EN ISO 3744. To position the measurement instruments, the enclosure of the unit under test is considered a main radiation area.

Inspection Reference According to EN ISO 9614-2:2010-11

The sound level is determined according to DIN EN ISO 9614-2 "Determination of sound power levels of noise sources using sound intensity", Part 2: "Measurement by scanning".

This measurement procedure keeps interference on the measurement result caused by noises from the environment to a minimum.

Type of Test / Thresholds and Requirements:

Type of Test / Thresholds and Requirements:	Sound level measurement according to DIN EN ISO 3744:2011-02 and DIN EN ISO 9614-2:2010-11 of sinusoidal, irregularly shaped, transient signals. Classification of ambient conditions in compliance with the German Noise Control Guidelines (TA Lärm). (according to Section 2)
Result:	The requirements were fulfilled.

SMA Solar Technology AG
January 18, 2016

White Paper BU-U-019
Page 1 of 2

BU Utility



Result of Measurements

The following rating levels can be determined from the sound power measurements performed:

Inverter type	Sound power level mean value L_{WA}
SC 2200	94
SC 2200-US	94
SC 2500-EV	92

The following tables show the selected distances from the inverter and their corresponding sound pressure levels L_{pA} in dB(A) at nominal AC power.

Distance	SC 2200	SC 2200-US	SC 2500-EV
1 m	79	79	77
10 m	66	66	64
20 m	60	60	58
30 m	56	56	55
40 m	54	54	52
50 m	52	52	50
60 m	50	50	49
70 m	49	49	47
80 m	48	48	46
90 m	47	47	45
100 m	46	46	44

Information:

The detailed test report may be requested from SMA Solar Technology AG if necessary.

APPENDIX 2: EMAIL RESPONSE FROM THE OEPA

From: Hans Jacob [<mailto:Hans.Jacob@epa.wa.gov.au>]
Sent: Monday, 27 February 2017 10:59 AM
To: Tim Sawyer <tsawyer@carnegiewave.com>
Subject: RE: Request for briefing by Carnegie Clean Energy re large scale Solar PV array

Dear Tim

Thanks for your email and update on the status of the large scale Solar PV array in Northam.

Based on our discussion today, I note that the proposal is located on cleared agricultural land and that you have concluded that the proposal does not trigger the need for referral to the Environmental Protection Authority (EPA).

Should you have new information about the potential environmental impacts of the proposal that would change your view about the need for a referral, then please don't hesitate to contact me to discuss the process and information requirements for a referral to the EPA.

Regards
Hans

Hans Jacob
Manager
Infrastructure Assessment Branch
Office of the **Environmental Protection Authority**
The Atrium, Level 8, 168 St Georges Terrace, Perth
Locked Bag 33, Cloisters Square, Perth WA 6850
direct: 08 6145 0810 | reception: 08 6145 0800 | fax: 08 6145 0895
email: hans.jacob@epa.wa.gov.au | web: www.epa.wa.gov.au

APPENDIX D

Technical Note: Noise Assessment for Northam PV Array





Carnegie Clean Energy Ltd

Contract/PO No. 17011201

TECHNICAL NOTE

Noise Assessment for Northam PV Array

0	27/04/17	BS	SS		BS	Issued for Use
Rev No	Date	By	Checked		MDR Approved	Issue Purpose

PROJECT NO: MP16004

Document No: MP16004-TNO-1001

Rev. 0

VERSION RECORD SHEET

Revision	Revision Date	Purpose	List of updated/modified sections if any
A	23-Apr-2017	Issued for client review	
0	27-Apr-2017	Issued for Use	Various through document based on comments received from Client on 27 April 2017

1. INTRODUCTION

Concern was raised through public consultation during the planning application for the Northam PV Array about the impacts caused by noise generated by the PV Array and infrastructure.

The subject of noise was addressed in the Environmental Site Assessment Report (Matters of Environment, 2017) but due to the public concern is expanded on in this Technical Note. This Technical Note describes the sources of noise that can be generated by solar PV farms and the potential impact on residents and other interest groups. It is broadly relevant to all PV arrays but is particularly relevant to the Northam Solar PV Array proposed by Carnegie Clean Energy Ltd.

This assessment does not consider noise exposure levels for residents as it is considered unlikely that residents will hear the noise of the PV Array in Northam. Instead it considers the likelihood that residents living closest to the PV Array will hear the PV Array above existing sources of noise in the area.

During the public consultation, more attention was given to operational noise as opposed construction noise as it was acknowledged, operational noise would continue for at least 25 years.

2. NOISE

The Western Australian Environmental Protection (Noise) Regulations 1997 (the Noise Regulations) prescribe restrictions on noise outputs for equipment located in new residential developments or rural premises. The values in Table 1 are assigned noise limitations for activities that may be heard outside residential premises.

Table 1: Assigned levels of noise for different times of day for residential premises.

Time of Day	Assigned Level		
	dB LA 10	dB LA 1	dB LA max
0700–1900 hrs Monday to Saturday	45	55	65
0900–1900 hrs Sunday and public holidays	40	50	65
1900–2200 hrs all days	40	50	55
2200 hrs to 0700 hrs Monday to Saturday and 2200 to 0900 hrs Sunday and public holidays	35	45	55

LA 10: assigned level not to be exceeded for more than 10% of period

LA 1: assigned level not to be exceeded for more than 1% of period

LA max: assigned level not to be exceeded at any time.

According to Western Power (2014), distribution transformer noise is limited to 30 dB(A) outside residential properties and levels over this attract penalties. Transformers are deemed to comply with the Noise Regulations if 1000 kVA transformers are greater than 7 m from residential lot boundaries or 5.5 m or more for transformers less than 630 kVA. This suggests that the transformers and inverters proposed for the Northam PV Array will be compliant since they are all located at least 300 m from the nearest residence as concluded in the Environmental assessment. However, this Technical Note will detail whether any noise from the PV Array will be audible at the residences.

Additional considerations or 'influencing factors' for traffic are also included in the Noise Regulations and increase the assigned levels. These influencing factors will however, be ignored for this assessment.

2.2 Existing Sources of Noise

Although the proposed Northam PV Array is located in a rural setting, the residential area is located adjacent existing noise sources. Background noise on the Woodley Farm Drive and Loton Drive area will be dominated by the following:

- frequent vehicles use along Northam-York Road
- continuous noise emitted from the Northam Substation
- passenger and freight trains transiting the Avon-Merredin railway line.

Northam-York Road is a moderately busy single carriage road between Northam and York and carries passenger vehicles, work vehicles and heavy freight. Typically source levels for cars travelling between 60 and 100 kph are between 101 and 107 dB(A)@ 1 m (Schreurs et al., 2011). Source levels from trucks were reported to be between 104 and 118 dB(A)@ 1 m depending on whether they were articulated or not and accelerating or at a constant speed (Schreurs et al., 2011).

The Northam Substation comprises 66/22 kV and 132/66 kV transformer systems (Western Power, 2015). Transformers generate noise in the form of a continuous hum (ABB, 2004) with source levels reported between 64 and 73 dB(A)@ 1 m (Ergon Energy, 2011), 80 dB(A)@ 1 m (SLR, 2014). AS/NZS 60076. 10:2009 stipulates noise limits for transformers although the limits set tend to be higher than those reported to have been measured. Circuit breakers can also emit a loud impulsive noise (bang) occasionally with source noise levels between 100 and 120 dB(A)@ 1 m (SLR, 2014).

Between four and six passenger trains per day (<http://www.transwa.wa.gov.au/plan-your-journey> accessed 20-Apr-17) and periodic freight trains use the Avon-Kalgoorlie railway line. Passenger trains with two to four carriages will be fleeting but the large freight trains can take many minutes to pass. Diesel passenger trains of the type that use the Avon – Merredin line generate between 109 and 113 dB(A)@ 1 m at 80 kph, depending on locomotive (AJM, 2016). Freight trains are assumed to occur four times per week in the absence of data and tend not to travel very fast. Diesel freight trains generate between 91 and 115 dB(A)@ 1 m (Terlich, 2013).

Using the same inverse square law applied in the Environmental Site Assessment Report (Matters of Environment, 2017), Table 2 provides predictions for levels of noise perceived at the residences nearest to the above features.

Table 2: Predicted levels of noise at closest residence from existing sources.

Existing source	Distance to dwelling (m)	Frequency	Source level dB(A)	Estimate at nearest residence dB(A)
Northam-York Road - Cars	45	Throughout day and night	101-107	69-75
Northam-York Road - Trucks	45	Many through day	104-118	71-85
Northam Substation – Transformer hum	122	Constant	64-80	26-41
Northam Substation – Circuit breaker	122	Sudden	100-120	60-76
Railway line – Passenger trains	85	4-6 times daily	109-113	70-74
Railway line – freight Trains	85	4 per week	91-115	50-76

Although the transformer hum in Table 2 is predicted to be quite low and within the limits of daytime noise for residential properties under the Noise Regulations, a local resident has indicated it causes an annoyance at his property (T. Sawyer, pers. comm. March 2017).

Predictions made in Table 2 do not account for wind direction, reflection or screening and instead relies on uninterrupted spreading on the sound wave. Trees, buildings and other structures will affect the transmission of sound and energy losses. Wind direction is predominantly from the south-east in the morning and from the west in the afternoon (BOM, 2016a and BOM, 2016b) and will carry noise further than on still days.

The nearest residence to the PV Array Site is 300 m to the north and in a rural setting. This residence is approximately 860 m from the nearest rail, 1,140 m from Northam-York Road and 1,100 m from the substation. Background noise at this residence will be low and of a rural nature. The principle noise will be from occasional agriculture on its property and the surrounding properties.

2.3 Noise Sources from Proposed PV Array

Installation

During installation, construction noise will be generated but, due to the relatively simple construction methods and lack of heavy ground works, these noises will not be as intrusive as typical construction activities. Work will be restricted to daytime hours of 07:00 to 18:00 Monday to Friday and 08:00 to 13:00 on Saturdays. Except for emergency work, activities will not take place outside standard hours without prior notification of local residents. Construction will span approximately six months and noise will typically occur from the activities and equipment listed below and in Table 3.

- Construction traffic
- Installation of fencing around the site perimeter
- Small diameter piles for PV frames
- Soil removal or regrading for hard standings and equipment locations
- Laying limestone covering for access roads and parking areas
- Excavation for cable trenching and backfilling
- Installation of inverters and control room.

Table 3: Sources of noise used in construction and source levels. (from Schreurs et al. 2011 and Atkins Acoustics, 2013)

Item	Noise Source Level dB(A)	Pattern of use	Distance to nearest residence (m)	Estimated noise at nearest residence dB(A)
On Highway				
Large haulage truck	114	Sporadic, up to six per day	45	82
Concrete truck	112	Occasional	45	80
Flatbed truck	106	Sporadic, up to six per day	45	73
Mobile crane	110	Sporadic for positioning inverters (4 No.) and control container	45	77
On Site				
Large haulage truck	114	Sporadic, up to six per day	300	64
Concrete truck	112	Occasional	300	62
Flatbed truck	106	Sporadic, up to six per day	300	56

Mobile crane	110	Sporadic for positioning inverters (4 No.) and control container	300	60
Hand tools	105	Occasional	300	55
Concrete truck	112	Occasional	300	60
Mobile crane	112	Sporadic for positioning inverters (4 No.) and control container	300	62
Wheeled loader (Bobcat)	105	Frequent to grade soil, lay limestone and backfill trenches	300	55
Excavator	114	Occasional when excavating cable trenches	300	64
Bored piling rig	110	Frequent when installing foundation piles for PV frames	300	60
Generator	104	As required for hand tools	300	54

The principle source of construction noise for most residents will be from vehicles delivering components to the site due to the proximity of Northam-York Road and residences. All are estimated to be at or below the existing noise coming off the road. Although some or all vehicles may arrive from the south, it is assumed vehicles delivering equipment to site will arrive from the north as a worst-case scenario for the sake of the impact assessment. The Northam-York Road is frequently used by large trucks and road trains and all vehicles travelling from the north are generally accelerating from the slower road areas in the north to the 110 km/hr zone that starts just south of the Woodley Farm Drive junction. The site access track lies 1.3 km south east of the dwelling on Northam-York Road and 1.4 km south east of the nearest dwelling on Loton Drive. Vehicles manoeuvring onto the access tracks are therefore unlikely to be audible above background noise at the residences.

The relatively low numbers of extra vehicle movements supplying the PV equipment to the site are not likely to add significant loadings to the residents situated close to the Northam-York Road.

The nearest residence to the PV Array Site is 300 m to the north and in a rural setting with little background noise. This residence is approximately 860 m from the nearest rail, 1,140 m from Northam-York Road and 1,100 m from the substation. Some of the work activities on Site are likely to be audible at this residence to the north depending on the conditions (e.g. wind strength and direction). These noises will therefore not be masked by background noise but will be similar to agricultural machinery although more constant during the construction period. All estimated values are within the assigned levels for day time stipulated by the Noise Regulations.

The nearest other residence to the PV Array Site is approximately 370 m west of the south-west corner of the site but is within 50 m of the Northam-York Road, 75 m of the railway and 310 m of the substation. Other noises are likely to dominate during the day at this residence but construction noise is likely to be heard when traffic and railway noises are low. Maximum levels would be around 62-63 dB(A) from trucks or excavator compared with upwards of 70-80 dB(A) from traffic. All other nearby residences are on the western side of Northam-York Road and less likely to hear construction noise above existing background levels. Highest construction noise estimates at residences west of Northam-York Road would be around 58 dB(A) compared with traffic noise upwards of 70 dB(A).

No construction is planned to occur outside normal working hours.

Operations

Noise during operations can be divided into the continuous noise emitted by the PV array equipment and the sporadic noise created by site activities (personnel and vehicles). Site visits by operational staff are

anticipated to be infrequent as the PV Array will be controlled remotely. Most site activities will be limited to inspections and minor maintenance matters which are not likely to generate noise of the level found during construction. In the unlikely event of major maintenance, similar levels of noise may be generated as for construction but for shorter periods of time.

All potential sources of noise from electrical generation are listed in Table 4 with estimates of received levels at nearest residence.

Table 4: Sources of noise from equipment comprising the Northam PV Array. Source levels are taken from manufacturers specifications.

Component	No. Units	Noise Source Level dB(A)	Distance to nearest residence (m)	Estimated noise level at nearest residence
Photovoltaic panels	36,000	None detectable	350	none
Single axis tracking motors*	TBA	<64	350	<15
Inverter [#]	4	79	350	<30

* TECO Australia Pty Ltd induction motors for solar tracking, [#] SMA Solar Technology for inverters

The above results strongly indicate that operational noise from the PV Array will not be audible at any of the residences closest to the chosen site, including the residence to the north that lies within a rural setting away from roads, rail and the substation. The array is likely to be inaudible at any residence even if there were no vehicles or trains in the area during still weather. Towards the west, the existing substation would dominate background noise at the existing residences and is operating 24 hours per day.

Noise from the array's inverters would not occur between dusk and dawn when solar energy is insufficient to generate electricity in the PV cells.

3. CONCLUSIONS

The findings from this extended assessment on noise is consistent with the conclusions of the Environmental Site Inspection (Matters of Environment, 2017).

Noise from construction and unlikely major maintenance are expected to comply with the requirements of the Noise Regulations for all residences adjacent to the proposed PV Array.

Noise from equipment comprising the PV array is highly unlikely to be audible at any residence but if it were (strictly during periods of relatively still weather and with the wind direction either from the south or east), it would be perceived as a distant, dull hum and substantially less than day-time limits set by the Noise Regulations.

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APPENDIX E

Technical Note: Light Reflection and Emissions from PV Arrays





Carnegie Clean Energy Ltd

Contract/PO No. 17011201

TECHNICAL NOTE

Light Reflection and Emissions from PV Arrays

1	01/05/17	BS	SS	BS	Issued for Use
Rev No	Date	By	Checked	MDR Approved	Issue Purpose
PROJECT NO: MP16004					
Document No: MP16004-TNO-1002					Rev. 1

VERSION RECORD SHEET

Revision	Revision Date	Purpose	List of updated/modified sections if any
A	24-Apr-2017	For Review	
0	28-Apr-2017	Issued for Use	Various through document based on comments received from Client on 27 April 2017
1	01-May-2017	Issued for Use	Added additional content on urban heat island effect.

1. INTRODUCTION

Concern was raised through public consultation during the planning application for the Northam PV Array about the impacts caused by sunlight reflecting off PV panels and other emissions (e.g. heat and microwave).

This subject was addressed in the Environmental Site Assessment Report (Matters of Environment 2017) but due to the public concern is expanded on in this Technical Note. This Technical Note describes all forms of electromagnetic emissions from solar PV farms and the potential impact on residents, aviation, and other interest groups.

2. EMISSIONS FROM PV PANELS

2.1 Light Reflection

PV Panel Design

PV cells create electricity by light particles (photons) passing through a layer of electrically charged silica which frees electrons and induces an electric current. PV cells are fragile and need protecting usually with a sheet of glass. In the interests of efficiency, designers of PV panels select glass that allow as much light transmission as possible with the lowest amount of reflection (Protogeropoulos and Zachariou, 2010). These glass types are low-iron containing glass, coated or both and reflect between 2 and 10% of the light hitting the surface (Protogeropoulos and Zachariou, 2010, Spaven Consulting, 2011). The factors that contribute to reflection are discussed below.

Glare

Glare is defined as a prolonged source of light that is a nuisance or hazard to people, processes, or animals (Rea, 2000). Sources of glare can be directly from a light source or indirectly via reflected light. Glare is generally caused when a source or sources of light are substantially brighter than the surrounding scene. Glare interferes with vision by impairing sight, reducing the aesthetic appearance of a view, and extreme cases of glare can cause discomfort or even pain (Rea 2000). Sensitivity is a function of the intensity of the glare and the individual's perception of that glare. Sensitivity to glare is subjective and varies widely between individuals and states of health within the individual. Age related eye degradation also makes older individuals more sensitive to glare.

Glint is a similar reflection of light but momentary in nature and is not considered a hazard for activities around PV arrays. Because glint is temporary it does not generally obscure vision long enough to be considered a nuisance. However, the description of glare in this Technical Note are equally applicable to glint.

Since PV panels do not generate light, it is light from the sun, reflected off the glass panels that causes most concern amongst people living or working in proximity to a PV array. Light from the moon may be reflected off PV panels and this will also be addressed in this Technical Note. Only PV panels are expected to have potential for glare; the other components are not expected to cause viable glare.

Creation of glare is a function of the following four basic components:

- angles involved between source of light, reflective surface, and position of the receiver
- intensity of the light
- reflectivity and absorptive capacity of the surface
- ambient light conditions.

A number of studies have described the physics of light reflection from PV panels including Sunpower (2011), Spaven Consulting (2011), GHD (2014) and provide a good account of how light is reflected off PV panels. The angles at which the source of light hits a reflective surface and then reflects off or is transmitted or absorbed is critical to understanding reflection off PV panels and is repeated here for clarity.

Light is reflected off flat and smooth (specular) surfaces at the same angle that it strikes the reflective plane as shown in Figure 1.

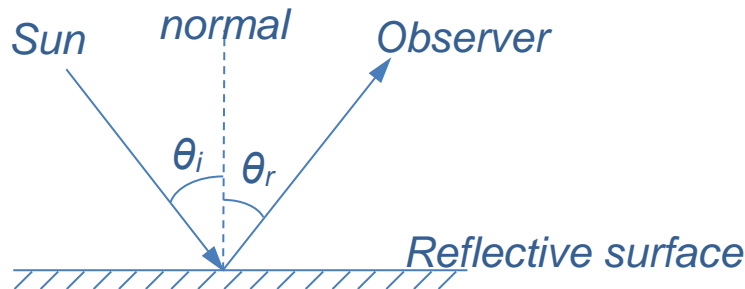


Figure 1: Angle of reflection off a flat, smooth surface. Angles θ_i and θ_r are always equal (Protoogeropoulos and Zachariou, 2010).

High values of θ_i shown in Figure 1 will result in higher levels of reflectance regardless of the surface (Protoogeropoulos and Zachariou, 2010). Figure 1 is a simplification of most real-world examples and assumes 100% of the light is reflected and none is lost to absorption or transmission. It also assumes all light arrives from the same direction. In reality, most surfaces absorb some of the light incident on them, and transparent surfaces allow light to pass through (transmitted). Light falling on the Earth's surface also arrives by many pathways and not just from the direction of the sun as inferred in Figure 1. Angle of reflection and low reflectivity influence the risks of glare from PV at ground level and from the air and are explained more fully below.

Orientation of PV Panels

PV panels are orientated to minimise the incident angles with the sun and maximise absorption of photons. To achieve this, panels can be fixed in one mean optimum position or can track the sun to maximise absorption of light particles in one or two planes. The selected strategy will depend on the physical constraints of each site.

For the Northam PV Array Carnegie has selected long strips of PV panels, laid relatively flat in an approximately north-south direction. Each strip of panels will tilt from east to west by up to 60 degrees from horizontal to track the sun as shown in Figure 2.

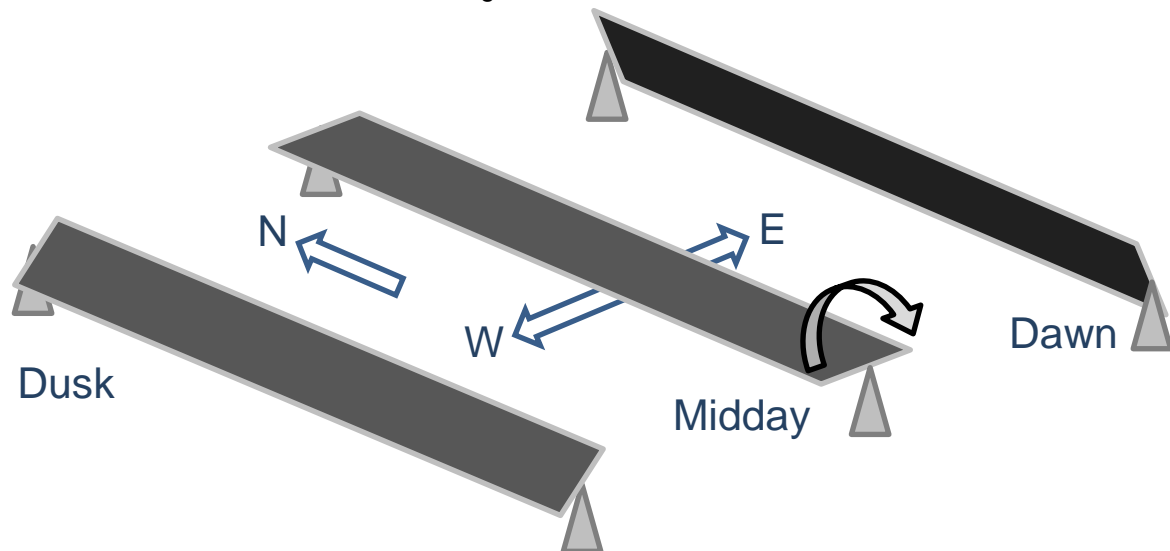


Figure 2: Schematic of single axis PV panels proposed for Northam PV Array. Orientation is approximate and will depend on land fall. Each strip of panels will follow lay of the land and where the land falls to south so panels will be tilted slightly away from north by a few degrees away from horizontal.

Potential for Reflectivity in Northam

In Northam, WA, the sun is at its highest in the sky at midday on the summer solstice (18 December) and will rise to 81.5° above the horizon. On the winter solstice (18 June) the sun reaches a maximum of 34.8° from horizon. At dawn and dusk this angle reduces to zero (<http://www.ausdesign.com.au/articles/calc.html>). With reference to Figure 2, sunlight will always be reflected off the panels upwards as shown in Figure 3.

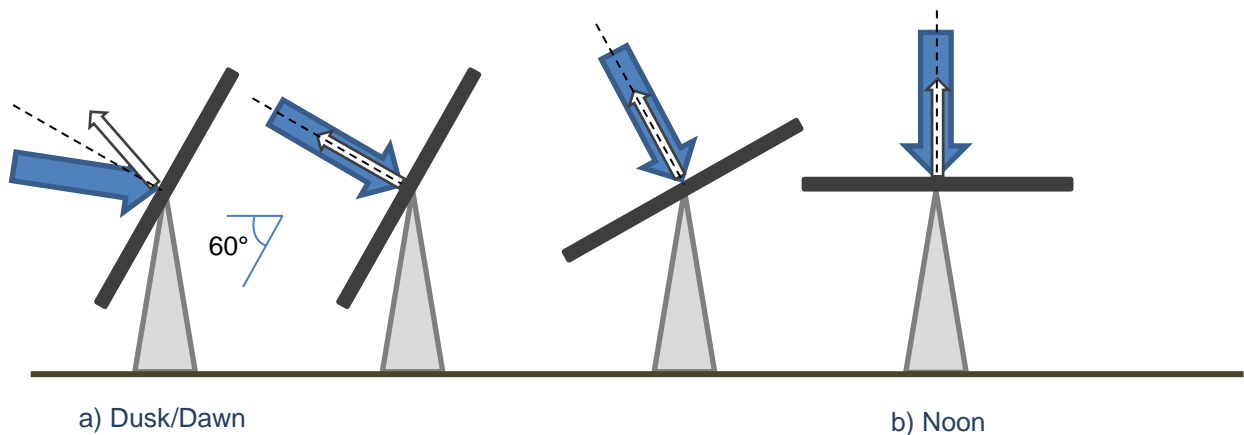


Figure 2: Two-dimensional schematic of reflected light off PV panels in east-west cross section. The third dimension (north-south) will also affect incident angles which will be low during summer (circa 8° from normal) but high (65° from normal) during winter. As a result, reflection will be proportionately higher in winter than in summer due to the change in altitude of the sun. Blue arrows denote incident light and white arrows reflected light. Glare will not be visible from ground level or from ground lower than 30° above horizontal ($60-90^\circ$). Assumes horizons are 10° above plane of PV panels (a).

As stated above, due to landfall at Northam PV Array, it is possible some panel strips will face slightly away from north. Panels tilting away from north will reflect light at a correspondingly lower angle than if they were horizontal or tilted slightly towards north as on a residential roof. The slope on the panel strips is not expected to be so extreme that light will reflect to ground level and would have to correspond to the altitude of noon day sun at mid-winter to do so (34.5°).

This therefore demonstrates that glare at ground level from reflection of the sun (or moon) due to the PV Array at Northam is not possible. Sunlight will be reflected upwards and therefore potentially visible to aircraft pilots as discussed below.

PV Panel Reflectivity

The Federal Aviation Administration in the United States acknowledges solar PV arrays are compatible with airports because they are designed to absorb sunlight and minimize potential for glare (FAA, 2010). The reasons why this is so are discussed below.

In comparison to PV glass (2-8%), general glazing reflects between 6 and 20% of the incident light (Meister Consultant Group 2014, Pilkington, 2010) and glass used on windscreens of vehicles reflects approximately 45% light (Protogeropoulos and Zachariou, 2010). Glazing used on office blocks known to be a cause of glare reflects between 20% and 50% of the light hitting the outside of the glass (Pilkington, 2010). Reflectivity of smooth water has been reported to be between 4-5% (GMI, 2015).

In addition to low reflectivity, glass used on PV panels has textured surfaces to aid absorption but also traps the small amount of light reflected off the aluminium elements of the PV cells by aiding internal reflection (Sunpower, 2011). A close-up photograph of a PV panel can be seen in Plate 1.

Because the panel strips are at or near horizontal, winter sun will have relatively large incident angles towards the south and reflect more light than if the panels were inclined towards north. An incidental advantage of textured glass is that the small amount of light that is reflected will be reflected in different directions and reduce the effects of glare.

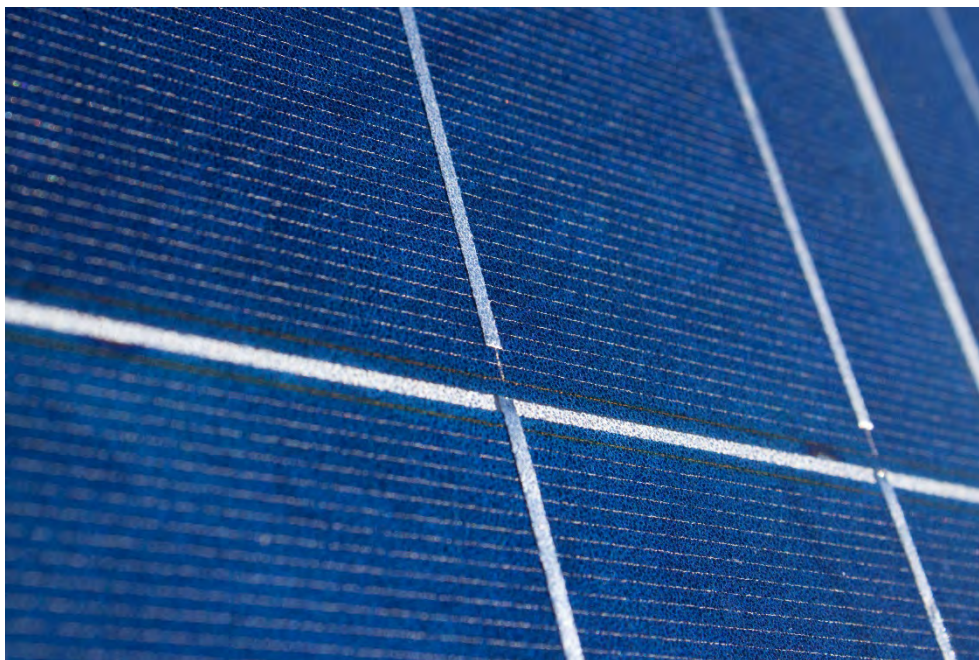


Plate 1: Close-up photograph of a PV panel showing the textured surface of the protective glass layer. Photo: B. Shepherd.

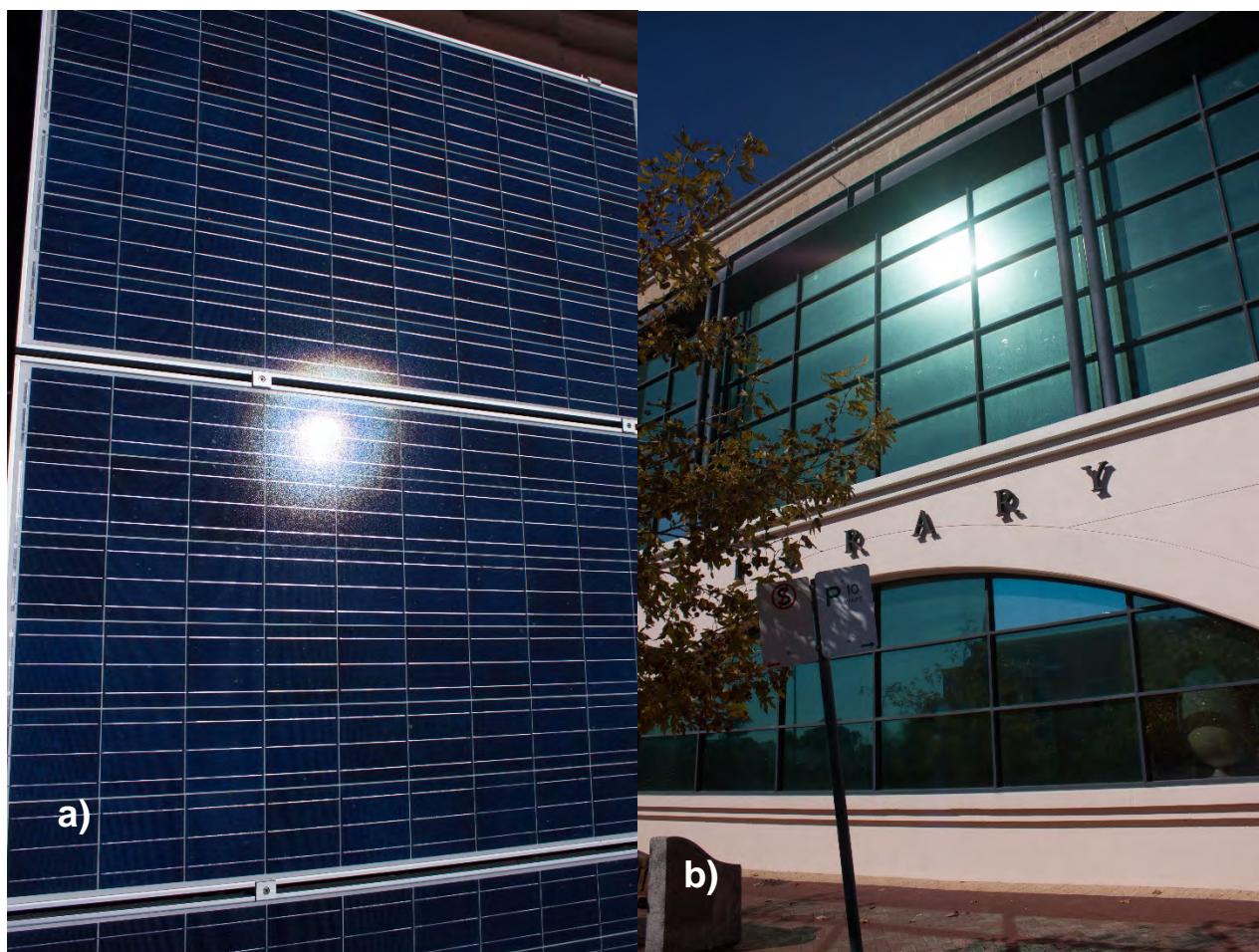


Plate 2: Photo of reflection from full sun on a) household photovoltaic panel and b) glazing. Glare from the PV panel is distinctly lower in intensity and diffuse “softened” compared with the intense glare off glazed panels of a public library. The photographs were taken in full sun around noon on 28 April 2017. Photos: B. Shepherd.

PV panels are therefore designed to reflect minimal light; what is reflected is greatly reduced and diffuse as shown in Plates 2. The low levels of reflection off PV panels are likely to be seen from aircraft but will not pose a glare hazard to aviation. Other forms of glare such as off parked cars are much more likely to cause nuisance but both facilities are frequently placed in close proximity to airports. Otherwise PV panels would be prohibited near airports, which is not the case (Federal Aviation Administration, 2010 and TBB 2017).

Other Potential Sources of Glare

Site lighting may be required during installation for security purposes around the temporary site office, but these will be nominal and have downward reflectors to minimise light spill. While site lighting may be visible at night during the installation period, other urban lighting along roads and residences in the area is likely to dominate.

There are no plans to use site lighting for operations but some lighting may be required during emergency maintenance.

2.2 Other Electromagnetic Emissions

PV arrays generate electricity and will therefore generate electromagnetic fields (EMFs). EMFs occur around all electrical equipment and cabling, and occur naturally around organisms, during electrical storms and around magnetic anomalies (WHO, 2012). While the World Health Organisation and Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) advise there are no known threats to human health from EMFs, both agencies agree on prudent avoidance of extremely low frequency (ELF) EMF with frequencies less than 2 kHz (WHO, 2012). This includes the 50 Hz power line transmission in Australia.

Chang and Jennings (1994) measured EMF at commercial PV arrays in the US and found them to be lower than for domestic applications and were indistinguishable from background levels at the boundary of the PV array. Similarly, NRPB (2004) measured EMF at a number of electrical substations in the UK and reported that EMF from the substations could not be detected above background within five metres.

Electrical standards require all components and installations to meet electromagnetic compliance (EMC) which includes shielding and other controls that prevent interference with other electrical appliances and communications. The Northam PV Array will adhere to applicable Australian electrical standards. All components of the Northam PV array will be contained within the site fencing excluding the export cable which runs up to the existing overhead 22 kV distribution lines owned and operated by Western Power. Due to the exclusion fencing, engineered controls for EMFs and very short range for remaining EMFs, it is highly unlikely that EMFs would present a hazard to the public.

2.3 Heat Generation

PV panels necessarily absorb the visible and the thermal components of the solar spectrum and can be expected to heat up when sunlight falls on them. Although the same amount of solar radiation would fall on the agricultural land before a PV array is installed, the thermal inertia of the surfaces on which the sunlight falls are different. A small amount of internal heating will also occur due to electron movement within the cells and connecting cables, but this is considered insignificant compared with solar heating. There is public concern that PV arrays may significantly increase the ambient temperature surrounding the PV array (Barron-Gafford et al., 2016). Numerous studies have investigated the effects of urban heat islands (UHI) which are similar to the concerns investigated by Barron-Gafford et al. (2016). Findings on UHI are varied and depend on a wide range of factors including in particular: vegetation within the urban area and its surrounds; wind characteristics, and landform (dos Santos Cardoso et al. (2017), There is only one study of the heating effect of PV Arrays so must be treated with some caution as the effect may not occur elsewhere.

PV panels operate most efficiently at 25°C (Ike, 2013). Above this, the electricity produced drops by up to 5% for temperatures of 28°C above the optimum in free standing and well-cooled PV panels (Nordmann and Clavadetscher, undated). For this reason, materials making up the PV panels are selected so heat is dissipated instead of stored (Barron-Gafford et al., 2016).

Modelling studies conducted for heatwave conditions in the US (Los Angeles) and France (Paris) suggest the presence of PV panels reduce the temperature in cities and lower the effects of heat islands (Masson et al., 2014). However, empirical evidence gathered by Barron-Gafford et al. (2016), indicated that a PV array installed over bare ground had ambient temperatures 2-4.8°C higher than urban areas and arid, natural vegetation in the same region and similar to that of central Western Australia. They concluded that the heat island was influenced primarily by the lack of vegetation at the PV site and release of the heat energy to the air instead of absorption to the ground. Vegetation helps reduce ambient air temperature by shading the ground

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and the evaporative cooling effects of transpiration (release of water vapour through leaf pores) (Myeong, 2010). No information was found for PV arrays installed over vegetated agricultural paddock which may counteract the heating effect and has been offered as a management control by Barron-Gafford et al., (2016). Similarly, no information was found for the difference in temperature between bare soil after harvesting and natural vegetation as sampled by Barron-Gafford et al. (2016). Arable crops are generally harvested from October to December (Land Commodities, website Accessed 1/05/2017) leaving most of the paddocks around Northam in stubble or bare soil during the summer. It is likely therefore, that the temperature difference between the PV Array and surrounding bare soil of the agricultural land, will not be as high in the summer as the values quoted by Barron-Gafford et al. (2016).

It is possible the presence of the PV panels may cause the ambient air temperatures at the site of the PV Array to rise during warmer condition by up to four degrees. Conversely, the vegetation under the panels will possibly counteract that but to an unknown degree. This increase in temperature over the site and surrounding area will be influenced by the following factors:

- the distances to the dwellings (minimum 300 m)
- mixing of air over the site and surrounds through wind and convection currents
- effects of evapotranspiration from vegetation in the area including the woodland south and west of the PV Array, and trees surrounding the residence in the north
- effects of the existing heat island from impervious surfaces surrounding the residences to the west of the site in the south of Northam.

Studies on heat islands have been conducted but few have measured the temperature gradient across the urban/rural fringe. Zhang et al. (2004) and Zhou et al. (2015) found that heat islands could influence vegetation growth through the year by up to 10 km into the surrounding areas but did not report temperature gradients across the urban/rural boundary. Other factors besides temperature may have influenced vegetative growth. Myeong (2010), detected that vegetated parkland areas cooled surrounding urban areas in Seoul, South Korea by up to 4°C over distances between 240 and 360 m while Rosenzweig (2007) found that cooling effects of parkland were detectable by between 15 and 60 m into the urban environment in New York, United States depending on the size of the park. Hart and Sailor (2008) identified that vegetation cover in the urban environment was the largest single feature influencing cooling in the urban environment. Conversely, it was the absence of vegetation that had the greatest influence on temperature increases in urban environments. These results suggest that the cooling effects of vegetation around the PV array and residences in the area will be the dominant influence on temperature in the surrounds rather than the PV array heating the surrounding vegetated areas.

In conclusion, it is unlikely that residents will detect any change in temperature due to the heat island effect of the PV array due to the dominant influence of the surrounding environment.

3. CONCLUSIONS

The information provided in this Technical Note show that glare from the Northam Solar PV Array will not be seen from ground level; reflectance of sunlight will in all cases be upwards. Residents and other users of the surrounding areas at ground level are unlikely therefore to see any glare from the PV panels.

Aircraft pilots in the air are likely to see some glare reflecting off the PV panels when the position between the pilot-PV panels and sun allows, but this is unlikely to cause nuisance or a hazard. The glare will be subdued and diffused due to the characteristics of the materials used in the panels.

EMF generated by the operation of the PV array will be shielded and controlled through Australian electrical requirements and will not pose a hazard to the public or interfere with electrical appliances or communications.

The PV panels could heat the air around the site and cause a rise in ambient temperatures. However, this is unlikely to be felt by residents in the area due to the greater influence of the cooling effects of vegetation under the panels and partly surrounding the Site. Other factors are also likely to minimise this risk including the mixing of air by wind and convection currents and distance to the nearby residences.



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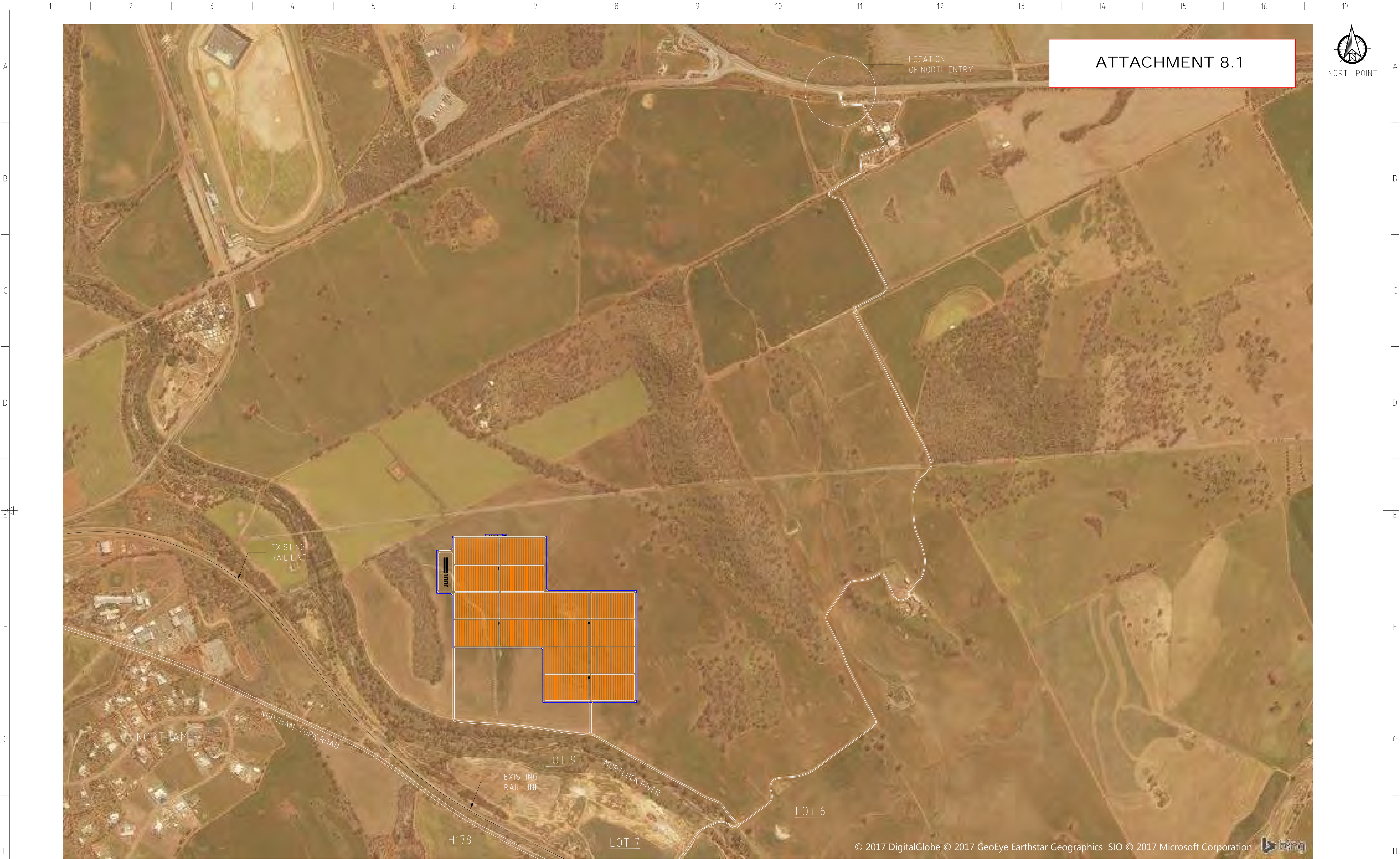
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GENERAL NOTES:



1. DRAWING UNITS IS IN METERS.
2. KEY LOCATIONAL POINTS CALCULATED WITH RESPECT TO THE GEOCENTRIC DATUM OF AUSTRALIA 1994 (GDA94).
3. REFER TO NOR1-1-5-1 FOR SITE ACCESS SOUTH ENTRY.

LEGEND :

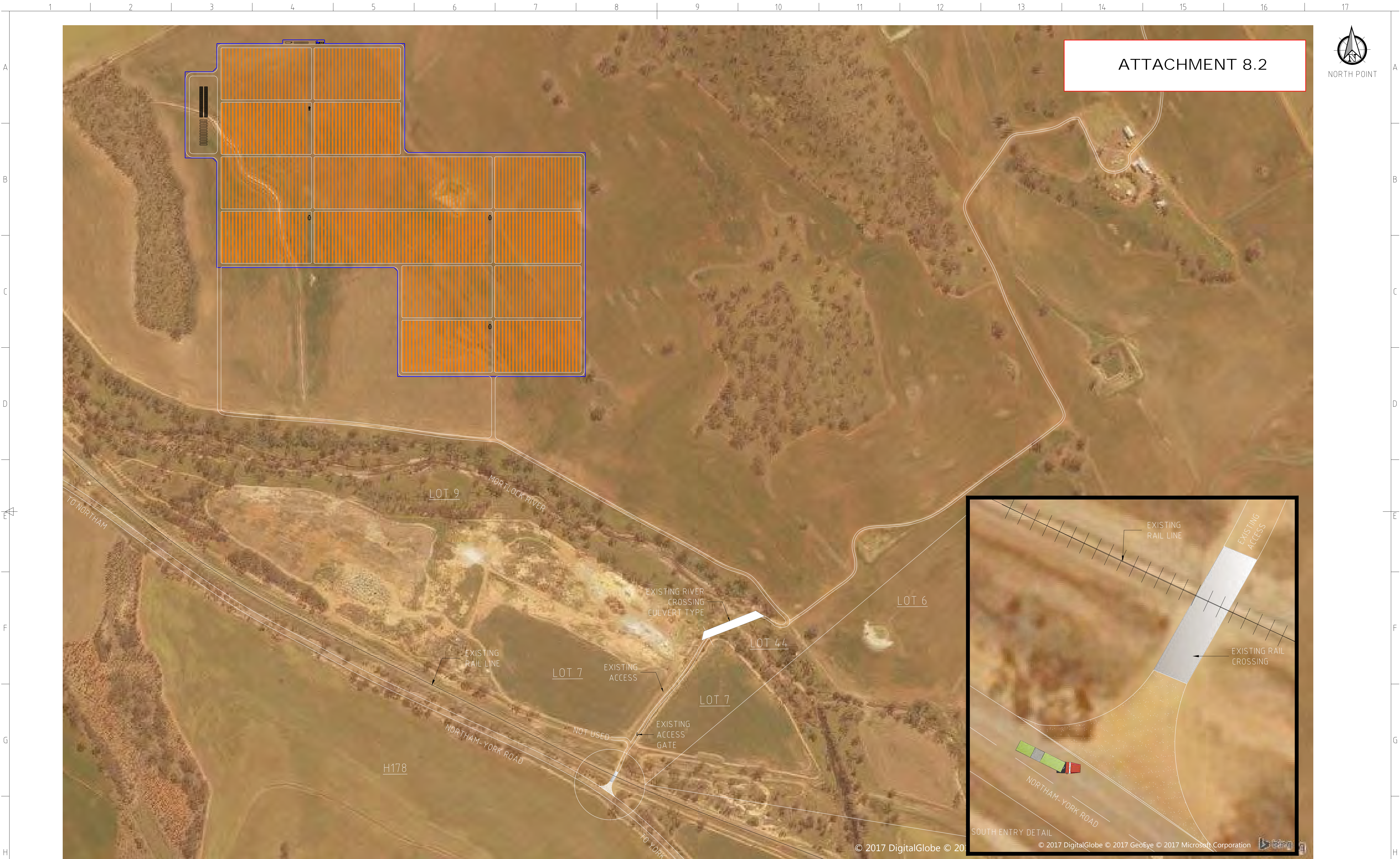
- FENCE LINE
- ROAD

NOR1-1-5-1	SITE ACCESS SOUTH ENTRY				
NOR1-1-1	LAYOUT PLAN	0	16.05.17	APM	INITIAL RELEASE
NUMBER	TITLE	REV.	DATE	NAME	DESCRIPTION
REFERENCE DRAWINGS		REVISION HISTORY			

NORTHAM SOLAR FARM
SITE ACCESS
NORTH ENTRY

CLIENT:		ENGINEERED BY:		ENERGY MADE CLEAN			
					Name:	Signed:	EMC Drawing No.
				Design:	BJC	-	NOR1-1-5-2
				Drawn:	JTB	-	
				Checked:	APM	-	Revision: 0
				Approved:	AS	-	Scale: 1:6000
						A1	

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ATTACHMENT 8.2



GENERAL NOTES:

1. DRAWING UNITS IS IN METERS.
2. KEY LOCATIONAL POINTS CALCULATED WITH RESPECT TO THE GEOCENTRIC DATUM OF AUSTRALIA 1994 (GDA94).
3. REFER TO NOR1-1-5-2 FOR SITE ACCESS NORTH ENTRY.

NOR1-1-5-2	SITE ACCESS NORTH ENTRY	1	10.03.17	BJC	NEW ARRAY LAYOUT
NOR1-1-1	LAYOUT PLAN	0	09.03.17	APM	INITIAL RELEASE
NUMBER	TITLE	REV.	DATE	NAME	DESCRIPTION
REFERENCE DRAWINGS			REVISION HISTORY		

NORTHAM SOLAR FARM
SITE ACCESS
SOUTH ENTRY

LEGEND :

- FENCE LINE
- ROAD

CLIENT:		ENGINEERED BY:		ENERGY MADE CLEAN			
				Design:	Name: BJC	Signed: -	EMC Drawing No.
				Drawn:	JTB	-	NOR1-1-5-1
				Checked:	APM	-	Revision: 1
				Approved:	AS	-	Scale: 1:3000
							A1

Shire of Northam Local Planning Scheme No.6
Application for Planning Approval – Power Generation - Lot 6 No.131 Northam-York Road, Muluckine
Schedule of Submissions

No.	Date Received	Name	Address of Affected Property	Comments Made	Applicant's Comments	Local Government Comments & Recommendations
1	Received 31/3/17	Margaret Evans	Lot 13 Northam-Cranbrook Rd, Northam	The proponent is not permitted access to their site via my property. According to the plans access is not addressed. Fire break and green belt of shrubs and trees near my boundary fence not shown on plan 7.	<p>Site access arrangements</p> <ul style="list-style-type: none"> The development application does not propose access through Lot 13 Northam-Cranbrook Road. Access is taken from Northam-York Road. No fence is proposed to be removed as part of the development application. <p>Visual Amenity The applicant has liaised with the landowner of Lot 6 Northam-York Road and Ms Evans in relation to providing additional trees for visual relief.</p>	<p>Access will not be obtained through Lot 13 Northam-Cranbrook Road.</p> <p>The planting of additional native vegetation to the north of the solar arrays for screening is recommended as a condition of approval.</p> <p>Recommendation: That the submission be partially upheld.</p>
2	Received 6/4/17	Kevin & Amanda Beazley	26 Loton Drive, Northam	The proposal impacts on the character of the area and the view we overlook.	<ul style="list-style-type: none"> The nearest point of the solar array is approximately 1.4km from their property. The nearest points of the solar array will not be visible due to vegetation and landform. The solar array would be approximately 2km from their property (26 Loton Drive), measured to the eastern perimeter of the solar array. Refer to property marked 'A' on the Attachment 1 for a visual 	<p>It is acknowledged that the solar arrays will be visible from surrounding properties to some extent. However it is considered that the solar arrays would not result in a detrimental impact to visual amenity for the following reasons:</p> <ul style="list-style-type: none"> Solar panels will be covered by glass with low reflectance for maximum

No.	Date Received	Name	Address of Affected Property	Comments Made	Applicant's Comments	Local Government Comments & Recommendations
					<p>reference to the extent of visibility, approximately from the eastern perimeter of the solar array. Portions of the side of the dwelling, front yard and backyard are partially visible in the photo.</p> <p>Visual Amenity</p> <ul style="list-style-type: none"> The solar array fits in the landscape character and does not have a significant impact when viewed from the Woodley Farm Estate area, as: <ul style="list-style-type: none"> Trees, houses and topography leads to the development being obscured to some extent, as demonstrated in the photos – refer to Plate 8 of the Photo Analysis in Appendix B, and property marked as 'A' on the Attachment 1; The landform is not impacted by the proposal, as it utilises low-lying land and does not require earthworks. The development itself is low to the ground, and from a distance would appear to be a pattern of dark grey / blue objects. There would be some break-up of the appearance of the development as the ground would be visible beneath it. <p>The development is not overbearing and is not obtrusive, and for the</p>	<p>absorption of sunlight to reduce glare.</p> <ul style="list-style-type: none"> The amount of glare will be similar to that of a smooth body of water. Glare from the solar array will mostly be reflected upwards and not towards surrounding residents. Solar panels will be a grey colour to ensure that the development blends in as much as possible with the surrounding the landscape. The development is situated in a low lying area and will be partially obscured by native vegetation and other buildings in the view shed. The development would not obstruct overall views of the surrounding areas and ridgelines of the hills to the north-east. <p>The solar panels will only be visible at a particular time of day as they move throughout the day.</p> <p>Recommendation: That the submission be noted.</p>

No.	Date Received	Name	Address of Affected Property	Comments Made	Applicant's Comments	Local Government Comments & Recommendations
					greater part, is not easily visible in the broader context of the landscape.	
3	Received 6/4/17	Quinten & Carroll Kowald	Lot 1302 Loton Drive, Northam	This will affect our view negatively and our selling value of our house. Possible reflection in our direction. Our rates are in our view very high for this region. Prefer this to be further out of town with less negative impact. Bulk of appearance, an 'eye sore' & will spoil the character of living in this rural area.	<ul style="list-style-type: none"> The nearest point of the solar array is approximately 1.1km from their property. The nearest points of the solar array will not be visible due to vegetation and landform. The solar array would be approximately 1.8km from their property (38 Loton Drive), measured to the eastern perimeter of the solar array. Refer to property marked 'B' on the Attachment 1 for a visual reference to the extent of visibility, approximately from the eastern perimeter of the solar array. The dwelling is obscured from view, however parts of their property may have views. <p>Visual Amenity</p> <ul style="list-style-type: none"> Refer to visual amenity responses for submission 2. Property values are not a material planning consideration. A "right to a view" is not a material planning consideration. Trees, the next-door house and topography leads to the 	<p>Perceived impacts upon property value and rates are not valid planning considerations.</p> <p>See response to submission 2 in regard to visual amenity impacts.</p> <p>Recommendation: That the submission be noted.</p>

No.	Date Received	Name	Address of Affected Property	Comments Made	Applicant's Comments	Local Government Comments & Recommendations
					<p>development being obscured to some extent.</p> <p>Glare Glare has been addressed in the application and in the Technical Note contained in Appendix E of the Development Application. Glare will not be seen at ground level; and glare for an aviator would be diffuse, and consistent with that of flat water.</p>	
4	Received 4/4/17	Alan Friend	10 Marshall Place, Northam	<p>The value of our property will be affected by visual pollution. Our uninterrupted view of farmland will be affected.</p> <p>The supplied information does not show how the power will be transferred from the property eg. power poles & lines.</p> <p>We have an industrial park at Meenar which would be a better site than one so close to Northam's townsite.</p>	<ul style="list-style-type: none"> The nearest point of the solar array is approximately 1.4km from their property. The nearest points of the solar array will not be visible due to vegetation and landform. The solar array would be approximately 2.1km from their property (10 Marshall Place), measured to the eastern perimeter of the solar array. Refer to property marked 'C' on the Attachment 1 for a visual reference to the extent of visibility, approximately from the eastern perimeter of the solar array. The dwelling is visible from the eastern perimeter of the development. Property values are not a material planning consideration. 	<p>Perceived impacts upon property value is not a valid planning consideration.</p> <p>See response to submission 2 in regard to visual amenity impacts.</p> <p>Power Generation is a use class that may be considered on lots zoned 'Rural' in accordance with Local Planning Scheme No.6.</p> <p>Recommendation: That the submission be noted.</p>

No.	Date Received	Name	Address of Affected Property	Comments Made	Applicant's Comments	Local Government Comments & Recommendations
					<ul style="list-style-type: none"> A "right to a view" is not a material planning consideration. Trees, the next-door house and topography leads to the development being obscured to some extent. <p>Visual Amenity Refer to visual amenity responses for submission 2.</p>	
5	Received 6/4/17	Cole Hazelwood	18 Loton Drive, Northam	<p>Aesthetics, Glare, Heat, Valley, Still summer days, prime residential or commercial land? I can smell a dodgy deal.</p> <p>All for solar arrays. Most I have seen are out of town – over a hill – not sure why it is proposed 'in town' where heat & glare can impact a lot of residents. Approach a farmer with same rent.</p> <p>I think this needs some serious examination. Is there any other solar arrays that have been put so close to town? I.e. in town?</p> <p>The closest I've seen are at least a couple of K's out past the last residential area. I'm not just saying this because I live in Woodley Farm, I'm pretty sure I won't even see it from my house.</p> <p>I would like to see the results of a study of the heat they convect, the glare effect and even sonic microwaves emitted from the inverters etc.</p>	<ul style="list-style-type: none"> The nearest point of the solar array is approximately 1.5km from their property. The nearest points of the solar array will not be visible due to vegetation and landform. The solar array would be approximately 2.1km from their property (18 Loton Drive), measured to the eastern perimeter of the solar array. Refer to property marked 'D' on the Attachment 1 for a visual reference to the extent of visibility, approximately from the eastern perimeter of the solar array. A portion of the dwelling's roof is visible. Houses and trees otherwise obscure views. The proposal is in a 'rural' zoned area and whilst no solar arrays currently exist near Northam, this form of 	<p>See response to submission 2 in regard to visual amenity impacts.</p> <p>It is unlikely that surrounding land owners will experience an increase in temperatures due to the development.</p> <p>There is no known evidence that EMFs can affect human health.</p> <p>Power Generation is a use class that may be considered on lots zoned 'Rural' in accordance with Local Planning Scheme No.6.</p> <p>Recommendation: That the submission be noted.</p>

No.	Date Received	Name	Address of Affected Property	Comments Made	Applicant's Comments	Local Government Comments & Recommendations
				<p>We all know how hard it is to convince someone to live near a power transformer, don't be involved in a repeat of the old hospital, we only just got rid of the one ill-conceived eyesore.</p> <p>I don't see why it can't go down the road a bit, oh I know cable costs money, it's so close to Western Power etc. More like we're pretty good buddy's with the guy who's just coincidentally ended up with this land, and the long term lease rates sure beat cropping. Offer the same lease to a farmer down the road and see what happens...</p> <p>Just saying do your due diligence on this one, it doesn't feel like a winner to me.</p>	<p>development has been contemplated as a possible land use in the Scheme.</p> <ul style="list-style-type: none"> Proposed location of the solar array is outside of the Northam townsite boundary that is shown in the Shire of Northam Local Planning Strategy. <p>Visual Amenity</p> <ul style="list-style-type: none"> Refer to visual amenity responses for submission 2. <p>Glare</p> <ul style="list-style-type: none"> Glare has been addressed in the application and in the Technical Note contained in Appendix E of the Development Application. Glare will not be seen at ground level; and glare for an aviator would be diffuse, and consistent with that of flat water. <p>Heat</p> <ul style="list-style-type: none"> No anticipated issues of heat as outlined in the Technical Note in Appendix E of the Development Application. No previous reports of heat impacts from existing PV solar arrays in Australia. <p>Electromagnetic Field</p> <ul style="list-style-type: none"> The Western Power sub-station already exists in vicinity to the estate. The 	

No.	Date Received	Name	Address of Affected Property	Comments Made	Applicant's Comments	Local Government Comments & Recommendations
					<p>substation and the solar array both generate EMF, as is experienced with all electrical appliances including domestic solar panels. The Solar array is distant from houses and EMF is not considered to be a hazard to human health, as outlined in the Technical Note in Appendix E of the Development Application.</p> <ul style="list-style-type: none"> The solar array is proposed in accordance with applicable Australian Standards. <p>Residents are not likely to experience or detect EMF from the solar array.</p>	
6	Received 9/4/17	Daniel & Trisha Ellis	132 Woodley Farm Drive, Northam	<p>Whilst we are supportive of clean energy and commend the Shire for considering an environmentally friendly initiative, we do have concerns that the project will affect our lifestyle and have a negative impact on the quiet enjoyment of our home.</p> <p>The proposal document prepared for Carnegie Clean Energy Ltd is largely dismissive of potential concerns by residents and offers no measures to allay any negative impact:</p> <p><u>1. Noise</u> The proposal document advises the "facility is unlikely to be audible by dwellings". The word unlikely is highly subjective and instils little confidence</p>	<ul style="list-style-type: none"> The nearest point of the solar array is approximately 800m from their property. The nearest points of the solar array will not be visible due to vegetation and landform. The solar array would be approximately 1.4km from their property (132 Woodley Farm Drive), measured to the eastern perimeter of the solar array. Refer to property marked 'E' on the Attachment 1 for a visual reference to the extent of visibility, approximately from the 	<p>Noise generated by the development will be consistent with normal rural background noise and will not exceed limits set by the <i>Environmental Protection (Noise) Regulations 1997</i>.</p> <p>See response to submission 2 in regard to visual amenity and glare impacts.</p> <p>Solar arrays can be easily removed at the end of the developments lifespan and the land returned to its previous state. The reinstatement of the land following the expiration of the use is recommended as a condition of approval.</p>

No.	Date Received	Name	Address of Affected Property	Comments Made	Applicant's Comments	Local Government Comments & Recommendations
				<p>in us, as homeowners, that the project operators can guarantee no noise. How will the Shire ensure that the facility is not audible from our home and what consequences are there to the project owners if we do experience noise issues? Furthermore, the document doesn't include details on maintenance at the site – how often will this be required, what type of maintenance will be conducted etc – and therefore, the impact of those activities on us as nearby residents.</p> <p><u>2. Visual Impact</u> We purchased our property specifically for the rural outlook. Our outdoor entertaining areas and views from our master bedroom and two livings areas are positioned to take advantage of that outlook. Section 3.3.1 Visual Analysis is rudely dismissive of the importance of the rural outlook to residents, describing the arrays as appearing as “dark grey objects”. This is vastly different to a crop or grassy paddock and changes the landscape significantly. The report also assumes that ‘some views may be taken from front or back yards’ and clearly doesn't appreciate how, as home owners, we use our property. Outdoor living is a major part of our, and our neighbours', lifestyle and is just as important as the views from inside our home. The project is not simply a few dark grey objects, it covers a very large area and</p>	<p>eastern perimeter of the solar array. The roof of the house is partially visible however the house has no clear view of the proposed solar array due to trees obscuring views.</p> <p>Noise</p> <ul style="list-style-type: none"> • The noise output is understood to be 79dB measured at 1m for the inverters during day-time operations; at or near zero at night. • Noise levels reduce in accordance with the inverse-square law. For every doubling of the distance from the sound source in a free field situation, the sound intensity will diminish by 6 dB. • The subject property is over 800 metres from the property. In accordance with calculating noise using the Inverse Square Law, and without considering other noise sources the inverter noise level at 800m will be <20dB. 20dB is the equivalent noise to a ticking watch, rustling leaves, or whispering. • This level of noise is below the assigned limits of noise 	<p>Recommendation: That the submission be noted.</p>

No.	Date Received	Name	Address of Affected Property	Comments Made	Applicant's Comments	Local Government Comments & Recommendations
				<p>impacts almost all of the outlook to the East, i.e. to the front of our home.</p> <p>Section 5.1 (c) of the State Planning Policy 2.5 Rural Planning, as referred to by Taylor Burrell Barnett, provides for "...protection of valued landscape and views". The report writer responds to this section of the State Planning Policy by suggesting the proposal will have "Low to negligible impact." The photograph representing the proposed Solar Array, as circulated to residents, is in stark contrast to the writer's "low to negligible impact". The photograph shows a very noticeable change from the existing rural landscape to one of dark grey solar panels covering a large area. This is therefore, in contravention of Section 5.1 of the State Planning Policies.</p> <p><u>3.Glare</u> Section 3.3.2 Glare refers largely to the impact of glare on pilots. There is little reference to the impact of glare to residents. Given that the system rotates to capture the sunlight, the panels will be positioned toward our property in the afternoons. How will the Shire ensure the project operators manage any glare issues that may arise and can we be guaranteed that we will not be affected by glare? The project covers a very large area and therefore, the impact of even a small amount of</p>	<p>under the <i>Environmental Protection (Noise) Regulations 1997</i>.</p> <p>Project longevity</p> <ul style="list-style-type: none"> The PV solar array is expected to be operational for 25 years and the conflict between documents on this statement is acknowledged. <p>Visual Amenity</p> <ul style="list-style-type: none"> Refer to visual amenity responses for submission 2. <p>Glare Glare has been addressed in the application and in the Technical Note contained in Appendix E of the Development Application. Glare will not be seen at ground level; and glare for an aviator would be diffuse, and consistent with that of flat water.</p>	

No.	Date Received	Name	Address of Affected Property	Comments Made	Applicant's Comments	Local Government Comments & Recommendations
				<p>glare will have a monumental negative impact on our lifestyle.</p> <p>4. <u>Project Longevity</u> The report prepared by Taylor Burrell Barnett advises that a 25 year lease has been secured for the project. However, the Environmental Site Assessment Report refers to the solar array being operational for only 20 years. This information is conflicting.</p> <p>The Taylor Burrell Barnett report is bias towards the benefits of the project, as demonstrated through the company's response to the Rural Zone Objectives for the Local Planning Scheme 6 ('the Scheme'):</p> <ol style="list-style-type: none"> 1. <i>"To project the potential of agricultural land for primary production and to preserve the landscape and character of the rural area"</i> – we agree the project, on its completion, returns the land for primary production. However, it does not preserve the landscape and character of the rural area during the next 20 or 25 years. It very clearly, changes the landscape and character of Lot 6 for a long period of time and this is in direct contravention to the Scheme. 		

No.	Date Received	Name	Address of Affected Property	Comments Made	Applicant's Comments	Local Government Comments & Recommendations
				<p>2. <i>"To protect land from land degradation and further loss of biodiversity..."</i> While the Environment Site Assessment Report raises no major environmental concerns, the project misses the opportunity to develop and protect corridors of native vegetation. The project does not further enhance the environment other than providing clean energy. There is an opportunity to adhere to this objective by planting native vegetation and have a positive environmental impact through vegetation whilst addressing our concerns on the visual impact.</p> <p>We ask what assurances will be provided to address and correct any negative impact that does arise, given Carnegie Clean Energy Ltd's proposal fails to adequately consider nearby residents.</p> <p>From reviewing the information, including reports and photos, provided to us we believe the project, in its current form, will have a profound negative impact on our lifestyle and property. As previously mentioned, the report provided by Carnegie Clean Energy Ltd does not address potential</p>		

No.	Date Received	Name	Address of Affected Property	Comments Made	Applicant's Comments	Local Government Comments & Recommendations
				<p>residential concerns, but rather, is dismissive of the project's impact.</p> <p>We would appreciate the Shire's support in having the project re-considered so that measures are implemented to ensure visual amenity is protected, and glare and noise will be a non-issue.</p> <p>Furthermore, we understand that Carnegie Clean Energy Ltd are holding a meeting for residents on 10 April 2017. The meeting is too late in the public submission period for our concerns to be discussed and still allow adequate time to prepare our comments in response.</p> <p>We welcome the Shire contacting us to clarify our concerns.</p>		
7	Received 12/4/17	Anthony and Julianne Page	8 Marshall Place, Northam	<p>After reading the recent proposal for the solar panel farm in Northam we have some concerns we would like you to address:</p> <ol style="list-style-type: none"> 1. One of the reasons we selected our home was because of the beautiful rural views. 25 hectares of solar panels will affect our view, lifestyle and resale value. 2. We will be able to see at least 50% of the solar array from our property and even with the reduced glare materials being used for the panels, we are concerned about the effect of the glare on our household. 	<ul style="list-style-type: none"> • The nearest point of the solar array is approximately 1.5km from their property. The nearest points of the solar array will not be visible due to vegetation and landform. • The solar array would be approximately 2.1km from their property (8 Marshall Place), measured to the eastern perimeter of the solar array. • Refer to the property marked 'F' on the Attachment 1 for a visual reference to the extent of visibility, approximately 	<p>Perceived impacts upon property value is not a valid planning consideration.</p> <p>See response to submission 2 in regard to visual amenity impacts.</p> <p>Recommendation: That the submission be noted.</p>

No.	Date Received	Name	Address of Affected Property	Comments Made	Applicant's Comments	Local Government Comments & Recommendations
				<p>We understand the benefits of a solar array and are supportive of a renewable energy lifestyle. However we would appreciate the shire of Northam considering relocating the farm to an area that will not affect private households.</p> <p>We look forward to you addressing our concerns and await your response.</p>	<p>from the eastern perimeter of the solar array. The dwelling is visible from the eastern perimeter of the development.</p> <p>Visual Amenity</p> <ul style="list-style-type: none"> Refer to visual amenity responses for submission 2. <p>Glare</p> <p>Glare has been addressed in the application and in the Technical Note contained in Appendix E of the Development Application. Glare will not be seen at ground level; and glare for an aviator would be diffuse, and consistent with that of flat water.</p>	
8	Received 12/4/17	Robert Smith	11 Loton Drive, Northam	<p>My family and interests will be visually affected as well as property values devalued.</p> <p>Our existing lovely rural view to the north east will be massively ruined by the proposed erection of a huge area of "solar glass" plus we suspect it could be added to in the future.</p>	<p>Visual Amenity</p> <ul style="list-style-type: none"> The nearest point of the solar array is approximately 1.4km from their property. The nearest points of the solar array will not be visible due to vegetation and landform. The solar array would be approximately 2km from their property (11 Loton Drive) measured to the eastern perimeter of the solar array. Refer to property marked 'G' on the Attachment 1 for a visual reference to the extent of visibility, approximately from the eastern perimeter of the 	<p>Perceived impacts upon property value is not a valid planning consideration.</p> <p>See response to submission 2 in regard to visual amenity & glare impacts.</p> <p>Further development approval will be required prior to any future expansion of the use.</p> <p>Recommendation: That the submission be noted.</p>

No.	Date Received	Name	Address of Affected Property	Comments Made	Applicant's Comments	Local Government Comments & Recommendations
					<p>solar array. The roof of the dwelling however vegetation obscures views.</p> <ul style="list-style-type: none"> Refer to visual amenity responses for submission 2. 	
9	Received 12/4/17	Brent Annels	22 Loton Drive, Northam	<p>I'd like to make a submission on the following grounds,</p> <ol style="list-style-type: none"> Loss of visual amenity – from our property at 22 Loton Drive (as can be seen in attached photo A & B) the view looking east from inside our front windows and also from our front garden will be heavily impacted. When photos of the proposal were sent to affected residents as part of the Taylor, Burrell, Barnett Development Application I did notice the photo's were all taken at lower areas of both Loton Drive and Marshall Place which didn't show a true reflection of the visual impact for all residences, just the lower lying ones. Item 1.3 on application – "The development is on low-quality, frost affected land". Frost has had an effect on crop yields on not just low lying land over the years, it's not limited to low lying land and there's other factors such as planting times etc. 	<p>Visual Amenity</p> <ul style="list-style-type: none"> The nearest point of the solar array is approximately 1.5km from their property. The nearest points of the solar array will not be visible due to vegetation and landform. The solar array would be approximately 2.1km from their property (22 Loton Drive), measured to the eastern perimeter of the solar array. Refer to property marked 'H' on the Attachment 1 for a visual reference to the extent of visibility, approximately from the eastern perimeter of the solar array. The side of the dwelling and portions of the front yard and backyard are visible in the photo. Refer to visual amenity responses for submission 2. <p>Glare</p> <ul style="list-style-type: none"> Glare has been addressed in the application and in the Technical Note contained in Appendix E of the Development 	<p>Perceived impacts upon property value is not a valid planning consideration.</p> <p>See response to submission 2 in regard to visual amenity & glare impacts.</p> <p>The proposed development is consistent with the objectives of the rural zone due to the following reasons:</p> <ul style="list-style-type: none"> The proposal will provide for a new local industry that is compatible with existing rural uses. The proposal would not result in the loss of quality agricultural land or prevent other rural land uses from occurring in the area. The development will not result in removal of native vegetation, loss of biodiversity or other environmental impact. The proposed development will not obstruct ridgelines which

No.	Date Received	Name	Address of Affected Property	Comments Made	Applicant's Comments	Local Government Comments & Recommendations
				<p>Also is there evidence that the land is low quality compared to the rest of the paddock/farm?</p> <p>3. Item 1.4 – In Item 1.4 it states that the land owner recently burned off the paddock, but noted that the majority of unburnt land was because it's low-quality agricultural land, and does not contribute towards the landowners crop yields. This is an interesting point, up until this year the whole paddock to my recollection has all been treated the same and it's only now that the development proposal has been put forward that an area has been left separate.</p> <p>4. Item 3.3.2 – "like with all reflective surfaces and materials, including grassy fields and smooth water, there us a potential for glare reflection at particular angles". This statement does NOT rule out the chance of reflection from the panels to our property or anyone else's with line of sight to the development.</p> <p>(Submission included photographs and highlighted extract of the development application report).</p>	<p>Application. Glare will not be seen at ground level; and glare for an aviator would be diffuse, and consistent with that of flat water.</p> <p>Objectives of the Rural zone</p> <ul style="list-style-type: none"> The development provides for a local service, insofar as it produces electricity which feeds into the interconnected grid. This complies with Objective 1. The location of the development avoids placement of the solar array on the landowner's productive agricultural land. The location of the development also avoids clearing of native habitat. The trees on-site and along the Mortlock River assist in screening a significant proportion of the development from passing road traffic and obscures views from the Woodley Farm Estate. The leasing of the land complies with Objective 3, which precludes further subdivision. <p>The development complies with Objective 4. The location of the development is on land that is capable of accommodating solar</p>	<p>contribute the character of the area.</p> <p>Recommendation: That the submission be noted.</p>

No.	Date Received	Name	Address of Affected Property	Comments Made	Applicant's Comments	Local Government Comments & Recommendations
					panels. It has no drainage or geotechnical issues. The development will not contribute to a loss of biodiversity in the locality.	
10	Received 12/4/17	Peter Stewart & Eleanor Press	120 Woodley Farm Drive, Northam	<p>We are making this submission regarding the proposed Solar Array at Lot 6 No. 131 Northam-York Road Muluckine. We are property owners at the York Road end of Woodley Farm Drive, our kitchen and living room windows directly overlook the proposed address for the solar array. Our primary concern is the visual impact of multiple thousands of solar panels. The potential glare created by these surfaces, especially late afternoon when they will be possibly directed straight at our home will create an unacceptable environment for us. A further aspect to the visual impact of this development to our area concerns the character. We specifically chose to buy here just over a year ago as the character of the area is desirable, we feel the installation of an array of this size will be have an extremely negative affect on the character of this area.</p> <p>We are also concerned about the electromagnetic fields created by a solar array of this magnitude. We question how much will be created in a development of this size and would like to see the Shire request detailed information, and provide this to all residents, prior to any final decisions</p>	<p>Visual Amenity</p> <ul style="list-style-type: none"> The nearest point of the solar array is approximately 1km from their property. The nearest points of the solar array will not be visible due to vegetation and landform The solar array would be approximately 1.5km from their property (120 Woodley Farm Drive), measured to the eastern perimeter of the solar array. Refer to the area marked 'I' on the Attachment 1 for a visual reference to the extent of visibility, approximately from the eastern perimeter of the solar array. The roof of the house is partially visible however the house has no clear view of the proposed solar array due to trees and vegetation obscuring views. <p>Glare</p> <p>Glare has been addressed in the application and in the Technical Note contained in Appendix E of the Development Application. Glare will not be seen at ground level; and</p>	<p>See response to submission 2 in regard to visual amenity & glare impacts.</p> <p>There is no known evidence that EMFs can affect human health.</p> <p>Power Generation is a use class that may be considered on lots zoned 'Rural' in accordance with Local Planning Scheme No.6.</p> <p>Recommendation: That the submission be noted.</p>

No.	Date Received	Name	Address of Affected Property	Comments Made	Applicant's Comments	Local Government Comments & Recommendations
				<p>being made. We feel it would be remiss of the Shire to discount this out of hand.</p> <p>We fully support the creation, development and installation of solar arrays for renewable power generation, however we are questioning the location of this array. There is a designated Industrial park located only 18 kilometers from the Northam townsite where these types of developments would surely be more suited. It would be a fabulous thing for the Avon Community Development Foundation and the Wheatbelt Development Commission to have such a significant investment in the area of green power generation located at the park.</p> <p>We thank you for the opportunity to submit our proposal regarding this possible development and would like to invite you to contact us if you require any further information.</p>	glare for an aviator would be diffuse, and consistent with that of flat water.	
11	Late Submission Received 20/4/17	Rowan Lee	126 Woodley Farm Drive, Northam	<p>As an owner and occupier of a property in Woodley Farm Drive this could devalue our homes and the outlook of Woodley Farm.</p> <p>People have invested a lot of money building homes in Woodley Farm. We are mean to look at farming properties not solar panels. This should be built at Meenar Industrial Park.</p>	<p>Visual Amenity</p> <ul style="list-style-type: none"> The nearest point of the solar array is approximately 900m from their property. The nearest points of the solar array will not be visible due to vegetation and landform. The solar array would be approximately 1.5km from their property (120 	<p>Perceived impacts upon property value is not a valid planning consideration.</p> <p>See response to submission 2 in regard to visual amenity & glare impacts.</p> <p>Recommendation: That the submission be noted.</p>

No.	Date Received	Name	Address of Affected Property	Comments Made	Applicant's Comments	Local Government Comments & Recommendations
					<p>Woodley Farm Drive), measured to the eastern perimeter of the solar array.</p> <ul style="list-style-type: none"> Refer to the area marked 'I' on the Attachment 1 for a visual reference to the extent of visibility, approximately from the eastern perimeter of the solar array. The roof of the house is partially visible however the house has no clear view of the proposed solar array due to trees and vegetation obscuring views. <p>Meenar Industrial Park</p> <ul style="list-style-type: none"> A 'Power Generation' land use is an 'A' discretionary use within the 'Rural' and the 'General Industry' zone. The solar array has been proposed at Lot 6 due to a number of compelling reasons: <ul style="list-style-type: none"> The Proponent has successfully secured a lease of the land from the registered landowner. The subject site is in close proximity to the Western Power Northam substation and to the distribution line, providing for efficient electricity generation and transmission. 	

No.	Date Received	Name	Address of Affected Property	Comments Made	Applicant's Comments	Local Government Comments & Recommendations
					<ul style="list-style-type: none"> – Direct line of sight is available between the Northam substation and the solar array for communications, allowing for reliable remote operation of the solar array by Western Power / Carnegie Clean Energy. – There are no geotechnical, site or access constraints. 	
12	Late submission received 27/4/17	Steph Painter	159 Woodley Farm Drive, Northam	<p>I do not agree with this proposal! Our kitchen/living room face this proposed site and the thought of the yearlong glare from these ridiculous solar panels and being so close to town when we have Meenar Industrial Park 10kms away!</p> <p>Our main concern is the glare from these solar panels and the decrease in valuation of properties in the Woodley Farm Estate. Why so close to the township? When we have Meenar Industrial Park.</p>	<p>Glare</p> <ul style="list-style-type: none"> • The nearest point of the solar array is approximately 800m from their property. The nearest points of the solar array will not be visible due to vegetation and landform. • Refer to the area marked 'K' on the Attachment 1 for a visual reference to the extent of visibility, approximately from the eastern perimeter of the solar array. The roof of the house is partially visible however the house has no clear view of the proposed solar array due to trees and vegetation obscuring views. • Glare has been addressed in the application and in the Technical Note contained in Appendix E of the Development Application. Glare will not 	<p>See response to submission 2 in regard to visual amenity & glare impacts.</p> <p>Perceived impacts upon property value is not a valid planning consideration.</p> <p>Recommendation: That the submission be noted.</p>

No.	Date Received	Name	Address of Affected Property	Comments Made	Applicant's Comments	Local Government Comments & Recommendations
					<p>be seen at ground level; and glare for an aviator would be diffuse, and consistent with that of flat water.</p> <p>Meenar Industrial Park</p> <ul style="list-style-type: none"> Refer to comments outlined in submission 11. 	
External Agency Submissions						
12	12/4/17	MRWA	N/A	No objection.		Noted
13	10/4/17	DER	N/A	No objection.		Noted
14	10/4/17	Public Transport Authority	N/A	<p>The level crossing which is intended to serve as access to the proposed development is currently classified as a private occupational level crossing. As such, BR will seek to enter into an Interface Agreement with the owner of, or person responsible for the crossing, to work with BR to determine rail crossing interface requirements.</p> <p>Given it appears there is multiple users of the occupational level crossing (which is not encouraged) both PTA and BR recommend council consider having this crossing upgraded to a public road.</p> <p>Notwithstanding the above, the following conditions should be included in an approval -</p> <ol style="list-style-type: none"> Vehicles in excess of 20m in length are not permitted to use the crossing G9-67-1 signage be installed on both crossing approaches 	<p>Access</p> <ul style="list-style-type: none"> The Applicant is not a landowner and does not have management of the crossing as it is within the railway reserve. The Applicant would be happy to liaise with Brookfield Rail to secure an Interface Agreement, if required. Vehicles used during construction or maintenance will be less than 20m in length. Typical operational vehicles will be 4WD or SUV vehicles. The Applicant has no objections to installing signage and a solid stop line to improve safety. The Applicant has no objection to preparing and implementing a traffic management plan in 	<p>Noted.</p> <p>The PTA's recommendation that the level crossing being upgraded to a public road is not supported.</p> <p>It is considered that the crossing will be used extensively for the construction period only, and thereafter on an intermittent basis.</p> <p>It is considered that the crossing issue can be managed through a construction management plan as a condition of approval. Refer RAR - Condition 7.</p> <p>Modification of the proposal not required.</p>

No.	Date Received	Name	Address of Affected Property	Comments Made	Applicant's Comments	Local Government Comments & Recommendations
				<p>3. A painted solid stop line be installed on both sealed road approaches at a distance of 3.5m from the rail tracks to indicate a safe position for vehicles to stop and assess for approaching trains</p> <p>4. A traffic management plan be implemented that staggers the access and egress of construction traffic to prevent 2 vehicles being on the crossing at the same time. This should prevent stationary vehicles on the level crossing and vehicles from queuing back from the crossing onto the Northam-York Road</p>	consultation with the PTA and Brookfield Rail.	
15	24/4/17	Department of Water	N/A	<p>It is unclear from the information provided the setback of the proposed power generation development from the Mortlock River. In accordance with State Planning Policy 2.9: Water Resources (WAPC, 2006) set back of the development should be at least 30m from the Mortlock River, or alternatively an appropriate buffer or foreshore area determined by a biophysical assessment as outlined in Operational Policy 4.3: Identifying and establishing waterways foreshore areas (DoW, 2012) to ensure adequate protection of the river.</p> <p>Stormwater management for the site (mainly during the construction phase) also needs to be addressed, to ensure erosion and other potential impacts to the waterway are minimised, in</p>	<p>Setback to River</p> <ul style="list-style-type: none"> The Lot 6 cadastral boundary generally is 30m or more away from the Mortlock River. The PV solar array is at approximately 100m north of the fenceline between Lot 6 and the Mortlock River. This complies with SPP 2.9 <i>Water Resources</i>. <p>Stormwater Management</p> <ul style="list-style-type: none"> Stormwater will be managed on-site for on-site infiltration. Measures to prevent soil erosion are contained in Table 8 of the DA report and in Appendix C, section 4. 	<p>Noted.</p> <p>The proposal complies with the minimum setbacks to the Mortlock River in accordance with State Planning Policy 2.9: Water Resources.</p> <p>It is considered the management of stormwater during the construction phase should be addressed through the construction management plan (refer condition 7).</p> <p>Modification of proposal not required.</p>

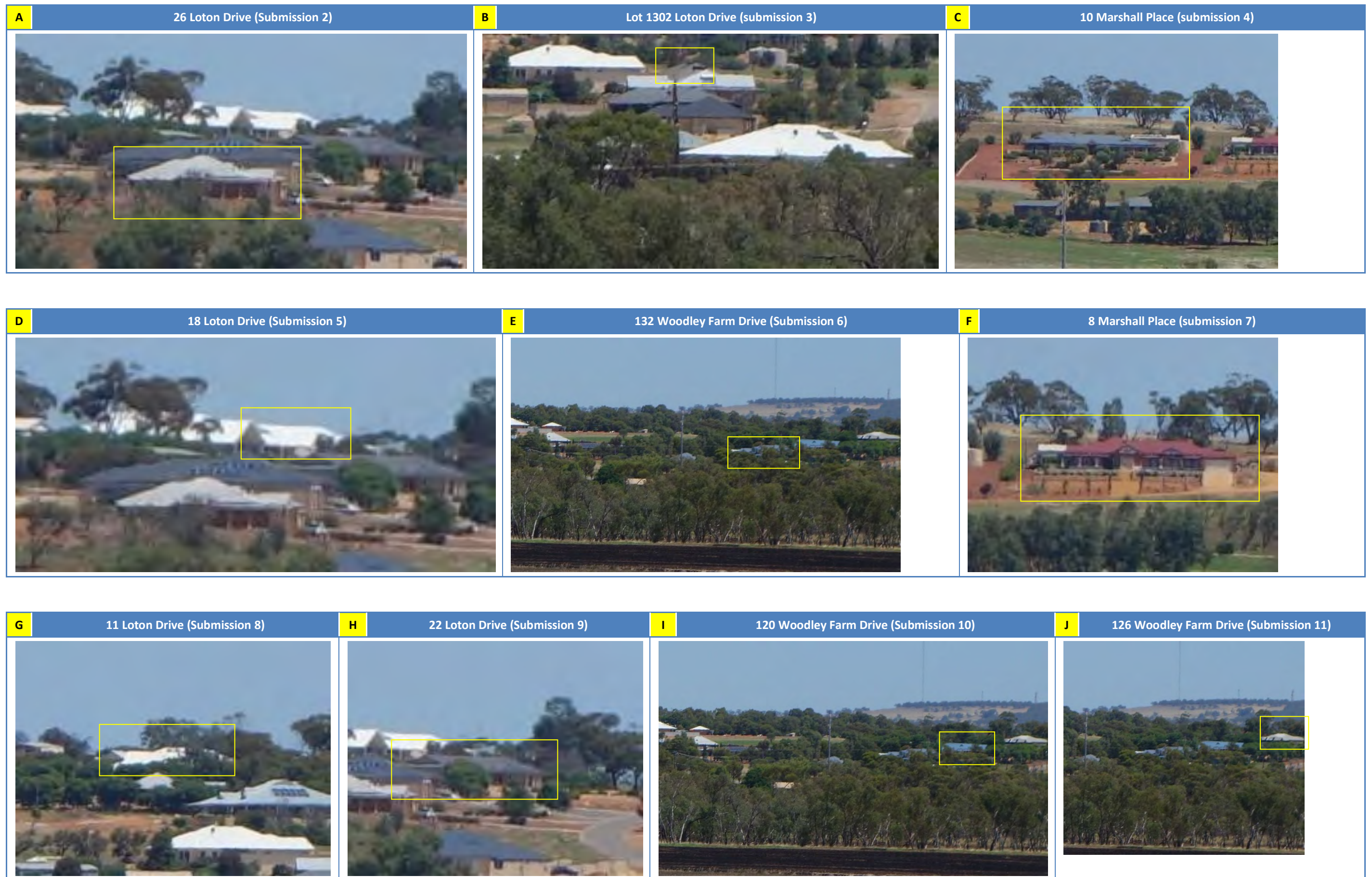
No.	Date Received	Name	Address of Affected Property	Comments Made	Applicant's Comments	Local Government Comments & Recommendations
				accordance with the <i>Stormwater Management Manual of Western Australia</i> (DoW, 2004-2007).		

- END OF SCHEDULE OF SUBMISSIONS -



ATTACHMENT 1 – Visual Reference to Submitters' Dwellings

Photo from the subject site is taken from an approximate location on the eastern perimeter side of the proposed solar array.



ATTACHMENT 1 – Visual Reference to Submitters’ Dwellings

Photo from the subject site is taken from an approximate location on the eastern perimeter side of the proposed solar array.



Form 2 – Responsible Authority Report (Regulation 17)

Property Location:	Lots 10847 and 10848 Rose Thomson Road, Warradarge
Development Description:	Warradarge Wind Farm Transmission Line
Proposed Amendments:	Request to extend timeframe on Condition 2 to 31 August 2022
DAP Name:	Mid-West/Wheatbelt Joint Development Assessment Panel
Applicant:	Synergy
Owner:	Judeen Nominees Pty Ltd
Value of Amendment:	Not Applicable
LG Reference:	ADM0300
Responsible Authority:	Shire of Carnamah
Authorising Officer:	Simon Lancaster
Department of Planning File No:	DP/12/00624
Report Date:	25 May 2017
Application Receipt Date:	4 May 2017
Application Process Days:	20 days
Attachment(s):	<p>Attachment 1 – JDAP Minutes relating to Original Determination 31 August 2012</p> <p>Attachment 2 – JDAP Agenda relating to Original Determination 31 August 2012</p> <p>Attachment 3 – Request to extend timeframe on Condition 2 to 31 August 2022 as submitted by Applicant dated 1 May 2017</p> <p>Attachment 4 – Location Plan (Drawing No. WAW-AA-GA-G/002 SH001) as provided with JDAP Agenda relating to Original Determination 31 August 2012</p> <p>Attachment 5 – Site Plan overlaid upon Aerial Photograph (Drawing No. WAW-AA-GA-G/001 SH001) as provided with JDAP Agenda relating to Original Determination 31 August 2012</p> <p>Attachment 6 – Transmission Line Tower Elevation Plan (Drawing No. WAW-SS-PT-E/001 SH001) as provided with JDAP Agenda relating to Original Determination 31 August 2012</p> <p>Attachment 7 – Development Area Plan (Drawing No. WAW-AA-GA-G/001 SH003) as provided with JDAP Agenda relating to Original Determination 31 August 2012</p> <p>Attachment 8 – Photomontage from both Garibaldi Willis Road (Drawing No.61-27826-SK004) and Rose Thomson Road (Drawing No.61-27826-SK006) as provided with JDAP Agenda relating to Original Determination 31 August 2012</p> <p>Attachment 9 – Schedule of Submissions as</p>

	<p>provided with JDAP Agenda relating to Original Determination 31 August 2012</p> <p>Attachment 10 – Copy of Submissions as provided with JDAP Agenda relating to Original Determination 31 August 2012</p> <p>Attachment 11 – Copy of original application as provided with JDAP Agenda relating to Original Determination 31 August 2012</p>
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Officer Recommendation:

That the Mid-West/Wheatbelt Joint Development Assessment Panel resolves to:

1. **Accept** that the DAP Application reference DP/12/00624 and A2370626 as detailed on the DAP Form 2 dated 1 May 2017 is appropriate for consideration in accordance with regulation 17 of the *Planning and Development (Development Assessment Panels) Regulations 2011*;
2. **Approve** the DAP Application reference DP12/00624 and A2370626 as detailed on the DAP Form 2 date 1 May 2017 in accordance with Clause 68 of the *Planning and Development (Local Planning Schemes) Regulations 2015* and the provisions of Part 9 of the Shire of Carnamah Town Planning Scheme No.2, for the proposed minor amendment to the approved condition 2 to extend the timeframe from 31 August 2017 to 31 August 2022, as it is considered reasonable that projects of this nature can encounter delays relating to factors including financing requirements, applicant restructuring, Commonwealth and State Government review, project scheduling and other matters.

Amended Condition

2. The approved development shall be substantially commenced prior to 31 August 2022 and if the development is not substantially commenced the approval shall lapse and be of no further effect. Where an approval has so lapsed, no development shall be carried out without the further approval of the responsible authority having first been sought and obtained.

Advice Notes

All other conditions and requirements detailed on the previous approval dated 31 August 2012 shall remain unaltered.

Details: outline of development application

Zoning	MRS:	Not Applicable
	TPS:	Rural
Use Class:		Essential Services Public Utility ('D' use)
Strategy Policy:		Not Applicable
Development Scheme:		Not Applicable
Lot Sizes:		Lot 10847 – 1,806.4ha Lot 10848 – 1,441.4ha
Existing Land Use:		Rural

The JDAP approved an application on 31 August 2012 to establish a 330kV spur transmission line running south-east off the existing Eneabba-Karara transmission

line for a distance of 10km across Lots 10847 and 10848 Rose Thomson Road, Warradarge to link with the proposed Warradarge Wind Farm. The section of the transmission line within the Shire of Carnamah would be approximately 5.5km in length. The transmission line would require 22 steel lattice towers measuring 50-63m in height with approximately 500-600m spacing between each tower.

The application was supported by the Shire of Carnamah Council at its 15 August 2012 meeting following advertising.

The transmission line would enable the proposed Warradarge Wind Farm to connect into the South-West Interconnected System. The Warradarge Wind Farm project in the neighbouring Shire of Coorow proposes 100 wind turbines producing on average 875 million Kilowatt-hours of electricity annually (equivalent to the average annual electricity needs of 140,000 West Australian homes), with a design life of 25 years, to be established 15km south-east of Eneabba.

The application for a transmission line forms part of the larger \$600 million Warradarge Wind Farm application. The transmission line portion of the project that is located within the Shire of Carnamah has an estimated value of \$7.5 million.

A copy of the complete application for the total Warradarge Wind Farm project (inclusive of the transmission line component) was provided separately to JDAP members with the 31 August 2012 Agenda on disc format due to the large (43MB) size of the application. The complete submitted development application report included the following technical documents:

- Planning and Context Statement (Urbis);
- Landscape and Visual Impact Assessment (GHD);
- Flora, Vegetation and Fauna Assessment (Biota Environmental Sciences);
- Noise Impact Assessment (Herring Storer Acoustics);
- Background Noise Monitoring (Herring Storer Acoustics);
- Investigation of Possible Impacts on Broadcasting and Radiocommunication Services (Lawrence Derrick and Associates);
- Aviation Impact Statement Assessment (AECOM);
- Planning Compliance Report (Urbis);
- Verve Health and Safety Policy (Verve Energy);
- Verve Environmental Policy (Verve Energy);
- Draft Environmental Management Plan (Verve Energy); and
- Stakeholder Consultation Report (Verve Energy).

This has again been provided to JDAP Members, as Attachment 11.

In support of their original proposal the applicant advised:

“The Eneabba to Karara line currently crosses Lot 10847 and our line would either connect directly into this line at the connection point or at the onsite substation. There are tentative plans from Western Power to construct a new Eneabba substation on a piece of land they acquired adjacent to Lot 10847. If we are required to connect into this substation this transmission line corridor route would still be utilised....The first tower is likely to be adjacent to the substation within Lot 10850. The rest of the towers will be routed through 10851, 10847 and 10848 to the grid connection point. The final detailed design of the towers and routing of the transmission will be determined by the principal contractor and Proponent prior to construction.”

Background:

The subject site has not previously been subject to the lodgement of a major development application (excepting the 31 August 2012 JDAP Determination) and is presently used for farming purposes.

Legislation and Policy:Legislation

Planning and Development Act 2005;
Planning and Development (Development Assessment Panels) Regulations 2011 (Regulation 17);
Planning and Development (Local Planning Schemes) Regulations 2015 (Schedule 2 Part 9);
Shire of Carnamah Town Planning Scheme No.2 (Part 2);
Environmental Protection (Clearing of Native Vegetation) Regulations 2004 (Regulation 5).

State Government Policies

WAPC Planning Bulletin No.67 - Guidelines for Wind Farm Development.

Local Policies

Not Applicable.

Consultation:Public Consultation

As discussed in the original Planning Assessment section of the 31 August 2012 JDAP Agenda (provided as Attachment 2), the original application could have been determined without advertising, however, the applicant stated their preference for the proposal to be formally advertised and Council agreed at its 18 July 2012 meeting to advertise the application for a 330kV transmission line upon Lots 10847 and 10848 Rose Thomson Road, Warradarge for a period of 21 days with the matter to be returned to its 15 August 2012 meeting for its further consideration.

Given that both the transmission line application within the Shire of Carnamah and the wind farm application within the Shire of Coorow were required to be submitted to a Development Assessment Panel and to avoid confusion for consulted parties, the total Warradarge Wind Farm application was advertised concurrently by the Shire of Carnamah and the Shire of Coorow. The advertising period ran from Friday 20 July 2012 until Friday 10 August 2012 with an advisory sign being displayed on-site during the advertising period. Notices were displayed in the Geraldton Guardian on 20 July 2012 and the Mid West Times on 26 July 2012, and the Mid West Times also ran an article on the Warradarge Wind Farm development application on 2 August 2012. A copy of the development application was displayed at the Shire of Carnamah office and the Shire of Coorow (Leeman) office.

In addition to the required advertising actions listed above, at the commencement of the advertising period, all landowners within 5km of the Warradarge Wind Farm

Transmission Line alignment were written to by the Shires and provided with a complete copy of the application and invited to make comment.

The applicant also undertook extensive public consultation as outlined in Section 2.3 of their submitted development application report, including direct contact, production of newsletters, mail-outs and e-mails, newspaper notices, surveys, and public information sessions.

10 submissions were received in relation to the total Warradarge Wind Farm project. 8 of these submissions were received from government agencies all offering no objection to the application (with some providing minor technical comment that was incorporated into the conditions of approval and advice notes). 2 submissions were received in objection to the Warradarge Wind Farm project from neighbouring landowners. Review of the issues raised within the objections confirmed that they were largely concerned with the perceived impact upon their properties arising from noise and the visual appearance of the Wind Farm itself rather than the associated transmission line.

The objecting landowners were located to the south and east of the proposed Wind Farm and the application within the Shire of Carnamah is for the associated transmission line, which is located north-west of the Wind Farm site. The nearest of the objecting landowners is located 6km from the transmission line and 9km from the portion of the transmission line within the Shire of Carnamah.

Nevertheless, a Schedule of Submissions was prepared for the Council's and JDAP's consideration in 2012 and this is included as Attachment 9 to this report, the Schedule identified the respondents, summarised the matters raised, provided individual comment upon the matters raised, and a recommendation in regard to each. The applicant was provided with a copy of the submissions received, in order to have the opportunity to respond to the issues raised, and a copy of the applicant's responses to the issues raised in objection were inserted into the Schedule of Submissions also. Copies of the received submissions have been provided in Attachment 10.

Consultation with other Agencies or Consultants

At the commencement of the advertising period for the original application the following agencies were written to and provided with a complete copy of the application and invited to make comment:

- Alinta Gas;
- Civil Aviation Safety Authority;
- Department of Agriculture and Food;
- Department of Environment and Conservation;
- Department of Indigenous Affairs;
- Department of Mines and Petroleum;
- Department of Planning;
- Department of Regional Development and Lands;
- Department of State Development;
- Department of Transport;
- Department of Water;
- Fire and Emergency Services Authority;
- Main Roads WA;
- Mid West Development Commission;
- State Heritage Office;

- Telstra;
- Water Corporation; and
- Western Power.

The applicant also undertook direct consultation with an extensive range of government departments and service authorities prior to lodgement of the development application, and this was detailed in Section 2.2 of their submitted development application report. The applicant's prior consultation and the submissions received during the advertising period identified no significant agency concerns with the Warradarge Wind Farm project.

Given that the type, location and scale of the proposed development details, inclusive of its location and scale are unchanged from the previous application, that was previously supported by Council, and approved by the JDAP, and the applicant's request relates merely to the commencement timeframe, the Council of the Shire of Carnamah did not consider that this matter should be re-advertised.

Planning Assessment:

The original application was assessed by the JDAP on 31 August 2012 under Shire of Carnamah Town Planning Scheme No.1. The assessment of the application against the Scheme No.1 criteria is included within Attachment 1 being the 31 August 2012 JDAP Agenda.

Shire of Carnamah Town Planning Scheme No.2 was gazetted on 13 August 2014, subsequent to the JDAP Determination.

It is noted that the zoning of the land subject to this JDAP application remains unchanged, being zoned 'Rural'.

It is further considered that the provisions of Scheme No.2 do not present a substantial departure from those of Scheme No.1 as relevant to this application, and would allow for conditional approval of the application were it to be received now.

Nonetheless an assessment against the relevant provisions of Scheme No.2 is provided below for comparative purposes to the Scheme No.1 assessment contained within Attachment 1.

Shire of Carnamah Town Planning Scheme No.2

Lots 10847 and 10848 are zoned 'Rural' under Shire of Carnamah Town Planning Scheme No.2.

Section 4.2.6 of the Scheme lists the objective for the 'Rural' zone as being:

- “(a) To ensure the continuation of broad-hectare farming as the principal land use in the District and encouraging where appropriate the retention and expansion of agricultural activities.*
- (b) To provide for other primary industries where it can be shown to be of benefit to the district.*
- (c) To consider non-rural uses where they can be shown to be of benefit to the district and not detrimental to the natural resources or the environment.”*

Given that the proposed transmission line would require minimal clearing only (0.7ha) and would not require loss of undue land area from agricultural production for the transmission towers it was not considered that the proposed application was contrary to the objectives for the 'Rural' zone.

The development of transmission line towers would generally be considered to have impact upon the rural appearance of an area, but it should be noted in this instance that the transmission line would effectively be a 'spur' line off the existing Eneabba to Karara 330kV transmission line that runs through this area.

The application, would meet with the definition of a 'Essential Service Utility' which is listed as a 'D' use within the 'Rural' zone under Table 1 of the Scheme, with this being defined as "means that the use is not permitted unless the local government has exercised its discretion by granting planning approval" under Section 4.3.2 of the Scheme.

'Essential Service Utility' is defined by Schedule 1 of the Scheme as follows:

"means any work or undertaking constructed or maintained by a service agency as may be required to provide water, sewerage, electricity, gas, drainage or other similar essential services."

Environmental Protection (Clearing of Native Vegetation) Regulations 2004

The proposed transmission line is estimated to require the clearing of 0.7ha of native vegetation. It is noted that there may be exemption under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* given that the proposed clearing would be under 5 ha and does not impact upon any threatened ecological communities and the alignment has been selected to avoid a Priority 4 species in this area.

Section 5 of the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* addresses the issue of prescribed clearing with Regulation 5 Item 1 as follows:

"Clearing of a site for the lawful construction of a building or other structure on a property, being clearing which does not, together with all other limited clearing on the property in the financial year in which the clearing takes place, exceed 5 ha, if —

- (a) the clearing is to the extent necessary; and*
- (b) the vegetation is not riparian vegetation."*

Officer Comments

It is not considered that there are any significant areas of non-compliance.

It is noted that the issue of the visual appearance of the proposed Warradarge Wind Farm was raised as a source of objection during the original consultation period, although this largely related to the 100 proposed wind turbines within the neighbouring Shire of Coorow rather than segment of associated transmission line within the Shire of Carnamah (the Schedule of Submissions included as Attachment 6 provides further detail on the issues of objection).

Visual Appearance:

The Landscape and Visual Assessment prepared by GHD for the applicant demonstrated that the Warradarge Wind Farm and associated transmission line would not be visible from the Eneabba townsite and would be largely obscured from the Brand Highway. The Visual Assessment does conclude that the visual impact of the Wind Farm will be high within 5km of the site, i.e. the Garibaldi Willis Road and Rose Thomson Road areas, and intervening vegetation and variation in topography will reduce the visibility of the Wind Farm significantly as the radius extends out to 15km, then 25km.

In relation to the specific issue of the proposed transmission line, the Landscape and Visual Assessment demonstrates that its immediate proximity to (and connection into) the existing Eneabba to Karara 330kV transmission line should be a consideration as to the visual impact this specific proposal will have on the surrounding rural landscape. Further the area in which the proposed transmission line would be sited is not specifically identified as a place of scenic value in either the Coorow or Carnamah Town Planning Schemes or strategic level planning documents.

It is considered that the local economic benefits and the wider regional and state benefits to the environment presented by the project, and the analysis provided by the submitted Landscape and Visual Impact Assessment, provide sufficient grounds for approval of the application.

Options/Alternatives

The Shire of Carnamah does not consider that there is a reasonable and fair basis for the refusal of the request for an extension of the timeframe for commencement of the development.

Council Recommendation

The applicant's request dated 1 May 2017 seeking a 5 year extension to the approval period was presented to the meeting of the Shire of Carnamah Council held on 17 May 2017 where it was resolved:

"That Council advise the Development Assessment Panel that it supports the applicant's request for an amendment to Condition 2 of Development Approval DP/12/00624 A2370626 to extend approval for the proposed Warradarge Wind Farm Development for a further 5 years (new commencement date of 31 August 2022)."

Conclusion:

The Shire of Carnamah recommends that condition 2 be amended as follows:

- "2. The approved development shall be substantially commenced prior to 31 August 2022 and if the development is not substantially commenced the approval shall lapse and be of no further effect. Where an approval has so lapsed, no development shall be carried out without the further approval of the responsible authority having first been sought and obtained."



Minutes of the Mid-West Joint Development Assessment Panel

Meeting Date and Time: Friday 31 August 2012, 1:10pm
Meeting Number: M-WJDAP/2
Meeting Venue: Leeman Recreation Centre,
Ruddock Street, Leeman

Attendance

DAP Members

Mr Rory O'Brien (Presiding Member)
Mr Robert Fenn (Deputy Presiding Member)
Mr Patrick Dick (Specialist Member)
Cr Ian Stirling (Local Government member, Shire of Carnamah – Item 8.2)
Cr Jan Waite (Local Government Member, Shire of Coorow – Item 8.1)
Cr Belinda McDonald (Local Government member, Shire of Coorow – Item 8.1)

Officers in attendance

Mr Stephen Ferguson (Department of Planning)
Mr Ron Couacaud (Department of Planning)
Mr Simon Lancaster (Shire of Coorow)
Mr Darren Friend (Shire of Coorow)
Mr David Hadden (Shire of Coorow)

Local Government Minute Secretary

Mrs Kathryn Jackson (Shire of Coorow)

Applicants, Submitters and Members of the Public

Mr James Townsend, Verve Energy (Applicant – Verve Energy)
Ms Linda Hett (Applicant – Verve Energy)
Cr Damien Rackemann (President – Shire of Coorow)
Cr Allan Williams (Shire of Coorow)

1. Declaration of Opening

The Presiding Member, Mr Rory O'Brien declared the meeting open at 1.10pm on Friday 31 August 2012 and acknowledged the past and present traditional owners and custodians of the land on which the meeting was being held.

The Presiding Member announced the meeting would run in accordance with the *Development Assessment Panel Standing Orders 2012* under the *Planning and Development (Development Assessment Panels) Regulations 2011*.

The Presiding Member advised that the meeting is not being audio recorded.



2. Apologies

Cr Merle Isbister (Shire of Carnamah)

3. Members on Leave of absence

Nil.

4. Noting of minutes

The Presiding Member advised that the Minutes of the Mid-West JDAP meeting No.1 held on 18 January 2012 have been confirmed and endorsed.

5. Disclosure of interests

Nil.

6. Declaration of Due Consideration

Members all declared that due consideration had been given to the agenda and supporting documents.

7. Deputations and presentations

7.1. Presenter James Townsend – Verve Energy

James Townsend (Applicant) addressed the DAP for items 8.1 & 8.2.
An overview was given regarding the proposed Warradarge Wind Farm and Transmission Line. The applicant highlighted the consultation that has been undertaken with surrounding landowners and government agencies prior to the lodgement of the application with the Shires of Coorow and Carnamah.

8. Form 1 - Responsible Authority Reports – DAP Applications

8.1	Application Details:	Warradarge Wind Farm
	Property Location:	Lot 10850 and Lot 10853 Garibaldi Willis Road, and Lot 10848 and Lot 10851 Rose Thomson Road, Warradarge
	Applicant:	Verve Energy
	Owners:	Lot 10850 Garibaldi Willis Road and Lots 10848 & 10851 Rose Thomson Road, Warradarge – Judeen Nominees Pty Ltd; and Lot 10853 Garibaldi Willis Road, Warradarge – Gary Marshall Chivers & Vicki Gail Chivers
	Responsible authority:	Shire of Coorow
	Report date:	24 August 2012
	DoP File No:	DP/12/00625



REPORT RECOMMENDATION

That the Mid-West Joint Development Assessment Panel resolves to **Approve** DAP Application reference DP/12/00625 submitted by Verve Energy to develop the Warradarge Wind Farm and 330kV transmission line upon Lots 10850 & 10853 Garibaldi Willis Road and Lots 10848 & 10851 Rose Thomson Road, Warradarge as received by the Shire of Coorow on 6 June 2012 and accompanying plans (WAW-AA-GA-G/001 SH001 through WAW-AA-GA-G/001 SH003, WAW-AA-GA-G/002 SH001, WAW-AA-GA-G/002 SH002, WAW-AA-GA-G/002 SH004, WAW-AA-GA-G/004 SH001, WAW-AA-GA-G/004 SH002, WAW-AA-GA-G/005 SH001, WAW-AA-GA-G/006 SH001, WAW-AA-PR-C/001 SH001 through WAW-AA-PR-C/006 SH001, WAW-AA-PR-S/001 SH001, WAW-SS-PT-E/001 SH001 through WAW-SS-PT-E/003 SH001, WAW-SS-IC-I/001 SH001, WAW-SS-IC-I/002 SH001) in accordance with Part 4 and Section 5.14 of the Shire of Coorow Town Planning Scheme No.2, subject to the following conditions and advice notes:

Conditions of Approval

- 1 The approved development shall be undertaken generally in accordance with the plans and undertakings provided by Verve Energy and forming the Application for Planning Consent unless expressly altered by a condition attached to the approval.
- 2 The approved development shall be substantially commenced within a period of 5 years from the date of this approval and if the development is not substantially commenced the approval shall lapse and be of no further effect. Where an approval has so lapsed, no development shall be carried out without the further approval of the responsible authority having first been sought and obtained.
- 3 The applicant is to prepare, submit and implement a Traffic Management Plan to the satisfaction of Main Roads WA and the Local Government.
- 4 The applicant is to ensure that the location, design and construction of the access point from the development site onto the road network shall be to the satisfaction of the Local Government.
- 5 The applicant is to ensure that the installation of any traffic warning/safety signage in relation to the approved development during the transportation/construction phase shall be to the satisfaction of Main Roads WA and the Local Government.
- 6 Repairing of any damage to the road network including the surface is required by reason of use of the road in connection with the development to the satisfaction of Main Roads WA and the Local Government, with all costs met by the applicant.
- 7 The applicant is to ensure the design, construction (to a minimum compacted gravel standard), drainage and maintenance of the internal roads and vehicle manoeuvring areas required for the approved development shall be to the satisfaction of the Local Government.



- 8 The applicant is to prepare, submit and implement a Noise Management Plan to the satisfaction of the Department of Environment and Conservation and the Local Government.
- 9 The applicant is to prepare, submit and implement a Fire Management Plan to the satisfaction of the Fire and Emergency Services Authority and the Local Government.
- 10 The applicant is to prepare, submit and implement an Environmental Management Plan to the satisfaction of the Department of Environment and Conservation and the Local Government.
- 11 No signs or hoardings are to be erected in relation to the development without the separate approval of the Local Government.
- 12 All lighting devices must be installed and shaded in such a way as to not cause undue light spill to passing motorists or neighbouring residences.

Advice Notes

- (a) In relation to condition 3, prior to commencement of any site works, the applicant is responsible to ensure that the Traffic Management Plan is lodged with the Mid-West Regional Manager of Main Roads WA and the Shire of Coorow for review. The Traffic Management Plan shall incorporate a Traffic Impact assessment for the transportation activities associated with the development and to ensure that intersections and impacts to the road network are addressed. The Traffic Management Plan shall set out in detail the management commitments applicable to traffic relevant to all installations, activities and processes. The Traffic Management Plan shall include if required by Main Roads WA or the Shire of Coorow the identification of any necessary road upgrading, and property access construction and the provision of a dilapidation survey prior to and at the completion of the development with any damage caused to the road network used by transport vehicles accessing the site to be repaired to the requirements of Main Roads WA and the Local Government. Once approved, the applicant from time to time is responsible to ensure, that all installations, activities and processes carried out at all times and in all respects are in accordance with the Traffic Management Plan.
- (b) Main Roads WA advise that permits are required for overweight and oversized vehicles associated with the proposed development.
- (c) Main Roads WA advise that should the proponent undertake any works within the road reserve of its network, the proponent must submit an application to Main Roads WA to undertake works within the road reserve. Applications must conform to the Main Roads WA document titled 'Application Form for Organisations Seeking to Undertake Works within the Road Reserve - High Complexity Works' (application kits are available from the Main Roads' website). No works are to commence within the road reserve until Main Roads WA has approved the proponent's application seeking to undertake works within the road reserve.

Mr Rory O'Brien
Presiding Member, Mid-West Joint DAP



- (d) In relation to condition 8, prior to commencement of any site works, the applicant is responsible to ensure that the Noise Management Plan is lodged with the Department of Environment and Conservation and the Local Government for its review. The Noise Management Plan shall set out in detail the management commitments applicable to noise minimisation relevant to all installations, activities and processes, based on sound level measurements of plant, both individually and in combination. The Noise Management Plan shall take proper account of tonal components, amplitude or frequency modulations or impulses, and the Noise Management Plan shall demonstrate that noise emissions will achieve compliance with the requirements of the South Australian guidelines Environmental Protection Authority – Wind Farms Environmental Noise. Once approved, the applicant from time to time as directed by the Local Government is responsible to ensure, that all installations, activities and processes carried out at all times and in all respects are in accordance with the Noise Management Plan.
- (e) The applicant is to implement and maintain reporting mechanisms and monitoring for noise complaints throughout the duration of the operation of the development. In event of a substantiated complaint being received the applicant is required to demonstrate mitigation responses to the requirements of the Department of Environment and Conservation and the Local Government. Such responses will be treated as required modifications to the Noise Management Plan.
- (f) In relation to condition 9, prior to commencement of any site works, the applicant is responsible to ensure that the Fire Management Plan is lodged with the Fire & Emergency Services Authority and the Local Government for its review. The Fire Management Plan shall address the obtaining of any relevant approvals/licences from the Department of Water, in relation to water abstraction for fire management purposes if necessary.
- (g) In relation to condition 10, prior to commencement of any site works, the applicant is responsible to ensure that the Environmental Management Plan is lodged with the Department of Environment and Conservation and the Local Government for its review. The Environmental Management Plan shall address the following issues:
- Fuel storage, handling and spill response;
 - Weed management;
 - Surface, ground and stormwater management;
 - Waste disposal;
 - Flora and fauna; and
 - Dust suppression and stabilisation of any soils disturbed or deposited on site.
- (h) The applicant is advised that this planning approval does not negate the requirement for any additional approvals which may be required under separate legislation including but not limited to the Building Code of Australia, Building Act 2012, Health Act 1911, Health (Treatment of Sewerage and Disposal of Effluent and Liquid Waste) Regulations 1974, Environmental Protection (Clearing of Native Vegetation) Regulations 2004, Environmental Protection (Noise) Regulation 1997, Traffic Act 2000, Aboriginal Heritage Act 1972 and the obtaining of a works licence from the Department of Environment and Conservation if required. It is the applicant's



responsibility to obtain any additional approvals required before the development/use lawfully commences.

- (i) The discretions listed to the Local Governments, Main Roads WA, Department of Environment and Conservation, and the Fire and Emergency Services Authority under the conditions of approval shall be exercised by those parties in a reasonable manner. Any dispute on conditions may be referred back to the Development Assessment Panel.
- (j) Signs that are required for traffic management and occupational safety and health and as agreed in the Environmental Management Plan, Fire Management Plan, Traffic Management Plan and Noise Management Plan can be erected for use throughout the construction period.
- (k) If the applicant is aggrieved by this determination there is a right (pursuant to the Planning and Development Act 2005) to have the decision reviewed by the State Administrative Tribunal. Such application must be lodged within 28 days from the date of determination.

PRELIMINARY MOTION

Moved by: Mr Robert Fenn

Seconded by: Mr Patrick Dick

That the Mid-West Joint Development Assessment Panel resolves to determine that the DAP Application reference DP/12/00625 submitted by Verve Energy to develop broadacre farming, the Warradarge Wind Farm and 330kV transmission line upon Lots 10850 & 10853 Garibaldi Willis Road and Lots 10848 & 10851 Rose Thomson Road, Warradarge as received by the Shire of Coorow on 6 June 2012 shall be classified as a "Use Not Listed – Broadacre Farming, Warradarge Wind Farm and 330 kV transmission line" pursuant to Section 4.4.2(b) of the Shire of Coorow Town Planning Scheme No. 2.

Reason:

The DAP assumes the role of the Council for the purpose of determining the application and the Scheme requires that the approving authority is required under the scheme to make a determination on whether the subject application should be considered on the basis that it is a use not listed and also whether the activity is a permitted, discretionary or prohibited activity. The Council has completed the processes required by the Scheme on the basis that this application is a discretionary land use activity.

The preliminary motion was put and CARRIED UNANIMOUSLY



Mr Robert Fenn submitted in writing an Alternate Primary Motion to provide further clarity to the Report Recommendation conditions and advice notes.

ALTERNATE PRIMARY MOTION

Moved by: Mr Robert Fenn

Seconded by: Cr Jan Waite

That the Mid-West Joint Development Assessment Panel resolves to Approve DAP Application reference DP/12/00625 submitted by Verve Energy to develop broadacre farming, the Warradarge Wind Farm and 330kV transmission line upon Lots 10850 & 10853 Garibaldi Willis Road and Lots 10848 & 10851 Rose Thomson Road, Warradarge as received by the Shire of Coorow on 6 June 2012 and accompanying plans (WAW-AA-GA-G/001 SH001 through WAW-AA-GA-G/001 SH003, WAW-AA-GA-G/002 SH001, WAW-AA-GA-G/002 SH002, WAW-AA-GA-G/002 SH004, WAW-AA-GA-G/004 SH001, WAW-AA-GA-G/004 SH002, WAW-AA-GA-G/005 SH001, WAW-AA-GA-G/006 SH001, WAW-AA-PR-C/001 SH001 through WAW-AA-PR-C/006 SH001, WAW-AA-PR-S/001 SH001, WAW-SS-PT-E/001 SH001 through WAW-SS-PT-E/003 SH001, WAW-SS-IC-I/001 SH001, WAW-SS-IC-I/002 SH001) in accordance with Part 4 and Section 5.14 of the Shire of Coorow Town Planning Scheme No.2, subject to the following conditions and advice notes:

Conditions of Approval

1. The approved development shall be undertaken generally in accordance with the plans and undertakings provided by Verve Energy and forming the Application for Planning Consent unless expressly altered by a condition attached to the approval.
2. The approved development shall be substantially commenced within a period of 5 years from the date of this approval and if the development is not substantially commenced the approval shall lapse and be of no further effect. Where an approval has so lapsed, no development shall be carried out without the further approval of the Shire of Coorow having first being sought and obtained.
3. The applicant is to prepare, submit and implement a Traffic Management Plan to the satisfaction of the Shire of Coorow.
4. The applicant is to ensure that the location, design and construction of the access point from the development site onto the road network is appropriate for the approved development and the access point shall be constructed by and at the expense of the Applicant to the satisfaction of the Shire of Coorow.
5. The applicant shall at the applicant's cost repair, reinstate or replace any local road infrastructure under the control of the Shire of Coorow and to the satisfaction of the Shire of Coorow that is damaged, becomes unsafe or fails to meet appropriate engineering standards where the damage to the road network is caused by reason of use of the road in connection with the approved development.



6. The approved development shall for the duration of the approved use comply with the Environmental Protection (Noise) Regulations 1997 and no turbine shall be erected on-site which has the potential to impact on noise sensitive premises (either existing or possible) located external to the site, unless the applicant has negotiated secure tenure arrangements with the owner of the existing or potential premise and that tenure applies to the entire period that the relevant turbine is located on the site.
7. The applicant is to prepare, submit and implement a Fire Management Plan to the satisfaction of the Shire of Coorow.
8. The Applicant is to prepare, submit and implement an Environmental Management Plan to the satisfaction of the Shire of Coorow.
9. No signs or hoardings are to be erected in relation to the development without the separate approval of the Shire of Coorow.
10. All lighting devices shall be installed and shaded in such a way as to not cause undue light spill to passing motorists or neighbouring residences.
11. The applicant shall prepare, submit and implement a water management plan for the site to the satisfaction of the Shire of Coorow.
12. The applicant shall upon the decommissioning of the approved Warradarge Wind Farm development (in all or part) remove and dispose of all decommissioned structures from the site to the satisfaction of the Shire of Coorow

Advice Notes:

- A. In relation to condition 3, and prior to the commencement of any site works, the applicant is advised that the Shire of Coorow shall seek advice and comment on the Traffic Management Plan from the Mid-West Regional Manager of Main Roads WA. The Traffic Management Plan shall:
 - i. Incorporate a Traffic Impact Assessment for the transportation activities associated with the development and to ensure the intersections and impacts to the road network are addressed.
 - ii. Set out in detail the management commitments applicable to traffic relevant to all installations, activities and processes.
 - iii. Include if required by Main Roads WA or the Shire of Coorow the identification of any necessary road upgrading, and property access construction and
 - iv. Include the provision of a dilapidation survey prior to and at the completion of the development with any damage caused to the road network used by transport vehicles accessing the site to be repaired to the requirements of Main Roads WA and the Shire of Coorow.

Once approved, the Applicant is responsible to ensure that all installations, activities and processes carried out at all times and in all respects are in accordance with the Traffic Management Plan.



- B. Main Roads WA advises that permits are required for overweight and oversized vehicles associates with the proposed development.
- C. Main Roads WA advise that, should the proponent undertake any works within the road reserve of its network, the proponent must submit an application to Main Roads WA. No works are to commence within the road reserve until Main Roads WA has approved the application seeking to undertake works within the road reserve.
- D. In relation to condition 6 and prior to commencement of any site works, the applicant is encouraged to submit a Noise Management Plan with the Department of Environment and Conservation and the Shire of Coorow for review. The Noise Management Plan should set out in detail the management commitments applicable to noise minimisation relevant to all installations, activities and processes on-site to ensure the noise emissions will achieve compliance with the requirements of the South Australian guidelines Environmental Protection Authority – Wind Farms Environmental Noise.
- E. In relation to condition 7, prior to commencement of any site works, the applicant is responsible to ensure that the Fire Management Plan is lodged with the Fire and Emergency Management Authority and the Shire of Coorow for review and the actions recommended in the Plan are implemented. Any relevant approvals / licences required from the Department of Water, in relation to water extraction for fire management purposes shall be secured by the applicant.
- F. In relation to condition 8, prior to commencement of any site works, the applicant is responsible to ensure that the Environmental Management Plan is lodged with the Department of Environment and Conservation and the Shire of Coorow for its review. The Environmental Management Plan shall address the following issues:
- Fuel storage, handling and spill response,
 - Weed management,
 - Extraction of any road making materials from within the site and the rehabilitation of the excavation area to a suitable end use,
 - Integration of the broadacre farming activities on-site with the wind farm operations,
 - Surface, ground and storm water management,
 - Waste disposal,
 - Flora and fauna, and
 - Dust suppression and stabilisation of any soils disturbed or deposited on site
- G. The applicant is advised that this planning approval does not negate the requirement for any additional approvals which may be required under separate legislation, including but not limited to the Building Act 2012, Health Act 1911, Health (Treatment of Sewerage and Disposal of Effluent and Liquid Waste) Regulations 1974, Environmental Protection (Clearing of Native Vegetation) Regulations 2004, Environmental Protection (Noise) Regulations 1997, Traffic Act 2000, Aboriginal Heritage Act 1972 and the obtaining of a works licence from the Department of Environment and



Conservation if required. It is the applicant's responsibility to obtain any additional approvals required before the development / use lawfully commences.

- H. The discretions listed to the Local Government, Main Roads WA, Department of Environment and Conservation, and the Fire and Emergency Services Authority under the conditions of approval shall be exercised by those parties in a reasonable manner. If the applicant is aggrieved by a condition attached to the approval, the applicant can apply to have that condition reviewed pursuant to Regulation 17(1) of the *Planning and Development (Development Assessment Panels) Regulations 2011*.
- I. In regards to Condition 9, signs that are required for traffic management and occupational safety and health and as detailed in the Environmental Management Plan, Traffic Management Plan can be erected for use throughout the construction period.
- J. If the applicant is aggrieved by this determination there is a right (pursuant to the Planning and Development Act 2005) to have the decision reviewed by the State Administrative Tribunal. Such application must be lodged within 28 days from the date of determination.

AMENDING MOTION

Moved by: Mr Patrick Dick

Seconded By: Cr Belinda McDonald

That condition 6 of the Primary Motion be amended to read:

"The approved development shall for the duration of the approved use comply with the Environmental Protection (Noise) Regulations 1997."

Reason: To clarify the development approval conditions.

The motion was put and CARRIED UNANIMOUSLY

AMENDING MOTION

Moved by: Mr Patrick Dick

Seconded By: Cr Jan Waite

That condition 12 of the Primary Motion be amended to read:

"The applicant shall upon the decommissioning of the approved Warradarge Wind Farm development (in all or part) remove and dispose of all decommissioned structures located above ground from the site to the satisfaction of the Shire of Coorow."

Reason: To clarify the development approval conditions.

The motion was put and CARRIED UNANIMOUSLY



ALTERNATE PRIMARY MOTION (AS AMENDED)

That the Mid-West Joint Development Assessment Panel resolves to Approve DAP Application reference DP/12/00625 submitted by Verve Energy to develop broadacre farming, the Warradarge Wind Farm and 330kV transmission line upon Lots 10850 & 10853 Garibaldi Willis Road and Lots 10848 & 10851 Rose Thomson Road, Warradarge as received by the Shire of Coorow on 6 June 2012 and accompanying plans (WAW-AA-GA-G/001 SH001 through WAW-AA-GA-G/001 SH003, WAW-AA-GA-G/002 SH001, WAW-AA-GA-G/002 SH002, WAW-AA-GA-G/002 SH004, WAW-AA-GA-G/004 SH001, WAW-AA-GA-G/004 SH002, WAW-AA-GA-G/005 SH001, WAW-AA-GA-G/006 SH001, WAW-AA-PR-C/001 SH001 through WAW-AA-PR-C/006 SH001, WAW-AA-PR-S/001 SH001, WAW-SS-PT-E/001 SH001 through WAW-SS-PT-E/003 SH001, WAW-SS-IC-I/001 SH001, WAW-SS-IC-I/002 SH001) in accordance with Part 4 and Section 5.14 of the Shire of Coorow Town Planning Scheme No.2, subject to the following conditions and advice notes:

Conditions of Approval

1. The approved development shall be undertaken generally in accordance with the plans and undertakings provided by Verve Energy and forming the Application for Planning Consent unless expressly altered by a condition attached to the approval.
2. The approved development shall be substantially commenced within a period of 5 years from the date of this approval and if the development is not substantially commenced the approval shall lapse and be of no further effect. Where an approval has so lapsed, no development shall be carried out without the further approval of the Shire of Coorow having first being sought and obtained.
3. The applicant is to prepare, submit and implement a Traffic Management Plan to the satisfaction of the Shire of Coorow.
4. The applicant is to ensure that the location, design and construction of the access point from the development site onto the road network is appropriate for the approved development and the access point shall be constructed by and at the expense of the Applicant to the satisfaction of the Shire of Coorow.
5. The applicant shall at the applicant's cost repair, reinstate or replace any local road infrastructure under the control of the Shire of Coorow and to the satisfaction of the Shire of Coorow that is damaged, becomes unsafe or fails to meet appropriate engineering standards where the damage to the road network is caused by reason of use of the road in connection with the approved development.
6. The approved development shall for the duration of the approved use comply with the Environmental Protection (Noise) Regulations 1997.
7. The applicant is to prepare, submit and implement a Fire Management Plan to the satisfaction of the Shire of Coorow.



8. The Applicant is to prepare, submit and implement an Environmental Management Plan to the satisfaction of the Shire of Coorow.
9. No signs or hoardings are to be erected in relation to the development without the separate approval of the Shire of Coorow.
10. All lighting devices shall be installed and shaded in such a way as to not cause undue light spill to passing motorists or neighbouring residences.
11. The applicant shall prepare, submit and implement a water management plan for the site to the satisfaction of the Shire of Coorow.
12. The applicant shall upon the decommissioning of the approved Warradarge Wind Farm development (in all or part) remove and dispose of all decommissioned structures located above ground from the site to the satisfaction of the Shire of Coorow

Advice Notes:

- A. In relation to condition 3, and prior to the commencement of any site works, the applicant is advised that the Shire of Coorow shall seek advice and comment on the Traffic Management Plan from the Mid-West Regional Manager of Main Roads WA. The Traffic Management Plan shall:
 - i. Incorporate a Traffic Impact Assessment for the transportation activities associated with the development and to ensure the intersections and impacts to the road network are addressed.
 - ii. Set out in detail the management commitments applicable to traffic relevant to all installations, activities and processes.
 - iii. Include if required by Main Roads WA or the Shire of Coorow the identification of any necessary road upgrading, and property access construction and
 - iv. Include the provision of a dilapidation survey prior to and at the completion of the development with any damage caused to the road network used by transport vehicles accessing the site to be repaired to the requirements of Main Roads WA and the Shire of Coorow.

Once approved, the Applicant is responsible to ensure that all installations, activities and processes carried out at all times and in all respects are in accordance with the Traffic Management Plan.

- B. Main Roads WA advises that permits are required for overweight and oversized vehicles associates with the proposed development.
- C. Main Roads WA advise that, should the proponent undertake any works within the road reserve of its network, the proponent must submit an application to Main Roads WA. No works are to commence within the road reserve until Main Roads WA has approved the application seeking to undertake works within the road reserve.



- D. In relation to condition 6 and prior to commencement of any site works, the applicant is encouraged to submit a Noise Management Plan with the Department of Environment and Conservation and the Shire of Coorow for review. The Noise Management Plan should set out in detail the management commitments applicable to noise minimisation relevant to all installations, activities and processes on-site to ensure the noise emissions will achieve compliance with the requirements of the South Australian guidelines Environmental Protection Authority – Wind Farms Environmental Noise.
- E. In relation to condition 7, prior to commencement of any site works, the applicant is responsible to ensure that the Fire Management Plan is lodged with the Fire and Emergency Management Authority and the Shire of Coorow for review and the actions recommended in the Plan are implemented. Any relevant approvals / licences required from the Department of Water, in relation to water extraction for fire management purposes shall be secured by the applicant.
- F. In relation to condition 8, prior to commencement of any site works, the applicant is responsible to ensure that the Environmental Management Plan is lodged with the Department of Environment and Conservation and the Shire of Coorow for its review. The Environmental Management Plan shall address the following issues:
- Fuel storage, handling and spill response,
 - Weed management,
 - Extraction of any road making materials from within the site and the rehabilitation of the excavation area to a suitable end use,
 - Integration of the broadacre farming activities on-site with the wind farm operations,
 - Surface, ground and storm water management,
 - Waste disposal,
 - Flora and fauna, and
 - Dust suppression and stabilisation of any soils disturbed or deposited on site
- G. The applicant is advised that this planning approval does not negate the requirement for any additional approvals which may be required under separate legislation, including but not limited to the Building Act 2012, Health Act 1911, Health (Treatment of Sewerage and Disposal of Effluent and Liquid Waste) Regulations 1974, Environmental Protection (Clearing of Native Vegetation) Regulations 2004, Environmental Protection (Noise) Regulations 1997, Traffic Act 2000, Aboriginal Heritage Act 1972 and the obtaining of a works licence from the Department of Environment and Conservation if required. It is the applicant's responsibility to obtain any additional approvals required before the development / use lawfully commences.



- H. The discretions listed to the Local Government, Main Roads WA, Department of Environment and Conservation, and the Fire and Emergency Services Authority under the conditions of approval shall be exercised by those parties in a reasonable manner. If the applicant is aggrieved by a condition attached to the approval, the applicant can apply to have that condition reviewed pursuant to Regulation 17(1) of the *Planning and Development (Development Assessment Panels) Regulations 2011*.
- I. In regards to Condition 9, signs that are required for traffic management and occupational safety and health and as detailed in the Environmental Management Plan, Traffic Management Plan and be erected for use throughout the construction period.
- J. If the applicant is aggrieved by this determination there is a right (pursuant to the Planning and Development Act 2005) to have the decision reviewed by the State Administrative Tribunal. Such application must be lodged within 28 days from the date of determination.

The motion was put and CARRIED UNANIMOUSLY

A handwritten signature in dark ink, reading "R. O'Brien".



8.2 Application Details: Warradarge Wind Farm Transmission Line
 Property Location: Lot 10847 and Lot 10848 Rose Thomson
 Road,
 Warradarge
 Applicant: Verve Energy
 Owner: Judeen Nominees Pty Ltd
 Responsible authority: Shire of Carnamah
 Report date: 24 August 2012
 DoP File No: DP/12/00624

REPORT RECOMMENDATION

That the Mid-West Joint Development Assessment Panel resolves to Approve DAP Application reference DP/12/00624 submitted by Verve Energy to develop the Warradarge Wind Farm 330kV transmission line upon Lots 10847 & 10848 Rose Thomson Road, Warradarge as received by the Shire of Carnamah on 6 June 2012 and accompanying plans (WAW-AA-GA-G/001 SH001, WAW-AA-GA-G/001 SH002, WAW-AA-GA-G/002 SH001, WAW-AA-GA-G/002 SH004, WAW-AA-GA-G/005 SH001, WAW-SS-PT-E/001 SH001) in accordance with Section 3.3.5(b) of the Shire of Carnamah Town Planning Scheme No.1, subject to the following conditions and advice notes:

Conditions of Approval

- 1 The approved development shall be undertaken generally in accordance with the plans and undertakings provided by Verve Energy and forming the Application for Planning Consent unless expressly altered by a condition attached to the approval.
- 2 The approved development shall be substantially commenced within a period of 5 years from the date of this approval and if the development is not substantially commenced the approval shall lapse and be of no further effect. Where an approval has so lapsed, no development shall be carried out without the further approval of the responsible authority having first been sought and obtained.
- 3 In the event that the proposed development requires the use of any roads under the management of the Shire of Carnamah the applicant is required to undertake the following at their expense to the satisfaction of the Shire of Carnamah:
 - 3.1 Prepare, submit and implement a Traffic Management Plan to the satisfaction of the Shire of Carnamah;
 - 3.2 Ensure that the location, design and construction of the access point from the development site onto the road network shall be to the satisfaction of the Shire of Carnamah;
 - 3.3 Ensure that the installation of any traffic warning/safety signage in relation to the approved development during the transportation and construction phases shall be to the satisfaction of the Shire of Carnamah;



- 3.4 Repairing of any damage to the road network including the surface is required by reason of use of the road in connection with the development to the satisfaction of the Shire of Carnamah;
- 3.5 No signs or hoardings are to be erected on the entrance to the development without the separate approval of the Local Government.
- 4 The applicant is to prepare, submit and implement a Fire Management Plan to the satisfaction of the Fire and Emergency Services Authority and the Local Government.
- 5 All lighting devices must be installed and shaded in such a way as to not cause undue light spill to passing motorists or neighbouring residences.

Advice Notes

- (a) In relation to condition 3 (if required), prior to commencement of any site works, the applicant is responsible to ensure that the Traffic Management Plan is lodged with the Shire of Carnamah for review. The Traffic Management Plan shall incorporate a Traffic Impact assessment for the transportation activities associated with the development and to ensure that intersections and impacts to the road network are addressed. The Traffic Management Plan shall set out in detail the management commitments applicable to traffic relevant to all installations, activities and processes. The Traffic Management Plan shall include if required by the Shire of Carnamah the identification of any necessary road upgrading, and property access construction and the provision of a dilapidation survey prior to and at the completion of the development with any damage caused to the road network used by transport vehicles accessing the site to be repaired to the requirements of the Shire of Carnamah. Once approved, the applicant from time to time is responsible to ensure, that all installations, activities and processes carried out at all times and in all respects are in accordance with the Traffic Management Plan.
- (b) In relation to condition 4, prior to commencement of any site works, the applicant is responsible to ensure that the Fire Management Plan is lodged with the Fire & Emergency Services Authority and the Local Government for its review. The Fire Management Plan shall address the obtaining of any relevant approvals/licences from the Department of Water, in relation to water abstraction for fire management purposes if necessary.
- (c) The applicant is advised that this planning approval does not negate the requirement for any additional approvals which may be required under separate legislation including but not limited to the Building Code of Australia, *Building Act 2012*, *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*, *Environmental Protection (Noise) Regulation 1997*, *Traffic Act 2000*, *Aboriginal Heritage Act 1972* and the obtaining of a works licence from the Department of Environment and Conservation if required. It is the applicant's responsibility to obtain any additional approvals required before the development/use lawfully commences.
- (d) The discretions listed to the Shire of Carnamah and the Fire and Emergency Services Authority under the conditions of approval shall be exercised by



those parties in a reasonable manner. Any dispute on conditions may be referred back to the Development Assessment Panel.

- (e) In relation to condition 3.5 (if required), signs that are required for traffic management and occupational safety and health and as agreed in the Environmental Management Plan, Traffic Management Plan, and Noise Management Plan can be erected for use throughout the construction period.
- (f) If the applicant is aggrieved by this determination there is a right (pursuant to the *Planning and Development Act 2005*) to have the decision reviewed by the State Administrative Tribunal. Such application must be lodged within 28 days from the date of determination.

PRELIMINARY MOTION

Moved By: Mr Robert Fenn Seconded By: Cr Ian Stirling

That the Mid-West Joint Development Assessment Panel resolves to determine that the DAP Application reference DP/12/00624 submitted by Verve Energy to develop broadacre farming and 330kV transmission line upon Lots 10874 & 10848 Rose Thomson Road, Warradarge as received by the Shire of Carnamah on 6 June 2012 shall be classified as a "Use Not Listed – Broadacre Farming and 330 kV transmission line" pursuant to Section 3.3.5(b) of the Shire of Carnamah Town Planning Scheme No. 1.

Reason: The DAP assumes the role of the Council for the purpose of determining the application and the Scheme requires that the responsible authority is required under the scheme to make a determination on whether the subject application should be considered on the basis that it is a use not listed and also whether the activity is a discretionary or prohibited activity. The Shire of Carnamah has completed the processes required by the Scheme on the basis that this application is a discretionary land use activity.

The preliminary motion was put and CARRIED UNANIMOUSLY

Mr Robert Fenn submitted in writing an Alternate Primary Motion to provide further clarity to the Report Recommendation conditions and advice notes.

ALTERNATE PRIMARY MOTION

Moved by: Mr Robert Fenn Seconded By: Mr Patrick Dick

That the Mid-West Joint Development Assessment Panel resolves to Approve DAP Application reference DP12/00624 submitted by Verve Energy to develop broadacre farming and 330kV transmission line upon Lots 10847 & 10848 Rose Thomson Road, Warradarge as received by the Shire of Carnamah on 6 June 2012 and accompanying plans (WAW-AA-GA-G/001 SH001, WAW-AA-GA-G/001 SH002, WAW-AA-GA-G/002 SH001, WAW-AA-GA-G/002 SH004, WAW-AA-GA-G/005 SH001, WAW-SS-PT-E/001 SH001) in accordance with Section 3.3.5(b) of the Shire of Carnamah Town Planning Scheme No.1, subject to the following conditions and advice notes:



Conditions of Approval

1. The approved development shall be undertaken generally in accordance with the plans and undertakings provided by Verve Energy and forming the Application for Planning Consent unless expressly altered by a condition attached to the approval.
2. The approved development shall be substantially commenced within a period of 5 years from the date of this approval and if the development is not substantially commenced the approval shall lapse and be of no further effect. Where an approval has so lapsed, no development shall be carried out without the further approval of the Council having first being sought and obtained.
3. The applicant is to prepare, submit and implement a Fire Management Plan to the satisfaction of the Council.
4. All lighting devices shall be installed and shaded in such a way as to not cause undue light spill to passing motorists or neighbouring residences
5. The applicant is to prepare, submit and implement a Traffic Management Plan to the satisfaction of the Council.
6. The applicant is to ensure that the location, design and construction of the access point from the development site onto the road network is appropriate for the approved development and the access point shall be constructed by and at the expense of the Applicant to the satisfaction of the Council.
7. The applicant shall at the applicant's cost repair, reinstate or replace any local road infrastructure under the control of the Shire of Carnamah and to the satisfaction of the Council that is damaged, becomes unsafe or fails to meet appropriate engineering standards where the damage to the road network is caused by reason of use of the road in connection with the approved development.
8. No signs or hoardings are to be erected in relation to the development without the separate approval of the Council.
9. The applicant shall prepare, submit and implement a water management plan for the site to the satisfaction of the Council.

Advice Notes:

- A. In relation to condition 3, prior to commencement of any site works, the applicant is responsible to ensure that the Fire Management Plan is lodged with the Fire and Emergency Management Authority and the Council for review and the actions recommended in the Plan are implemented. Any relevant approvals / licences required from the Department of Water, in relation to water extraction for fire management purposes shall be secured by the applicant.
- B. In relation to condition 5 and prior to the commencement of any site works, the applicant is advised that the Council shall seek advice and comment on



the Traffic Management Plan from the Mid-West Regional Manager of Main Roads WA. The Traffic Management Plan shall:

- i. Incorporate a Traffic Impact Assessment for the transportation activities associated with the development and to ensure the intersections and impacts to the road network are addressed.
- ii. Set out in detail the management commitments applicable to traffic relevant to all installations, activities and processes.
- iii. Include if required by Main Roads WA or the Shire of Carnamah the identification of any necessary road upgrading, and property access construction and
- iv. Include the provision of a dilapidation survey prior to and at the completion of the development with any damage caused to the road network used by transport vehicles accessing the site to be repaired to the requirements of Main Roads WA and the Council.

Once approved, the Applicant is responsible to ensure that all installations, activities and processes carried out at all times and in all respects are in accordance with the Traffic Management Plan.

- C. In regards to Condition 8, signs that are required for traffic management and occupational safety and health and as detailed in the Traffic Management Plan can be erected for use throughout the construction period.
- D. The applicant is advised that this planning approval does not negate the requirement for any additional approvals which may be required under separate legislation, including but not limited to the Building Act 2012, Health Act 1911, Health (Treatment of Sewerage and Disposal of Effluent and Liquid Waste) Regulations 1974, Environmental Protection (Clearing of Native Vegetation) Regulations 2004, Environmental Protection (Noise) Regulations 1997, Traffic Act 2000, Aboriginal Heritage Act 1972 and the obtaining of a works licence from the Department of Environment and Conservation if required. It is the applicant's responsibility to obtain any additional approvals required before the development / use lawfully commences.
- E. The discretions listed to the Council, Main Roads WA and the Fire and Emergency Services Authority under the conditions of approval shall be exercised by those parties in a reasonable manner. If the applicant is aggrieved by a condition attached to the approval, the applicant can apply to have that condition reviewed pursuant to Regulation 17(1) of the *Planning and Development (Development Assessment Panels) Regulations 2011*.
- F. If the applicant is aggrieved by this determination there is a right (pursuant to the Planning and Development Act 2005) to have the decision reviewed by the State Administrative Tribunal. Such application must be lodged within 28 days from the date of determination.

The motion was put and CARRIED UNANIMOUSLY



9. Form 2 – Responsible Authority Reports - Amending or cancelling DAP development approval

Nil

10. Appeals to the State Administrative Tribunal

Nil

11. Meeting Close

There being no further business, the presiding member declared the meeting closed at 2.46pm.

A handwritten signature in black ink, reading "R. O'Brien".



Mid-West Joint Development Assessment Panel Agenda

Meeting Date and Time: Friday 31 August 2012, 1:00pm
Meeting Number: M-WJDAP/2
Meeting Venue: Leeman Recreation Centre
Rudduck Street, Leeman

Attendance

DAP Members

Mr Rory O'Brien (Presiding Member)
Mr Robert Fenn (Deputy Presiding Member)
Mr Patrick Dick (Specialist Member)
Cr Ian Stirling (Local Government member, Shire of Carnamah)
Cr Jan Waite (Local Government Member, Shire of Coorow)
Cr Belinda McDonald (Local Government member, Shire of Coorow)

Officers in attendance

Mr Stephen Ferguson (Department of Planning)
Mr Ron Couacaud (Department of Planning)
Mr Simon Lancaster (Shire of Chapman Valley)
Mr James Townsend (Verve Energy)

Local Government Minute Secretary

Mr David Hadden (Shire of Coorow)

1. Declaration of Opening

The Presiding Member declares the meeting open and acknowledges the past and present traditional owners and custodians of the land on which the meeting is being held.

2. Apologies

Cr Merle Isbister (Shire of Carnamah)

3. Members on Leave of Absence

Nil

4. Noting of Minutes

Note the minutes of the Mid-West JDAP meeting no.1 held on the 18 January 2012.

5. Disclosure of Interests

Nil

6. Declarations of Due Consideration

Any member who is not familiar with the substance of any report or other information provided for consideration at the DAP meeting must declare that fact before the meeting considers the matter.

7. Deputations and Presentations

Nil

8. Form 1 - Responsible Authority Reports – DAP Application/s

- 8.1** Application Details: Warradarge Wind Farm
 Property Location: Lot 10850 and Lot 10853 Garibaldi Willis Road,
 and Lot 10848 and Lot 10851 Rose Thomson
 Road, Warradarge
 Applicant: Verve Energy
 Owner/s: Lot 10850 Garibaldi Willis Road and Lots 10848
 & 10851 Rose Thomson Road, Warradarge –
 Judeen Nominees Pty Ltd; and
 Lot 10853 Garibaldi Willis Road, Warradarge –
 Gary Marshall Chivers & Vicki Gail Chivers
 Responsible authority: Shire of Coorow
 Report date: 24 August 2012
 DoP File No: DP/12/00625
- 8.2** Application Details: Warradarge Wind Farm Transmission Line
 Property Location: Lot 10847 and Lot 10848 Rose Thomson Road,
 Warradarge
 Applicant: Verve Energy
 Owner: Judeen Nominees Pty Ltd
 Responsible authority: Shire of Carnamah
 Report date: 24 August 2012
 DoP File No: DP/12/00624

9. Form 2 – Responsible Authority Reports - Amending or cancelling DAP development approval

Nil

10. Appeals to the State Administrative Tribunal

Nil

11. Meeting Closure



Minutes of the Mid-West Joint Development Assessment Panel

Meeting Date and Time: Wednesday 18 January 2012, 1.00pm
Meeting Number: MWDAP 1
Meeting Venue: Geraldton Regional Library (Randolph Stow Room 1) 37 Marine Terrace, Geraldton.

Attendance

Members

Mr R O'Brien (Presiding Member)
Mr R Fenn (Deputy Presiding Member)
Mr T Tyzack (Alternate Specialist Member)
Ms A Treloar (Shire of Three Springs Local Government Member)
Mr N Hebiton (Shire of Three Springs Local Government Member)

Officers in Attendance

Ms Sue Burrows (Department of Planning)
Mr Steve Ferguson (Department of Planning)

Local Government Minute Secretary

Mr T Brandy (Shire of Three Springs)

Applicant(s), Submitters and Members of the Public

Mr T Peterson (Director of ERM Power Ltd)
Mr T Brandy (Shire of Three Springs)
Members of the Public - 5

1. Declaration of Opening

The Presiding Member, Mr R O'Brien declared the meeting open at 1.00 pm and introduced and welcomed the DAP Members. The Presiding Member also acknowledged the past and present traditional owners and custodians of the land on which the meeting was being held.

The Presiding Member noted that the meeting would be conducted in accordance with Standing Orders and a Code of Conduct under the Planning and Development (Development Assessment Panels) Regulations 2011.

2. Apologies

Mr C Jackson (CEO, Shire of Three Springs)

3. Members on Leave of Absence



Specialist Panel member, Mr P Dick had been granted leave of absence by the Minister.

4. Noting of Minutes

Nil

5. Disclosure of Interests

Nil

6. Deputations and Presentations

6.1. Presenter Mr T Peterson, ERM Power Limited.

Mr Peterson gave a brief overview of the proposal to the DAPs members and offered to answer any questions from the members.

7. Responsible Authority Report

7.1	Application Details:	ERM Power Ltd Gas Fired Power Station Project, Three Springs
	Property Location:	Lot 25 Vol 2748, Folio 670 Perenjori/Three Springs Road, Womarden.
	Applicant:	ERM Power Ltd
	Owner of Property:	ERM Power Ltd (pending Subdivision
	Responsible authority:	Shire of Three Springs
	Report date:	08 January 2011
	DoP File No:	ADM 0086

RECOMMENDATION

Moved: Ms A Treloar

Seconded: Mr N Hebiton

That the Mid-West Joint Development Assessment Panel resolves to:

1. Approve DAP Application reference No 1 for ERM Power Ltd to commence development of a gas fired power and accompanying plans of the Shire of Three Springs Planning Scheme No 1, subject to the following conditions/for the following reasons as follows:

- a) Development must be carried out in accordance with the plans submitted on the 14th of October 2011
- b) Insert advice notes (if any)

2. Advises the applicant and the Shire of Three Springs of its decision accordingly.

Mr R Fenn proposed the following amending motion.

Reason – The recommendation as proposed does not have any conditions. To provide appropriate planning control, conditions pertaining to the development are proposed to be included in the approval decision.

Moved: Mr R Fenn Mr T Tyzack



Motion:

THAT the application lodged by ERM Power Ltd to commence development and construct a “Gas Fired Power Station” upon portion of Lot 25 Perenjori Three Springs Road, Womarden (proposed Lots 1 and 2 on the WAPC subdivision application) be granted Planning Scheme Consent, subject to the following conditions:

- 1. The proposed development shall be undertaken generally in accordance with the plans and undertakings provided by ERM Power Ltd and forming the Application for Planning Scheme Consent, unless expressly altered by a condition attached to this approval notice.***
- 2. The approved development shall be substantially commenced within a period of 2 years of the date of this determination and if development is not substantially commenced the approval shall lapse and be of no further effect.***
- 3. The outer wall surfaces of steel components on the proposed buildings and structures shall be covered in a factory applied non-reflective finish and exclude zincalume, to the satisfaction of the Shire of Three Springs.***
- 4. Subject to operational restrictions, a dense planting of shrubs and trees shall be provided along the northern and eastern boundaries of proposed lot 2 to screen the site from the Perenjori Three Springs Road.***
- 5. Security lighting shall be installed and shaded on-site to prevent light spill from the development site or light penetration towards vehicles using the Perenjori Three Springs Road.***
- 6. The internal access roads and car parking areas shall be sealed, drained and appropriately line marked and sign posted.***
- 7. The entrance driveway from the Perenjori Three Springs Road to the site shall be appropriately located to meet traffic-engineering standards and, if required, appropriate road widenings shall be undertaken or advance warning signs shall be erected on the Perenjori Three Springs Road at the developer’s expense.***
- 8. The developer shall provide a water management plan for the subject development to the satisfaction of the Shire of Three Springs, promoting the retention of stormwater on-site and the controlled disposed of excess runoff water into the local environment.***

Advice Notes:



- A. *This approval does not remove the requirement for the developer to obtain the requisite approvals from the authorising agencies under the Environmental Protection Act 1986, the Petroleum Pipeline Act 1969, the Rights in Water and Irrigation Act 1914, the Aboriginal Heritage Act 2004, the Environmental Protection (Clearing of Native Vegetation) Regulations 2004 and the Dangerous Goods Safety Act 2004.*
- B. *This approval does not provide an approval for the construction of a water supply or gas pipeline to the site, nor does it address any planning issues that may arise from the impact of a potential water supply or gas pipeline on existing or proposed land uses or developments external to the approved development site.*
- C. *In regards to condition 3, it is recommended that the developer use earth toned coloured finishes on buildings and utilised hot dip galvanising or painted finishes on external structural components associated with the proposed development.*
- D. *In regards to condition 4, the perimeter landscaping should seek to create a vegetated border to a height exceeding three metres and all planted shrubs and trees shall be maintained to ensure they achieve maturity, with diseased or dead plants being replaced.*
- E. *In regards to condition 8, no drainage from the proposed development shall be discharged onto the Perenjori Three Springs Road and the proposed water management pond shall be appropriately engineered to retain all treatment water on-site.*
- F. *The approval assumes that treatment water will be sourced below the site in accordance with a permit issued by the Department of Water and this approval does not extend to any works associated with sourcing treatment water on an external site.*
- G. *The approval assumes that the WA Planning Commission grants subdivision approval for the excision of proposed lots 1 and 2 from Lot 25 and that all development will be contained within proposed lots 1 and 2.*

The amended motion was put to the vote;

Carried unanimously.

The Primary motion as amended was then put to the vote.

Carried unanimously

8. Amending or cancelling DAP development approval

Nil

9. Appeals to the State Administrative Tribunal

Nil



10. Meeting Close

There being no further business, the Presiding Member declared the meeting closed at 1.25 pm.

A handwritten signature in black ink that reads "R. O'Brien".

Rory J O'Brien
Presiding Member Mid-West JDAP
3 February 2012



Form 1 - Responsible Authority Report

(Regulation 12)

Application Details:	Warradarge Wind Farm
Property Location:	Lots 10850 & 10853 Garibaldi Willis Road and Lots 10848 & 10851 Rose Thomson Road, Warradarge
DAP Name:	Mid West Joint Development Assessment Panel
Applicant:	Verve Energy
Owner:	Lot 10850 Garibaldi Willis Road and Lots 10848 & 10851 Rose Thomson Road, Warradarge – Judeen Nominees Pty Ltd Lot 10853 Garibaldi Willis Road, Warradarge – Gary Marshall Chivers & Vicki Gail Chivers
LG Reference:	A1492/A1493
Responsible Authority:	Shire of Coorow
Authorising Officer:	Simon Lancaster
Application No and File No:	DP 12/00625
Report Date:	24 August 2012
Application Receipt Date:	6 June 2012
Application Process Days:	58 days
Attachment(s):	<p>Attachment 1 - Location Plan (Drawing No.WAW-AA-GA-G/002 SH001)</p> <p>Attachment 2 - Site Plan overlaid upon Aerial Photograph (Drawing No. WAW-AA-GA-G/001 SH001)</p> <p>Attachment 3 – Wind Turbine Elevation Plan (Drawing No. WAW-AA-PR-S/001 SH001)</p> <p>Attachment 4 – Transmission Line Tower Elevation Plan (Drawing No. WAW-SS-PT-E/001 SH001)</p> <p>Attachment 5 – Development Area Plan (Drawing No. WAW-AA-GA-G/001 SH003)</p> <p>Attachment 6 - Photomontage from both Garibaldi Willis Road (Drawing No.61-27826-SK004) and Rose Thomson Road (Drawing No.61-27826-SK006)</p> <p>Attachment 7 - Schedule of Submissions</p> <p>Attachment 8 - Copy of Submissions</p>

Recommendation:

That the Mid West Joint Development Assessment Panel resolves to **Approve** DAP Application reference DP12/00625 submitted by Verve Energy to develop the Warradarge Wind Farm and 330kV transmission line upon Lots 10850 & 10853 Garibaldi Willis Road and Lots 10848 & 10851 Rose Thomson Road, Warradarge as received by the Shire of Coorow on 6 June 2012 and accompanying plans (WAW-AA-GA-G/001 SH001 through WAW-AA-GA-G/001 SH003, WAW-AA-GA-G/002 SH001, WAW-AA-GA-G/002 SH002, WAW-AA-GA-G/002 SH004, WAW-AA-GA-G/004 SH001, WAW-AA-GA-G/004 SH002, WAW-AA-GA-G/005 SH001, WAW-AA-GA-G/006 SH001, WAW-AA-PR-C/001 SH001 through WAW-AA-PR-C/006 SH001,

WAW-AA-PR-S/001 SH001, WAW-SS-PT-E/001 SH001 through WAW-SS-PT-E/003 SH001, WAW-SS-IC-I/001 SH001, WAW-SS-IC-I/002 SH001) in accordance with Part 4 and Section 5.14 of the Shire of Coorow Town Planning Scheme No.2, subject to the following conditions and advice notes:

Conditions of Approval

- 1 The approved development shall be undertaken generally in accordance with the plans and undertakings provided by Verve Energy and forming the Application for Planning Consent unless expressly altered by a condition attached to the approval.
- 2 The approved development shall be substantially commenced within a period of 5 years from the date of this approval and if the development is not substantially commenced the approval shall lapse and be of no further effect. Where an approval has so lapsed, no development shall be carried out without the further approval of the responsible authority having first been sought and obtained.
- 3 The applicant is to prepare, submit and implement a Traffic Management Plan to the satisfaction of Main Roads WA and the Local Government.
- 4 The applicant is to ensure that the location, design and construction of the access point from the development site onto the road network shall be to the satisfaction of the Local Government.
- 5 The applicant is to ensure that the installation of any traffic warning/safety signage in relation to the approved development during the transportation/construction phase shall be to the satisfaction of Main Roads WA and the Local Government.
- 6 Repairing of any damage to the road network including the surface is required by reason of use of the road in connection with the development to the satisfaction of Main Roads WA and the Local Government, with all costs met by the applicant.
- 7 The applicant is to ensure the design, construction (to a minimum compacted gravel standard), drainage and maintenance of the internal roads and vehicle manoeuvring areas required for the approved development shall be to the satisfaction of the Local Government.
- 8 The applicant is to prepare, submit and implement a Noise Management Plan to the satisfaction of the Department of Environment and Conservation and the Local Government.
- 9 The applicant is to prepare, submit and implement a Fire Management Plan to the satisfaction of the Fire and Emergency Services Authority and the Local Government.
- 10 The applicant is to prepare, submit and implement an Environmental Management Plan to the satisfaction of the Department of Environment and Conservation and the Local Government.

- 11 No signs or hoardings are to be erected in relation to the development without the separate approval of the Local Government.
- 12 All lighting devices must be installed and shaded in such a way as to not cause undue light spill to passing motorists or neighbouring residences.

Advice Notes

- (a) In relation to condition 3, prior to commencement of any site works, the applicant is responsible to ensure that the Traffic Management Plan is lodged with the Mid West Regional Manager of Main Roads WA and the Shire of Coorow for review. The Traffic Management Plan shall incorporate a Traffic Impact assessment for the transportation activities associated with the development and to ensure that intersections and impacts to the road network are addressed. The Traffic Management Plan shall set out in detail the management commitments applicable to traffic relevant to all installations, activities and processes. The Traffic Management Plan shall include if required by Main Roads WA or the Shire of Coorow the identification of any necessary road upgrading, and property access construction and the provision of a dilapidation survey prior to and at the completion of the development with any damage caused to the road network used by transport vehicles accessing the site to be repaired to the requirements of Main Roads WA and the Local Government. Once approved, the applicant from time to time is responsible to ensure, that all installations, activities and processes carried out at all times and in all respects are in accordance with the Traffic Management Plan.
- (b) Main Roads WA advise that permits are required for overweight and oversized vehicles associated with the proposed development.
- (c) Main Roads WA advise that should the proponent undertake any works within the road reserve of its network, the proponent must submit an application to Main Roads WA to undertake works within the road reserve. Applications must conform to the Main Roads WA document titled 'Application Form for Organisations Seeking to Undertake Works within the Road Reserve - High Complexity Works' (application kits are available from the Main Roads' website). No works are to commence within the road reserve until Main Roads WA has approved the proponent's application seeking to undertake works within the road reserve.
- (d) In relation to condition 8, prior to commencement of any site works, the applicant is responsible to ensure that the Noise Management Plan is lodged with the Department of Environment and Conservation and the Local Government for its review. The Noise Management Plan shall set out in detail the management commitments applicable to noise minimisation relevant to all installations, activities and processes, based on sound level measurements of plant, both individually and in combination. The Noise Management Plan shall take proper account of tonal components, amplitude or frequency modulations or impulses, and the Noise Management Plan shall demonstrate that noise emissions will achieve compliance with the requirements of the South Australian guidelines Environmental Protection Authority – Wind Farms Environmental Noise. Once approved, the applicant from time to time as directed by the Local Government is responsible to ensure, that all

installations, activities and processes carried out at all times and in all respects are in accordance with the Noise Management Plan.

- (e) The applicant is to implement and maintain reporting mechanisms and monitoring for noise complaints throughout the duration of the operation of the development. In event of a substantiated complaint being received the applicant is required to demonstrate mitigation responses to the requirements of the Department of Environment and Conservation and the Local Government. Such responses will be treated as required modifications to the Noise Management Plan.
- (f) In relation to condition 9, prior to commencement of any site works, the applicant is responsible to ensure that the Fire Management Plan is lodged with the Fire & Emergency Services Authority and the Local Government for its review. The Fire Management Plan shall address the obtaining of any relevant approvals/licences from the Department of Water, in relation to water abstraction for fire management purposes if necessary.
- (g) In relation to condition 10, prior to commencement of any site works, the applicant is responsible to ensure that the Environmental Management Plan is lodged with the Department of Environment and Conservation and the Local Government for its review. The Environmental Management Plan shall address the following issues:
 - fuel storage, handling and spill response;
 - weed management;
 - surface, ground and stormwater management;
 - waste disposal;
 - flora and fauna; &
 - dust suppression and stabilisation of any soils disturbed or deposited on site.
- (h) The applicant is advised that this planning approval does not negate the requirement for any additional approvals which may be required under separate legislation including but not limited to the Building Code of Australia, Building Act 2012, Health Act 1911, Health (Treatment of Sewerage and Disposal of Effluent and Liquid Waste) Regulations 1974, Environmental Protection (Clearing of Native Vegetation) Regulations 2004, Environmental Protection (Noise) Regulation 1997, Traffic Act 2000, Aboriginal Heritage Act 1972 and the obtaining of a works licence from the Department of Environment and Conservation if required. It is the applicant's responsibility to obtain any additional approvals required before the development/use lawfully commences.
- (i) The discretions listed to the Local Governments, Main Roads WA, Department of Environment and Conservation, and the Fire and Emergency Services Authority under the conditions of approval shall be exercised by those parties in a reasonable manner. Any dispute on conditions may be referred back to the Development Assessment Panel.
- (j) Signs that are required for traffic management and occupational safety and health and as agreed in the Environmental Management Plan, Fire Management Plan, Traffic Management Plan and Noise Management Plan can be erected for use throughout the construction period.

- (k) If the applicant is aggrieved by this determination there is a right (pursuant to the Planning and Development Act 2005) to have the decision reviewed by the State Administrative Tribunal. Such application must be lodged within 28 days from the date of determination.

Background:

Property Address:	Lots 10850 & 10853 Garibaldi Willis Road and Lots 10848 & 10851 Rose Thomson Road, Warradarge
Zoning	RS: Not Applicable
	TPS: Rural
Use Class:	Public Utility (as per Table 1 of the Scheme); or Wind Farm and Transmission Line (as per Sections 4.4.2(b) and 9.4.1(b) of the Scheme)
Strategy Policy:	Not Applicable
Development Scheme:	Not Applicable
Lot Sizes:	Lot 10848 – 1,441.4ha Lot 10850 – 2,001.7ha Lot 10851 – 1,825.7ha Lot 10853 – 2,012.0ha
Existing Land Use:	Rural
Value of Development:	\$600million

The subject site has not previously been subject to the lodgement of a major development application and is presently used for farming purposes.

Details: outline of development application

The application seeks to establish 100 wind turbines with an operational life of 25 years on farming land located between Garibaldi Willis Road and Rose Thomson Road, approximately 15km east of the Brand Highway and approximately 15km south-east of Eneabba.

The Warradarge Wind Farm site boundary covers 5,010ha (3,800ha for the wind turbine area and 1,210ha for the transmission line corridor) with an actual utilised area of 82.5ha, meaning that the remaining area would continue to be used for agricultural production or retained as remnant vegetation. The site has been selected due to its proximity to the existing 330kV transmission line, the reliability of the wind resource (it is expected that the wind farm would generating electricity approximately 90% of the time), the relatively low number of habitable buildings (and the large lot sizes in this area also reduce potential for further residences in the immediate area), and the previously cleared state of the majority of the site (with only 0.7ha of vegetation estimated as being required to be cleared and this clearing would not include any Priority Ecological Communities or Threatened Ecological Communities and field research does not suggest that this contains roosting sites for Carnaby's Cockatoos).

The turbines would have a tower (hub) height of 100m and an overall (blade) height of 152m. The wind farm would also require 5 x 100m high monitoring masts. The wind turbines would be connected via underground cabling and 7.5ha of gravel access tracks (with an additional 1ha of gravel access track serving the transmission

line). A fenced 6.25ha substation compound would be located in the north-west corner of the wind farm site as the connection point onto the 330kV transmission line. The compound would house a 22 to 330kV switchyard and transformers, a 367.2m² single storey relay and metering building, a 875m², 9.2m high site office and workshop, car parking area and a 50m high steel lattice communications mast.

The application also seeks to establish a 330kV spur transmission line running south-east for a distance of 10km off the Eneabba-Karara transmission line to enable connection of the Warradarge Wind Farm into the South-West Interconnected System. The northern section of the spur transmission line would be located within the Shire of Carnamah and the southern 4.5km section would be located within the Shire of Coorow. The transmission line would require 22 steel lattice towers measuring 50-63m in height with approximately 500-600m spacing between each tower.

Should approval be granted for the development, the wind farm is estimated to be operational by 2015 and the 2 year construction phase of the project would require a 1ha construction compound containing a lay down area, site offices, amenities and first aid buildings. The likely turbine delivery route to the Warradarge Wind Farm site would be from Geraldton port, via the Brand Highway turning east at Warradarge onto the Coorow-Green Head Road, and then turning north along the Garibaldi-Willis Road to the site entrance.

The following Attachments have been provided with this report:

Attachment 1 - Location Plan for the proposed Warradarge Wind Farm site that also illustrates the proposed construction site access;

Attachment 2 - Site plan for the proposed Warradarge Wind Farm site overlaid upon an aerial photograph that also illustrates the proposed transmission line alignment;

Attachment 3 - Typical Elevation Plan for a Wind Turbine;

Attachment 4 - Typical Elevation Plan for the proposed 330kV transmission line towers;

Attachment 5 - The applicant has advised that the exact route of the transmission line and the final site of each turbine is not finalised and is therefore seeking approval for the wind farm and transmission line within a development area as shown in Attachment 5;

Attachment 6 - Photomontage from both Garibaldi Willis Road and Rose Thomson Road that demonstrates the impact of the proposed wind farm at its most visible from a publically accessible location;

Attachment 7 - Schedule of Submissions; &

Attachment 8 - Copies of the received submissions.

A copy of the complete application for the total Warradarge Wind Farm project has been provided separately to Development Assessment Panel members on disc format due to the large (43MB) size of the application. The submitted development application report includes the following technical documents:

- Planning and Context Statement (Urbis);
- Landscape and Visual Impact Assessment (GHD);
- Flora, Vegetation and Fauna Assessment (Biota Environmental Sciences);
- Noise Impact Assessment (Herring Storer Acoustics);
- Background Noise Monitoring (Herring Storer Acoustics);

- Investigation of Possible Impacts on Broadcasting and Radiocommunication Services (Lawrence Derrick & Associates);
- Aviation Impact Statement Assessment (AECOM);
- Planning Compliance Report (Urbis);
- Verve Health and Safety Policy (Verve Energy);
- Verve Environmental Policy (Verve Energy);
- Draft Environmental Management Plan (Verve Energy); &
- Stakeholder Consultation Report (Verve Energy).

In support of their proposal the applicant has supplied the following additional information:

“The 100 turbine wind farm would produce on average every year, up to 875 million Kilowatt-hours (kWh) of electricity which is equivalent to the average annual electricity needs of 140,000 West Australian homes. The wind farm would also prevent at least 700,000 tonnes of CO2 from entering the atmosphere annually.

The final number, make and model of the wind turbines that will comprise the wind farm is not yet finalised and therefore development approval is sought for a 100 turbine wind farm and all associated infrastructure to be located within the wind farm envelope. To minimise the environmental impact of the development there are number of excluded areas where no turbines or associated infrastructure will be located. The Proposal footprint within the wind farm envelope is on cleared land and does not require further clearing of vegetated areas. Important vegetated areas that contain Threatened Ecological Communities and Priority Species have been intentionally avoided.

The exact route of the 10km transmission line is not yet finalised but a likely route corridor has been selected based on Western Power's connection requirements. Up to 0.7 hectares of vegetation may require clearing for the transmission line and this will be subject to a clearing permit through the Department of Environment and Conservation. The likely transmission line route has been surveyed and contains no Threatened Ecological Communities and the Priority 4 species has been intentionally avoided.

The design of the wind farm has taken into account the location of nearby residential premises to ensure that the operational noise from the wind farm is predicted to meet the noise limits for wind farm developments at these locations. The noise limits at relevant receivers is 35 dB(A) or the background noise (LA90,10 minute) plus 5 dB(A), whichever is the greater.

The wind farm location and design complies with the Visual Landscape Planning Manual of Western Australia. The wind farm has been shown to be in a compact area acceptable from a landscape and visual perspective provided that the wind farm is limited to 100 turbines up to 152m high within the wind farm envelope. The majority of impacts have been mitigated through the wind turbine and wind farm design.

The location of the wind farm has been assessed to determine whether any impacts are likely on air safety, radiocommunications and broadcasting and the results of these surveys are that no impacts are expected.

The proposed Warradarge Wind Farm will be a significant project for the Shires of Coorow and Carnamah and for Verve Energy. The Warradarge Wind Farm feasibility study to date has found that a wind farm can be built at the proposed site that meets the technical, social and environmental constraints imposed on it. The majority of the impacts associated with the wind farm have been mitigated through site selection and design.”

Legislation & policy:

Legislation

Planning and Development Act 2005;
Shire of Coorow Town Planning Scheme No.2.

State Government Policies

WAPC Planning Bulletin No.67 - Guidelines for Wind Farm Development.

Local Policies

Not Applicable.

Consultation:

As discussed in the Planning Assessment section of this report, this application could have been determined without advertising, however, the applicant has stated their preference for the proposal to be formally advertised under the Scheme and Council agreed at its 18 July 2012 meeting resolving as follows (Minute Reference: 2012/096):

“That Council resolve that the application for a Wind Farm and 330kV transmission line upon Lots 10850 & 10853 Garibaldi Willis Road and Lots 10848 & 10851 Rose Thomson Road, Warradarge be determined under Sections 4.4.2(b) and 9.4.1(b) of Shire of Coorow Town Planning Scheme No.2 and advertised as per Section 9.4.3 of the Scheme for a period of 21 days with the matter to be returned to its 15 August 2012 meeting as a Late Item for its further consideration.”

Section 9.4.3 of the Scheme requires that where Council decides to give notice of an application it shall cause one or more of the following to be carried out:

“The local government may give notice or require the applicant to give notice of an application for planning approval in one or more of the following ways-

- (a) *notice of the proposed use or development served on nearby owners and occupiers who, in the opinion of the local government, are likely to be affected by the granting of planning approval, stating that submissions may be made to the local government by a specified date being not less than 14 days from the day the notice is served;*
- (b) *notice of the proposed use or development published in a newspaper circulating in the Scheme area stating that submissions may be made to the local government by a specified day being not less than 14 days from the day the notice is published;*
- (c) *a sign or signs displaying notice of the proposed use or development to be erected in a conspicuous position on the land for a period of not less than 14 days from the day the notice is erected.”*

The application was advertised for public comment for a period of 21 days, rather than the minimum 14 days as required by Section 9.4.3 of the Scheme, to provide greater opportunity for all parties to make comment. Furthermore, the Wind Farm application is linked with the application for the section of 330kV transmission line within the Shire of Carnamah (that also must be placed before a Development Assessment Panel) and given the Carnamah Scheme requires an advertising period of 21 days it was considered advantageous for the advertising periods that are related to the same project to run concurrently.

The Warradarge Wind Farm application was advertised from Friday 20 July 2012 until Friday 10 August 2012 with an advisory sign being displayed on-site during the advertising period. Notices were displayed in the Geraldton Guardian on 20 July 2012 and the Mid West Times on 26 July 2012, and the Mid West Times also ran an article on the Warradarge Wind Farm development application on 2 August 2012. A copy of the development application was displayed at the Shire of Coorow (Leeman) and Shire of Carnamah (Carnamah) offices.

10 submissions have been received in relation to the Warradarge Wind Farm application. 8 of these submissions were received from government agencies all offering no objection to the application (with some providing minor technical comment that has been incorporated into the recommended conditions of approval and advice notes). 2 submissions were received in objection to the application from neighbouring landowners, and these largely related to the perceived impact upon their properties arising from noise and visual appearance.

A Schedule of Submissions has been prepared and included as **Attachment 7** to this report, the Schedule identifies the respondents, summarises the matters raised, provides individual comment upon the matters raised, and a recommendation in regard to each. The applicant was provided with a copy of the submissions received, in order to have the opportunity to respond to the issues raised, and a copy of the applicant's responses to the issues raised in objection have been inserted into the Schedule of Submissions also.

Copies of the received submissions have been provided in **Attachment 8**.

Public Consultation

In addition to the required advertising actions listed above, at the commencement of the advertising period, landowners within 5km of the Warradarge Wind Farm site

were written to and provided with a complete copy of the application and invited to make comment.

On 20 August 2012 the Shire was made aware that one of the landowners within a 5km radius of the Warradarge Wind farm site had not been written to by the Shire during the advertising period (Shire staff have confirmed that this was the only omission). The Shire therefore contacted the affected party by phone and subsequently e-mailed to the affected party on 20 August 2012 the details of the application as submitted by Verve Energy (with hard copy following in the mail) and this landowner's submission has been received and included within the Schedule of Submissions (**Attachment 7**).

The applicant has also undertaken extensive public consultation as outlined in Section 2.3 of their submitted development application report, including direct contact, production of newsletters, mail-outs and e-mails, newspaper notices, surveys, and public information sessions.

Consultation with other Agencies or Consultants

At the commencement of the advertising period the following agencies were written to and provided with a complete copy of the application and invited to make comment:

- Alinta Gas;
- Civil Aviation Safety Authority;
- Department of Agriculture & Food;
- Department of Environment and Conservation;
- Department of Indigenous Affairs;
- Department of Mines and Petroleum;
- Department of Planning;
- Department of Regional Development & Lands;
- Department of State Development;
- Department of Transport;
- Department of Water;
- Fire & Emergency Services Authority;
- Main Roads WA;
- Mid West Development Commission;
- State Heritage Office;
- Telstra;
- Water Corporation; &
- Western Power.

The applicant has also undertaken direct consultation with an extensive range of government departments and service authorities prior to lodgement of the development application, and this has been detailed in Section 2.2 of their submitted development application report. The applicant's prior consultation and the submissions received during the advertising period identified no significant agency concerns with the Warradarge Wind Farm project.

Planning assessment:

Shire of Coorow Town Planning Scheme No.2

The subject properties are zoned 'Rural' under Shire of Coorow Town Planning Scheme No.2 ('the Scheme'), the objective of this zone being:

"To provide for a range of rural pursuits such as broadacre and diversified farming which are compatible with the capability of the land and retain the rural character and amenity of the locality."

Figure 1 – Extract from Shire of Coorow Town Planning Scheme No.2 Map



Given that the proposed wind farm would require minimal clearing only (0.7ha) and would not require loss of undue land area from agricultural production it is not considered that the proposed application is contrary to the farming/agricultural production aspect of the objectives for the 'Rural' zone. However, the development will have impact upon the rural appearance of an area, but it should be noted that the Wind Farm is in proximity to the existing Eneabba to Karara 330kV transmission line that runs through this area. Further, the previous establishment of the Emu Downs and Walkaway Wind Farms could be argued as creating a growing familiarity and acceptance of applications of this type in the rural areas of the Mid West, and the surrounding landscape is not specifically identified as a place of scenic value in either the Coorow or Carnamah Town Planning Schemes.

The application, as lodged, would meet the definition of a 'Public Utility' which is listed as a 'D' use within the 'Rural' zone under Table 1 of the Scheme.

'Public Utility' is defined under Schedule 1.2 of the Scheme as follows:

"means any work or undertaking constructed or maintained by a public authority or the council as may be required to provide water, sewerage, electricity, gas, drainage, communications or other similar services."

A 'D' use is defined under Section 4.3.2 of the Scheme as follows:

“means that the use is not permitted unless the local government has exercised its discretion by granting planning approval.”

The applicant, in correspondence submitted to the Shire on 18 June 2012, sought Council’s determination of the application as a ‘use not listed’ as per Sections 4.4.2(b) and 9.4.1(b) of the Scheme. The applicant was aware that this would require the advertising of their application and may involve delays in determination of their project but expressed no objection to this. The applicant, being a public authority, would normally allow for determination of the application as a ‘public utility’ (discretionary use) but Verve Energy sought the determination of the application under the ‘use not listed’ requirements of the Scheme for the following reasons:

- advertising the wind farm proposal is preferred from an overall transparency perspective; and
- there is potential in the future for Verve Energy to enter into a joint venture agreement with a private entity for financing purposes.

The consideration of the application as a ‘use not listed’ would enable greater flexibility for Verve Energy in that they could pursue a joint venture partner from the private sector which would not be catered for under the definition of a ‘public utility’ under the Scheme.

Section 4.4.2 of the Scheme states that:

“If a person proposed to carry out on land any use that is not specifically mentioned in the Zoning Table and cannot reasonably be determined as falling within the type, class or genus or activity of any other use category the local government may;

- (a) determine that the use is consistent with the objectives of the particular zone and is therefore permitted;*
- (b) determine that the use may be consistent with the objectives of the particular zone and thereafter follow the advertising procedures of clause 9.4 in considering an application for planning approval;*
- (c) determine that the use is not consistent with the objectives of the particular zone and is therefore not permitted.”*

Section 9.4.1 of the Scheme states that:

“Where an application is made for planning approval to commence a use or commence or carry out development which involves a use which is –

- (a) an ‘A’ use as referred to in clause 4.3.2; or*
- (b) a use not listed in the Zoning Table; or*
- (c) a development subject to discretionary consideration under Clause 5.2.5*

the local government is not to grant approval to that application unless notice is given in accordance with clause 9.4.3.”

Given that the proposed 100 turbines, 5 monitoring masts, 1 communications tower and 22 transmission towers are not for agricultural use, and would be in excess of

8m in height, then Section 5.14 of the Scheme must also be considered in the assessment of this application:

“Height and Appearance of Buildings

With the exception of buildings and structures required for agricultural use in Rural Zones, no building in excess of two storeys or a height of 8 metres above natural ground level shall be erected within the Scheme Area.

Council may approve buildings which exceed the height specified after considering information provided and any submissions made by persons owning or having an interest in land affected directly or indirectly by the proposed building:

- Will be in harmony with the general character of buildings in the locality;*
- Will not be detrimental to the amenity or character of the locality or the quality of environment or the townscape.*
- Will observe the required setbacks from the boundaries of the lot on which it is to be constructed and will not prejudice the siting, design, aspect and privacy of buildings on other nearby lots.*
- Will not impair the potential for development of other vacant blocks in the vicinity with particular regard to amenity, aspect and views.*
- Has been designed in harmony with the natural land form of the site.*

Any such decision shall only be made by an absolute of Council.”

It is considered that the local economic benefits and the wider regional and state benefits to the environment presented by the project, and the analysis provided by the submitted Landscape and Visual Impact Assessment, provide sufficient grounds for consideration of the application.

Portions of Section 10.2 of the Scheme may also be considered relevant to this application:

“The local government in considering an application for planning approval is to have due regard to such of the following matters as are in the opinion of the local government relevant to the use or development the subject of the application:

- (c) any approved statement of planning policy of the Commission;*
- (e) any relevant policy or strategy of the Commission and any relevant policy adopted by the Government of the State;*
- (i) the compatibility of a use or development with its setting;*
- (j) any social issues that have an effect on the amenity of the locality;*
- (k) the cultural significance of any place or area affected by the development;*
- (l) the likely effect of the proposal on the natural environment and any means that are proposed to protect or mitigate impacts on the natural environment.*
- (n) the preservation of the amenity of the locality;*

- (o) *the relationship of the proposal to development on adjoining land or on other land in the locality including but not limited to, the likely effect of the height, bulk, scale, orientation and appearance of the proposal;*
- (q) *the amount of traffic likely to be generated by the proposal, particularly in relation to the capacity of the road system in the locality and the probable effect on traffic flow and safety;*
- (y) *any relevant submissions received on the application;*
- (z) *the comments or submissions received from any authority consulted under clause 10.1.1;*
- (za) *any other planning consideration the local government considers relevant.”*

Shire of Coorow Local Planning Strategy

Section 6.2.5 of the Shire of Coorow Local Planning Strategy notes that the rural zone has the basic objective of encouraging the retention and expansion of present agricultural activities and to consider granting planning consent to non-rural uses where it can be demonstrated to be of benefit to the district and not detrimental to the area's natural resources and environment generally. It is considered that the Warradarge Wind Farm project would provide an additional income stream to farming landowners, enabling a diversification (and climate-proofing) of the economic base for the immediate area without unduly impacting upon agricultural production and will provide an environmental benefit to the region and state.

The approval of the Warradarge Wind Farm project would further boost the Mid West region's position as the renewable energy exporting hub for the state of Western Australia, when considered along with the already operational Walkaway Wind Farm, Emu Downs Wind Farm and Greenough Solar Farm, and further to this the approved Chapman Solar Farm and Mumbida Wind Farm both of which are expected to commence construction, and the further potential of a tidal energy project at Horrocks Beach and the Coronation Beach/Oakajee Wind Farm.

WAPC Planning Bulletin No.67 - Guidelines for Wind Farm Development

The Western Australian Planning Commission released Planning Bulletin No.67 in 2004 as a guide for the assessment of wind farm developments. The application has been prepared with regard to the issues outlined in Planning Bulletin No.67 including landscape and visual assessment, noise assessment, other amenity impacts, vegetation and fauna, site analysis, and consultation. It is considered that the Warradarge Wind Farm project would meet with the requirements of Planning Bulletin No.67.

Annex 8 to the submitted development application provides a Planning Compliance Report that includes a Compliance Matrix demonstrating the application's ability to meet the requirements of Planning Bulletin No.67.

Noise

The Schedule of Submissions (**Attachment 7**) provides detail on the issues raised in relation to the proposed Warradarge Wind Farm, however, it would be fair to summarise that the objections largely concerned the issues of noise and visual appearance.

The Noise Impact Assessment prepared for the applicant by Herring Storer Acoustics has logged the existing background noise on-site (over a period of six weeks) and models the proposed noise impact (and low frequency noise and infrasound projections) and concludes that the Warradarge Wind Farm will meet with the requirements of the *Environmental Protection (Noise) Regulations 1997* and the 'Wind Farms—Environmental Noise Guidelines—July 2009' (Environmental Protection Authority of South Australia) which are the guidelines recognised by the Department of Environment and Conservation. The modelling has been undertaken using the conservative criteria of the wind turbine design that emits greatest noise (which may not be utilised for this project) and incorporates all wind conditions. The closest residence to the application would under the most noise conducive conditions experience 35dB(a) which is in compliance with the relevant regulations and guidelines for noise sensitive premises. It should be noted that in the event that the modelling is found to be inaccurate (undervalued) upon operation of the wind farm it would be the responsibility of the operator to modify the turbine(s) until compliant with the *Environmental Protection (Noise) Regulations 1997*.

The Noise Assessment does indicate that there are some land areas within the 35dB(A) noise contour (being the minimum background noise criteria) which are owned by non-participants of the wind farm development. These areas are within Lots 1, 10849, 10854, 10877, 10878, 10855 and 11017 and this presents a risk to the applicant in the absence of a statutory buffer, as noise sensitive premises would be permitted to 'encroach' into the 35dB(A) noise contour by the Scheme. In relation to this issue, Sections 1.9.3-1.9.5 of the submitted development application report makes the following comment:

"Verve Energy has negotiated secure tenure through Option agreements to lease the above lots for the purposes of the Proposal. These leases contain a noise buffer clause that allows for noise to exceed the greater of either 35dB(A) or 5dB(A) above background noise, in areas of land away from noise sensitive premises, such as in-situ houses. This ensures that no future noise sensitive premises will be constructed throughout the life of the wind farm in areas of the Lots where the wind farm may exceed the allowable noise limits.

Verve Energy is negotiating wind farm neighbour agreements with the owners of adjacent Lots (Lots 10849, 10854, 10877, & 10878) to ensure the areas of these lots where the wind farm will be generating noise exceeding 35dB(A) or 5dB(A) above background noise, whichever is greater, will not cause any conflict with any possible future noise sensitive premises.

It should be noted that the final design of the wind farm and its capacity will be dependent on these agreements. Should one or more wind farm neighbour agreements not be reached this will not affect the ability to operate a wind farm, only the position and overall number of turbines within the wind farm envelope."

Further to this Verve Energy, upon being made aware of the objections received provided further information on 10 August 2012 and 23 August 2012 that has been included within **Attachment 8**. The correspondence reiterates the applicant's intent to try and negotiate Neighbour Agreements that agree that no new homes or other noise sensitive receiver premises will be constructed during the lifetime of the wind

farm in the identified areas. Verve Energy have also stated that in the event that Neighbour Agreements cannot be reached then they can either:

- a) Relocate the relevant wind turbines to alternative non-optimal locations such that the Warradarge Wind Farm will never exceed the noise limits imposed by the Environmental Protection Authority (EPA) on nearby land; or
- b) Accepting the commercial risk that if Verve Energy proceeds with the optimal locations for the wind turbines within the project area and if a new house or other noise sensitive property is built near the wind farm, the wind turbines may need to have their output turned down at night to meet the statutory noise limits imposed by the EPA.

Annex 8 to the submitted development application provides a Planning Compliance Report that includes a Compliance Matrix demonstrating the application's ability to meet the requirements of the Environmental Protection Authority – Wind Farms Environmental Noise Guidelines (South Australia) (Noise Guidelines), this being a guide in the assessment of wind farms pending the adoption of a formal policy in Western Australia.

It should also be noted that in addition to the development approval process under the *Planning and Development Act 2005* administered by the Local Government and the Development Assessment Panel, the applicant is also subject to the environmental approval process under the *Environmental Protection Act 1986* administered by the Department of Environment and Conservation and the Environmental Protection Authority. The applicant must comply with the requirements of the EPA, the *Environmental Protection Act 1986* and the *Environmental Protection (Noise) Regulations 1997* both for the construction and operational phases irrespective of any conditions related to noise applied by the Local Government or Development Assessment Panel.

Visual Appearance:

The second major issue raised in objection to the proposed Warradarge Wind Farm, concerned the issue of visual appearance (the Schedule of Submissions included as **Attachment 7** provides further detail on the issues of objection).

The Landscape and Visual Assessment prepared by GHD for the applicant demonstrates that the Warradarge Wind Farm and associated transmission line would not be visible from the Eneabba townsite and would be largely obscured from the Brand Highway. The Visual Assessment does conclude that the visual impact of the Wind Farm will be high within 5km of the site, i.e. the Garibaldi Willis Road and Rose Thomson Road areas, and intervening vegetation and variation in topography will reduce the visibility of the Wind Farm significantly as the radius extends out to 15km, then 25km.

The Landscape and Visual Assessment for the Warradarge Wind Farm (Annex 2 to the submitted application) confirms that the development will be visible from the immediately neighbouring properties, and that repositioning of the turbines within the development area will not alter this.

However, it should be noted that the proposed Warradarge Wind Farm site is in proximity to the existing Eneabba to Karara 330kV transmission line that runs through this area which already has a visual impact on the surrounding rural landscape. Further the area in which the proposed wind farm would be sited is not

specifically identified as a place of scenic value in either the Coorow or Carnamah Town Planning Schemes or strategic level planning document.

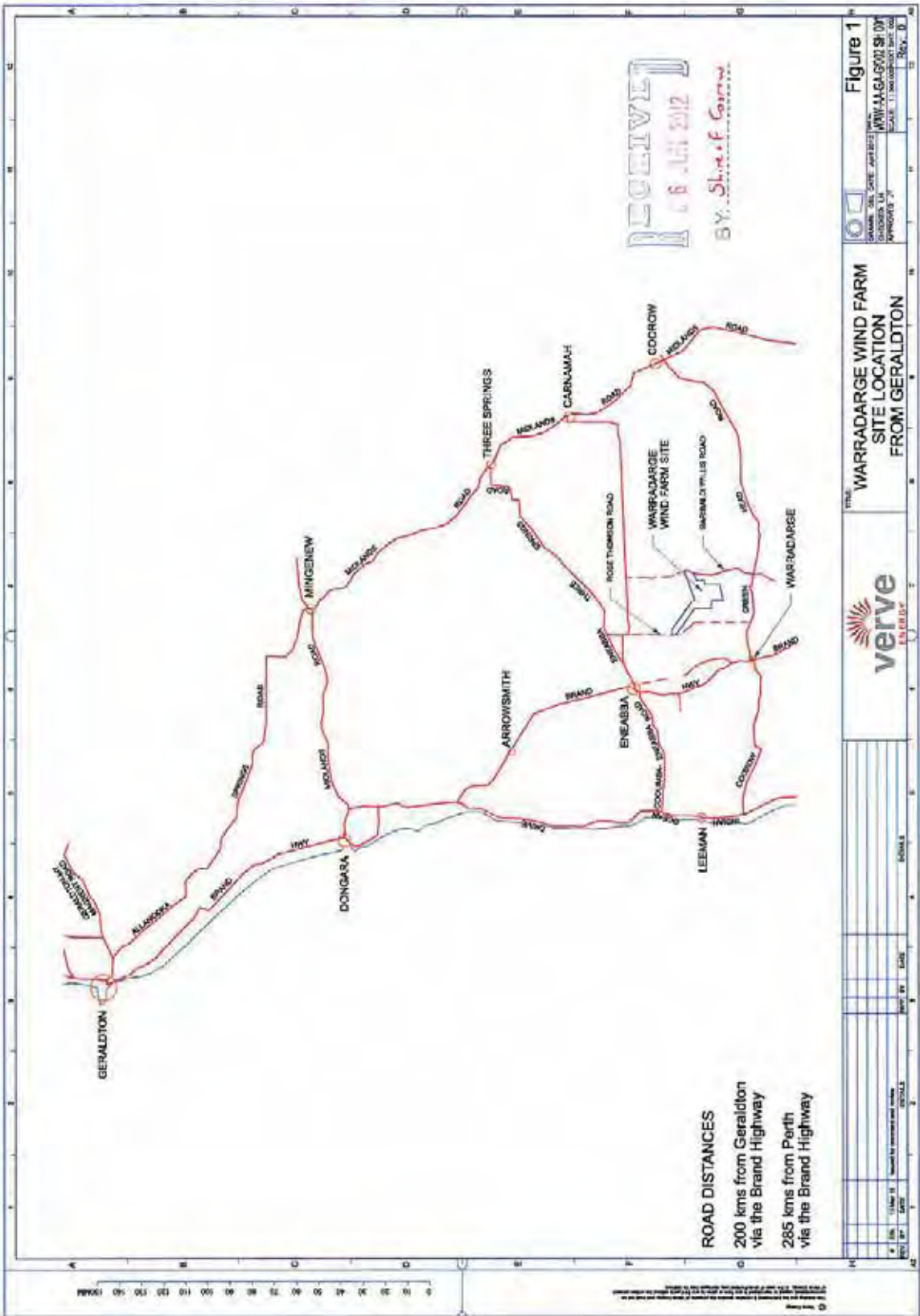
It might also be argued that the previous establishment of the Emu Downs and Walkaway Wind Farms to the south and north of the Warradarge site has created a growing familiarity and acceptance of applications of this type in the rural areas of the Mid West, with their economic and energy outputs understood and could even be considered as a point of interest for locals and tourists, rather than a visual blight.

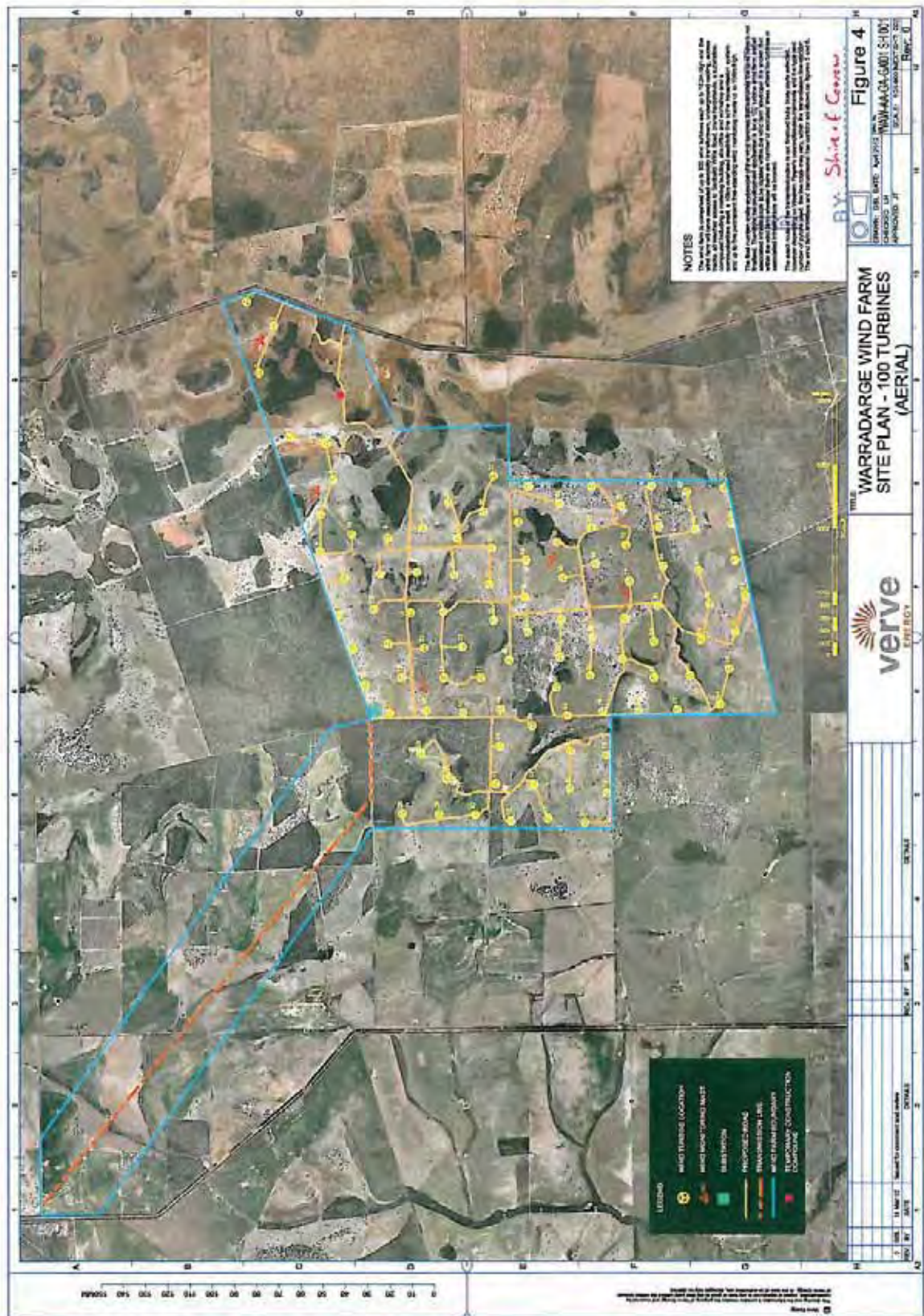
Options/Alternatives

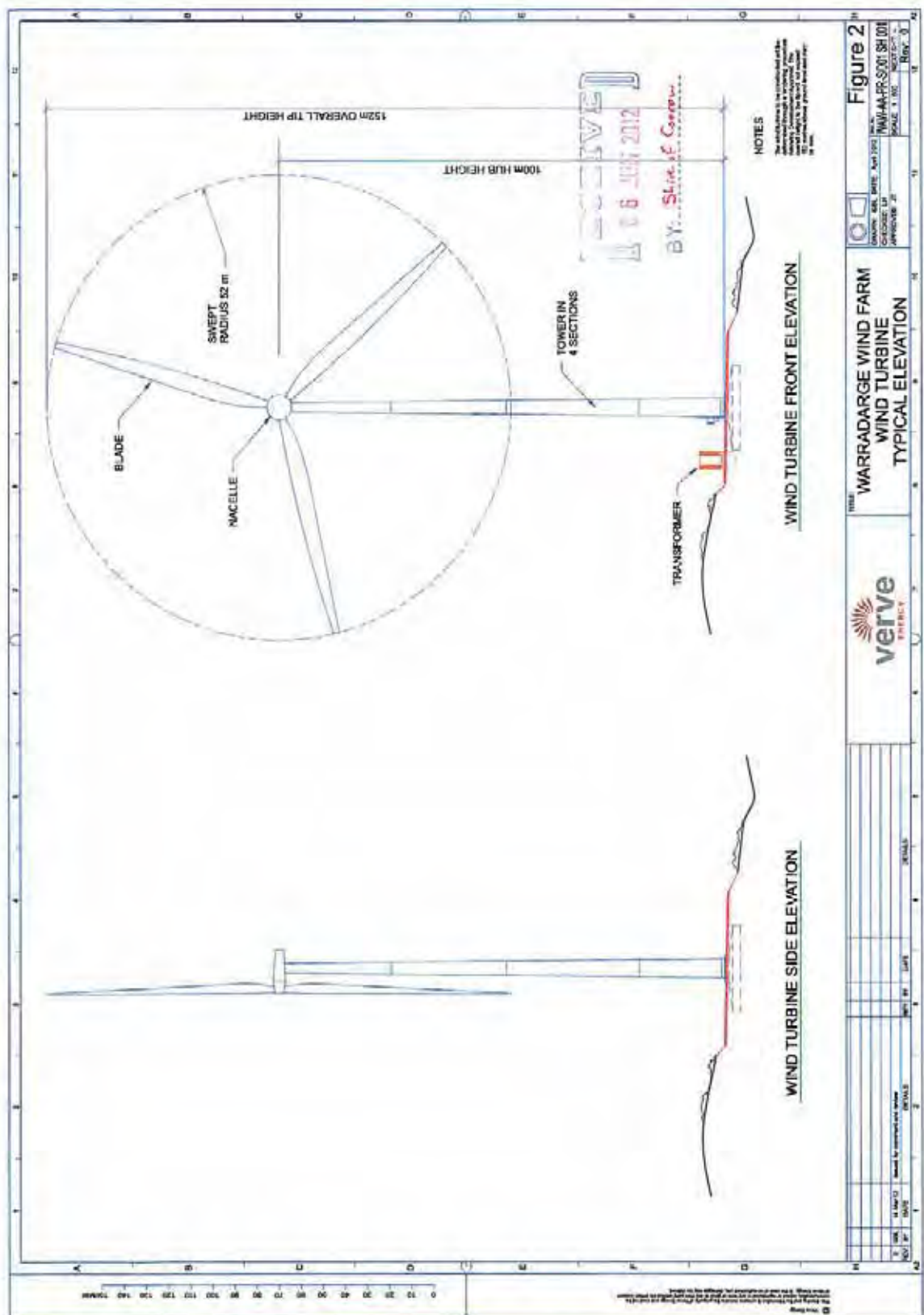
The Shire of Coorow does not consider that the issues raised in objection provide grounds for refusal of the application, however, should the Development Assessment Panel consider that the objections raised concerning noise give rise for concern then it may wish to require the applicant to modify the proposed distribution of the turbines in relation to any impacts concerning the objectors' properties.

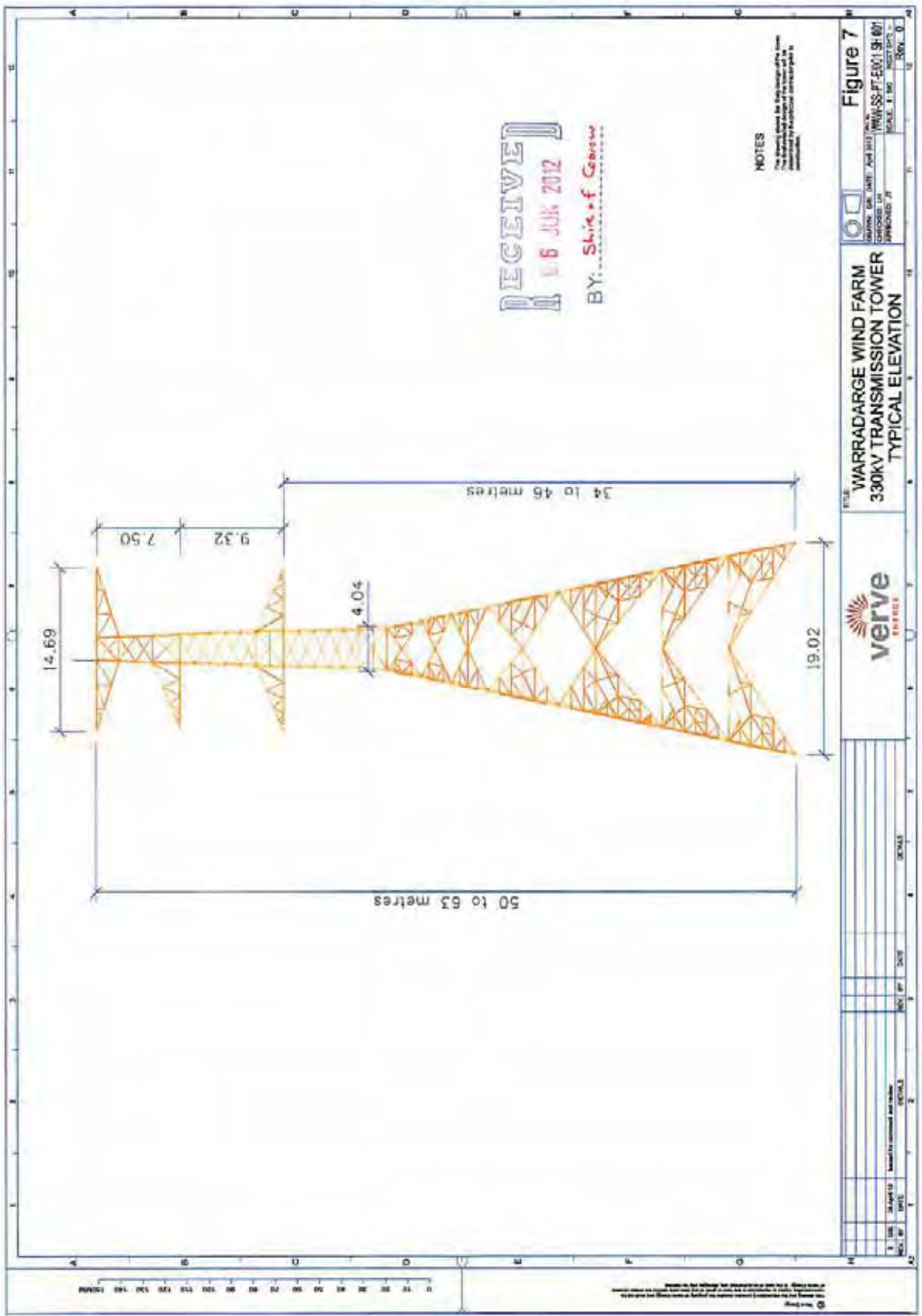
Conclusion:

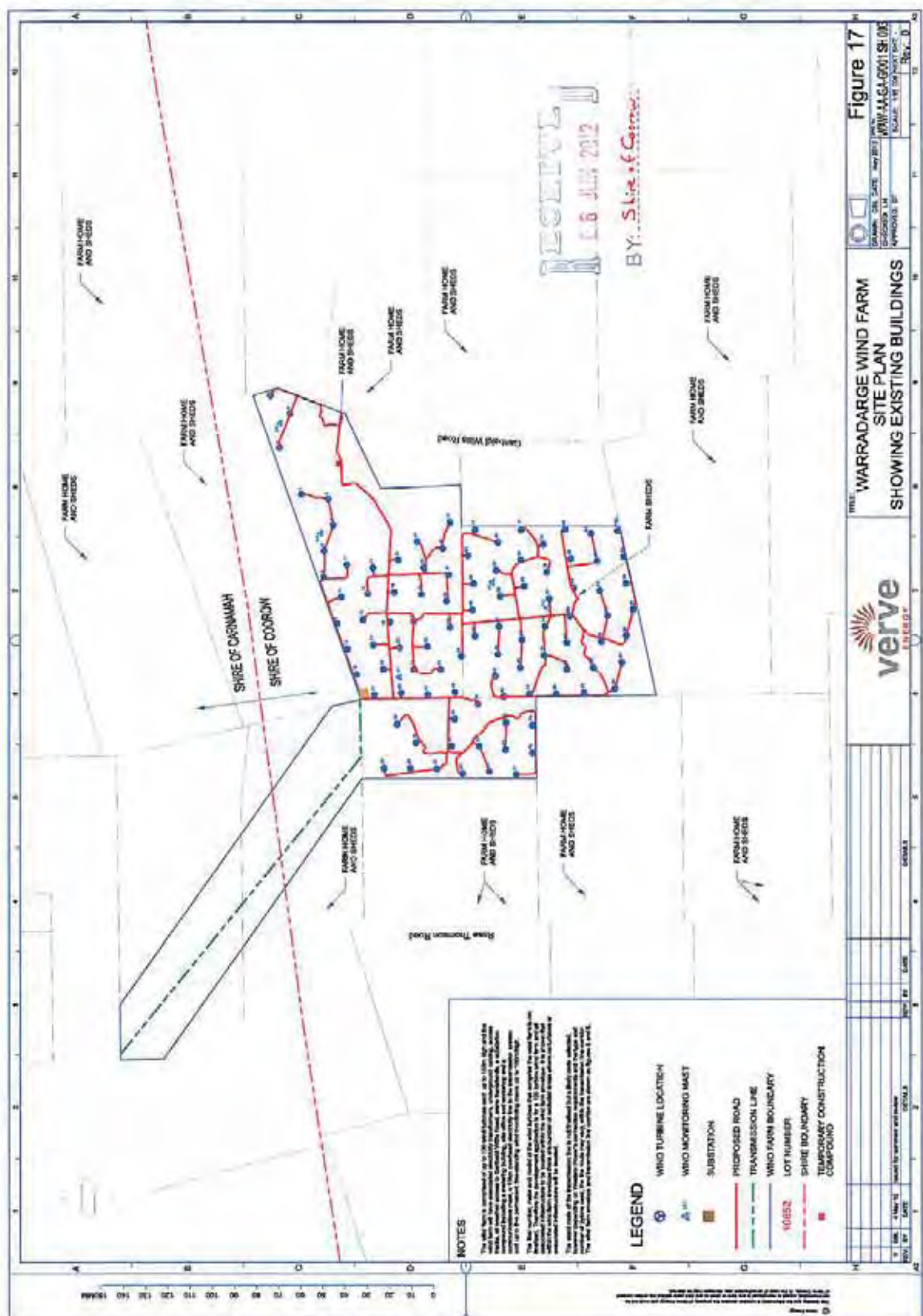
The Shire of Coorow recommends conditional approval of the proposed Warradarge Wind Farm and Transmission Line development.

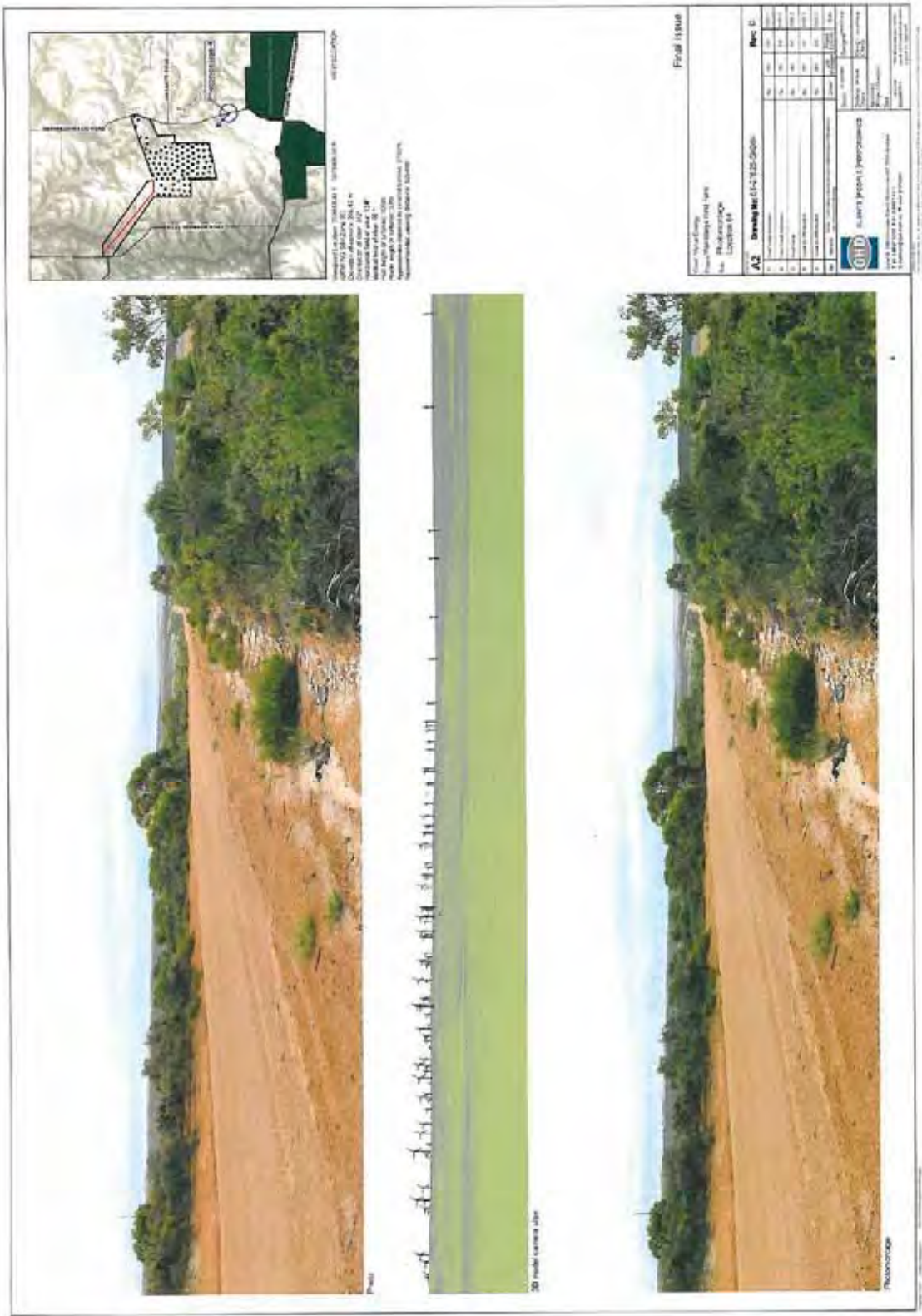


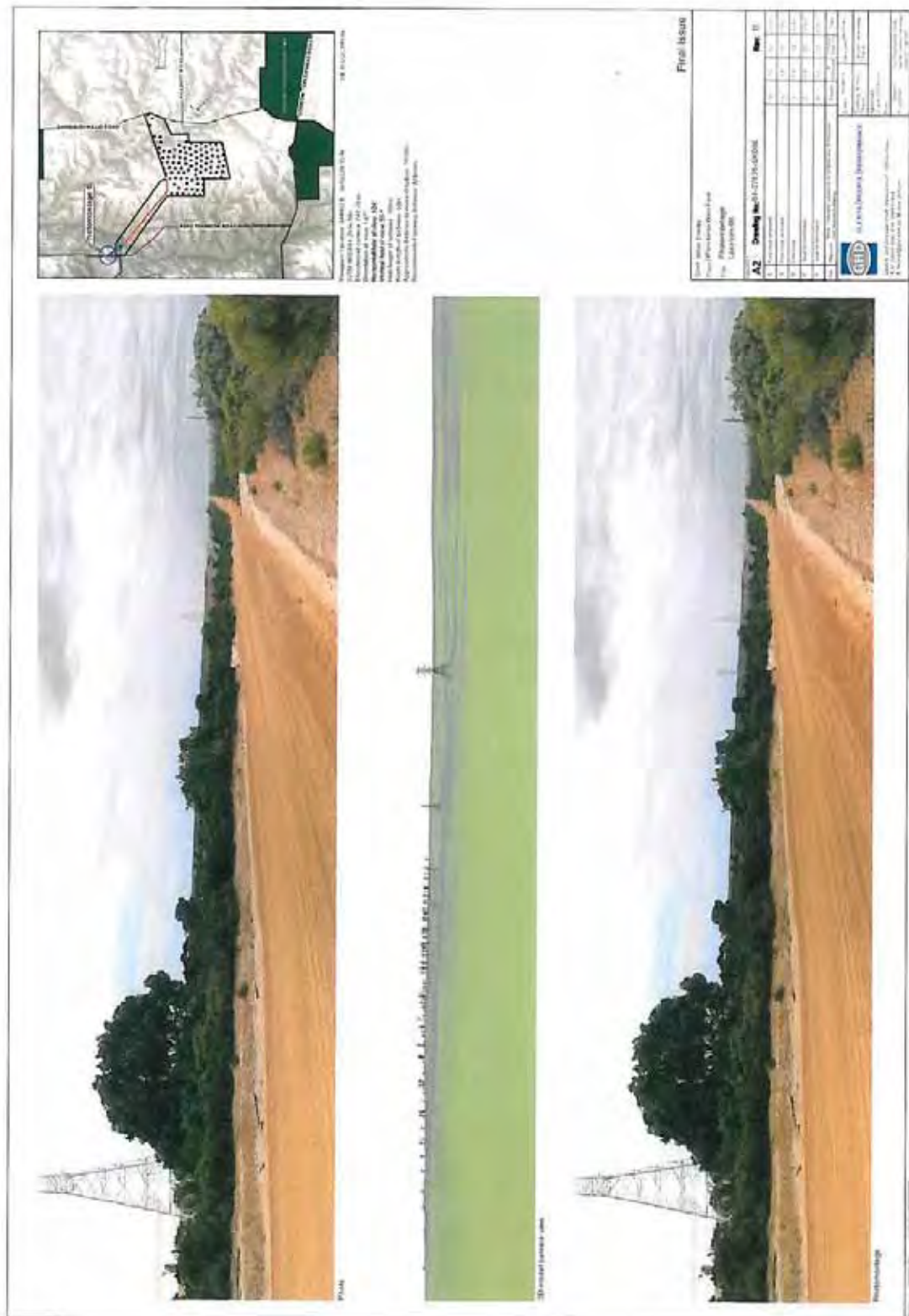












Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1 Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge				
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment	Recommendation
1 (3/8/2012)	State Heritage Office (PO Box 7479 Cloisters Square PERTH WA 6850)	<i>No objection</i> Proposal does not appear to impact upon any place of state cultural heritage significance.	No additional comment.	Note submission.
2 (6/8/2012)	L Marche (280 Kooyong Road KEWDALE WA 6105) Subject Property: Lot 10854 Garibaldi Willis Road, Warradarge	<i>Objection</i> Object to this application and inform your office of the inconsistencies that have been portrayed by Verve Energy to both your office and that of the EPA. The proposed wind farm will adversely affect not only the value but also the only possible use available for my property. My property although located in a rural precinct is not able to be used for farming purposes because the entire 5000 acres comprises of natural vegetation and/or remnant bush land. My property has not been able to be used for agricultural purposes for the last 20 years and unless the current legislation is over turned, it is unlikely that it could be farmed during the course of the next 20 years. The laws in place prohibiting clearing of land, whether it be natural vegetation or regrowth bush, prevents me from clearing my property. Therefore the only conceivable use for my property is that of a "lifestyle" property, attributable to its seclusion, peace, tranquility, flora and fauna. If the proposed wind farm proceeds the only use available for my property will not only be lost but the value of my property will be devalued for the entire 20-25 year duration of the wind farm. The placement of the wind turbines on the adjacent	The objector's property of Lot 10854 is zoned 'Rural' under the Shire of Coorow Town Planning Scheme No.2 and there are a number of uses listed under the Scheme Zoning Table for this zone that are either (P) permitted, (D) discretion, or (A) special notice. It is not considered that the presumption that the objector's property could only be used for "lifestyle" purposes has been verified through lodgement of development applications for these listed uses. It is noted that Section 5 of the <i>Environmental Protection (Clearing of Native Vegetation) Regulations 2004</i> addresses the issue of prescribed clearing with Regulation 5 Item 1 listing: "Clearing of a site for the lawful construction of a building or other structure on a property, being clearing which does not, together with all other limited clearing on the property in the financial year in which the clearing takes place, exceed 1 ha, if — (a) the clearing is to the extent necessary; and (b) the vegetation is not riparian vegetation."	Note submission and recommend that any development approval for the Warradarge Wind Farm be made subject to the following condition: "The applicant is to prepare, submit and implement a Noise Management Plan to the satisfaction of the Department of Environment and Conservation and the Local Government." Further it is recommended that advice notes be attached with the abovementioned condition requiring that: "Prior to commencement of any site works, the applicant is responsible to ensure that the Noise Management Plan is lodged with the Department of Environment and Conservation and the Local

Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1			
Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge			
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment
			Recommendation

		<p>property (Lot 10853) will destroy the visual and aesthetic qualities of my property and will also hinder any possibility of living on my property due to the noise from the wind turbines being a nuisance and interfering with the peace and tranquility of my property.</p> <p>Extremely concerned that the documentation submitted by Verve Energy to the EPA (and to the Shire of Coorow), has misrepresented my property as being "cleared agricultural/rural" land when almost the entire 5,000 acres is natural vegetation/nature reserve. A fact that has been conveyed to Verve Energy on several occasions.</p>	<p>The applicant was advised of the nature of the objection received and provided with the opportunity to make comment upon the issues raised in Submission 2. The comments of Verve Energy in relation to the specific issues that have been raised are provided in italic font in this comments section.</p> <p><i>"Figures 4 and 6 in the Development Application Report show Lot 10854 is predominantly vegetated. Verve Energy does not believe the Development Application Report shows it is "cleared agricultural/rural" land. Additionally, although Lot 10854 has a good wind resource, in our site selection process as discussed in section 1.8, we sought to select land that minimised any vegetation clearing."</i></p>	<p>Government for its review. The Noise Management Plan shall set out in detail the management commitments applicable to noise minimisation relevant to all installations, activities and processes, based on sound level measurements of plant, both individually and in combination. The Noise Management Plan shall take proper account of tonal components, amplitude or frequency modulations or impulses, and the Noise Management Plan shall demonstrate that noise emissions will achieve compliance with the requirements of the South Australian guidelines Environmental Protection Authority – Wind Farms Environmental Noise. Once approved, the applicant from time to time as directed by the Local Government is responsible to ensure, that all installations, activities and processes carried out at all times and in all respects are in accordance with the Noise Management Plan."</p>
		<p>Over the years my property has been enjoyed as a "lifestyle/recreational" parkland with extended family and friends frequently camping and caravanning at the shed located on my property, which has been shown as a "non-residence". Verve Energy are aware that the shed is where we stay when we camp at my property but did not mention this is in their application, probably because the shed is right in the middle of their</p>	<p>The Shire of Coorow has no record of a structure upon Lot 10854 being approved or subsequently constructed to a Class 1 (habitable) standard as per the Building Code of Australia. However, it is noted that a dwelling is listed as a permitted use under the Scheme Zoning Table for the 'Rural' zone. On this basis the landowner of Lot 10854 could make application for a habitable</p>	

Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1			
Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge			
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Recommendation

		noise buffer zone.	building to be constructed upon the property and such a building upon completion would be treated as a 'noise sensitive premise' and in the event that emissions from any neighbouring operation exceed regulatory criteria (be they noise, dust, vibration, odour etc.) then it is the responsibility of the emitter to modify their actions to meet the prescribed limits and not the responsibility of the receiver.	“The applicant is to implement and maintain reporting mechanisms and monitoring for noise complaints throughout the duration of the operation of the development. In event of a substantiated complaint being received the applicant is required to demonstrate mitigation responses to the requirements of the Department of Environment and Conservation and the Local Government. Such responses will be treated as required modifications to the Noise Management Plan.”
		If the proposed wind farm proceeds any prospect of a future tourism development on my property will be rendered impossible. The visual landscape of my property will be adversely affected by the location of the 100 turbines. I note that from the documentation lodged by Verve Energy my property is the only property upon which between 80 to 100% of the turbines will be seen/viewed at all times.	<p>“Verve Energy is aware that the land owners of Lot 10854 do use their existing shed for occasional residential purposes as shown in Figure 17.</p> <p>We have also assessed this location as a potential house labelled Receiver Point 12 in the Noise Impact Assessment, Annex 4. It is shown that the wind turbines will comply with the limits at this point.”</p> <p>Whilst it is acknowledged that the Warradarge Wind Farm would be visible from Lot 10854 a statement that this would render any neighbouring tourism development impossible is considered difficult to substantiate.</p> <p>“Verve Energy has shown in Figures 5 and 6 of the LVIA report (Annex 2) a Zone of Theoretical Visibility (ZTV) of the potential wind turbine layout. If that layout were adopted, there are a number of surrounding properties from which, theoretically, between 80% and 100% of the turbines could be</p>	<p>Recommend that any development approval for the Warradarge Wind Farm be made subject to the following condition:</p> <p>“The applicant is to prepare, submit and implement an Environmental Management Plan to the satisfaction of the Department of Environment and Conservation and the Local Government.”</p> <p>Further it is recommended</p>

Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1			
Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge			
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment
Recommendation			

			<p>visible. It is also noted that this ZTV is theoretical only, and does not take into account existing built form and vegetation which may provide screening.</p> <p>The Development Application Report states- 4.2.7 A Zone of Theoretical Visibility ("ZTV") for both tip and hub height has been produced for the Proposal and these are shown in Figures 5 and 6 in Annex 2. A ZTV is the area around a designated point in the landscape from which that point is visible. It is calculated using elevation data such as a Digital Elevation Model and does not take account of buildings or vegetation screening. It represents a worst case view of how many turbines or blade tips can be seen at the location.</p> <p>4.2.8 Figures 5 and 6 in Annex 2 shows the turbines that are visible from the hub (100m) upwards and the tip height (152m). These figures show that beyond 10km from the wind farm the number of turbines visible to the west reduces to zero except on a few elevated areas. In areas to the south and north the turbines are theoretically visible out to 15km, beyond which it they are only seen in isolated areas. To the west the tips of the turbines are theoretically visible to 25km except in lower areas of the landform but it can be seen that the hubs are not as visible beyond 15km, and this is due to the screening effect of the topography.</p>
			<p>that the following advice note be attached with the abovementioned condition requiring that:</p> <p>"Prior to commencement of any site works, the applicant is responsible to ensure that the Environmental Management Plan is lodged with the Department of Environment and Conservation and the Local Government for its review. The Environmental Management Plan shall address the following issues:</p> <ul style="list-style-type: none"> - fuel storage, handling and spill response; - weed management; - surface, ground and stormwater management; - waste disposal; - flora and fauna; & - dust suppression and stabilisation of any soils disturbed or deposited on site."

Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1 Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge			
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Recommendation
			Comment

			<p>4.2.9 In should be noted that the ZTV is a tool to assess theoretical visibility only and that vegetation and built structures will influence what is actually visible from various locations. It is for this reason that a number of viewpoints are selected to represent what the actual change of view will be and these are shown as photomontages. The viewpoints are selected in areas that theoretically have a view of at least 80% of the wind turbines.”</p> <p>It should also be noted that in addition to the development approval process under the <i>Planning and Development Act 2005</i> administered by the Local Government and the Development Assessment Panel, the applicant is also subject to the environmental approval process under the <i>Environmental Protection Act 1986</i> administered by the DEC and the EPA. The applicant must comply with the requirements of the EPA, the <i>Environmental Protection Act 1986</i> and the <i>Environmental Protection (Noise) Regulations 1997</i> both for the construction and operational phases irrespective of any conditions related to noise applied by the Local Government or Development Assessment Panel.</p> <p>The Noise Impact Assessment prepared by Herring Storer Acoustics has logged the existing background noise on-site (over a period of six weeks) and models the proposed noise impact (and low frequency</p>
		<p>The estimated noise implications for my property indicate that noise attenuation of between 39dB at my boundary fence which adjoins Lot 10853, will also impact across the entire length and breadth of my property, with an estimate of 25dB at the opposite boundary fence. The noise alone is going to adversely affect the use and enjoyment of my property. From information available about existing wind farms it is likely that the noise impact could be far greater once the turbines are in full operation and during various weather conditions, which will put off anyone from wanting to sleep over at my property, let alone stay their during daylight hours. Not to mention possible health concerns being another issue altogether.</p>	

Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1			
Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge			
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment
			Recommendation

			<p>noise and infrasound projections) and concludes that the Warradarge Wind Farm will meet with the requirements of the Noise Regulations and the 'Wind Farms—Environmental Noise Guidelines—July 2009' (EPA of South Australia) which are the guidelines recognised by the DEC. The modelling has been undertaken using the conservative criteria of the wind turbine design that emits greatest noise (which may not be utilised for this project) and incorporates all wind conditions. The closest residence to the application would under the most noise conducive conditions experience 35dB(A) which is in compliance with the relevant regulations and guidelines for noise sensitive premises. It should be noted that in the event that the modelling is found to be inaccurate (undervalued) upon operation of the wind farm it would be the responsibility of the operator to modify the turbine(s) until compliant with the <i>Environmental Protection (Noise) Regulations 1997</i>.</p> <p>The Noise Assessment does indicate that there are some land areas within the 35dB(A) noise contour (being the minimum background noise criteria) which are owned by non-participants of the wind farm development. These areas are within Lots 10849, 10854, 10877, 10878, 10855 and 11017 and this presents a risk to the applicant in the absence of a statutory buffer, as noise sensitive premises would be permitted to 'encroach' into the 35dB(A) noise contour.</p>
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Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1 Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge			
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment
			Recommendation

			<p>It is considered appropriate given the issues raised by the objector that any approval and operation of the Warradarge Wind Farm should be subject to the applicant preparing and adhering to a Noise Management Plan.</p> <p><i>"The Noise Impact Assessment has been carried out in accordance with Western Australian Planning Bulletin 67 and the Department of Environment and Conservation WA which recommends using the EPA of South Australia "Wind Farms – Environmental noise guidelines – July 2009" as the guidelines for the assessment of wind farms. The Noise Impact Assessment was provided in Annex 4 of the DAR.</i></p> <p><i>The noise limits for new wind farm developments is that the predicted noise level must not exceed the greater of either 35 dB(A) or 5 dB(A) above the background noise at any nearby homes or other noise sensitive receiver premises during night-time hours. The noise limits have been assessed for all nearby lots including Lot 10854 and are predicted to be below these levels at the existing sheds. The wind farm complies with the noise limits at the current sheds which were given the same importance as a house.</i></p> <p><i>The wind farm noise on areas of vegetated land of Lot 10854 closer to the turbines than the sheds could be greater than either 35 dB(A) or 5 dB(A) above the background noise. It is good practice for Wind Farm proponents to enter Good Neighbour Agreements to agree that no new homes or</i></p>
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Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1 Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge			
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment
			Recommendation

		<p>When the previous owners (my parents) lodged an application for permission to clear my property in about 2010, the DEC expressed concern about possible interference with the breeding habitats of the natural wildlife and birds inhabiting my property in particular mention was made of the endangered Carnabys Black Cockatoos. No consideration whatsoever has been given by Verve Energy as to how the wind farm will affect the fauna and bird life on my property. Environmental impact studies for noise, landscape & visual, and flora & fauna, particularly in relation to Lot 10854, have to be undertaken prior to the application for construction of the Warradarge Wind Farm proposal being approved.</p> <p>From the documentation provided by Verve Energy, my property - not being a participant in the wind farm, is the only property that will be greatly affected by the noise, land and visual impacts of the wind farm.</p>	<p><i>other noise sensitive receiver premises will be constructed during the lifetime of the wind farm in these areas. These areas are known as noise buffer areas."</i></p> <p>The submitted development application report includes a visual impact assessment, flora and fauna assessment, noise impact assessment, aviation impact assessment, environmental management plan, and outline of the stakeholder consultation undertaken by the applicant to date.</p> <p>"Verve Energy conducted a Noise Impact Assessment, Background Noise Monitoring, Flora, Vegetation and Fauna Assessment and a Landscape and Visual Impact Assessment (LVIA) on the proposed wind farm development site. The noise assessments and LVIA considers the impact on adjacent properties, however, a flora and fauna survey was not conducted on Lot 10854 as Verve Energy does not propose to clear any vegetation on that land.</p> <p>The Development Application Report states- 4.3.1 Biota Environmental Sciences undertook a Flora, Vegetation and Fauna Assessment of the wind farm envelope and a possible transmission line route. This comprised a desktop review, field survey and flora specimen identification and this report is provided in Annex 3. The field survey was conducting over two trips in the October and November of 2011 and comprised a total of 12 days. The</p>	
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Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1			
Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge			
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment
			Recommendation

			<p>land area of the wind farm envelope and area of transmission line corridor is 5,010 hectares, Biota surveyed 3,650 hectares of land which was the entire wind farm envelope and one possible line route within the transmission line corridor.</p> <p>4.4.3 Verve Energy engaged specialist consultant Herring Storer Acoustics ("HSA") to undertake Noise Impact Assessment for the Warradarge Wind Farm. A prediction of worst case noise propagation from the proposed wind farm was undertaken and background noise measurements undertaken. The Noise Impact Assessment is in Annex 4. The background noise measurements took place over 6 weeks and the results of these have set the noise limits to be applied to nearby noise sensitive premises such as residential properties, this report is in Annex 5.</p> <p>4.2.2 Following the initial wind farm design, GHD have undertaken a landscape and visual impact assessment and this is attached in Annex 2. The assessment covers a 25km radius study area from the Proposal and it investigates the various effects the wind farm has on the landscape and people in the study area at seven different publicly accessible locations.</p> <p>4.2.3 To assess the Proposal, the wind farm is designed with the greatest likely footprint and the</p>
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Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1			
Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge			
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment
			Recommendation

			<p>north-south/east-west extents are shown as spaced across the greatest amount of overall land area within the wind farm envelope, as shown in Figures 5 and 6. This is deemed the worst case design from a visual point of view.</p> <p>4.2.4 As such, the width of any view of the wind farm is greatest from any viewpoint. Therefore, smaller or fewer number of turbines within the wind farm envelope or 100 turbines located in different locations within the wind farm envelope are also encompassed by the assessment.”</p> <p>“Verve Energy has not stated at any point that a Good Neighbour (noise buffer) Agreement has been signed with the land owner of Lot 10854. However such an agreement has been among the topics discussed at meetings with Mr Eric Marche.</p> <p>Verve Energy commenced discussions with various land owners on 16 June 2011 regarding the proposed wind farm and the potential for a noise buffer (if applicable).</p> <p>Verve Energy met Mr Eric Marche in June 2011, November 2011 and in June 2012, with various correspondence and conversations in between. During this time a draft agreement was presented for consideration and a counter proposal received. Verve Energy is open to continuing discussions with the owner of Lot 10854 to come to a mutually</p>
		<p>For the record, neither my mother, nor my father nor myself have agreed to enter into any Noise Neighbour Agreement or any other agreement with Verve Energy, nor have we consented to the Wind Farm being proposed.</p>	

Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1 Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge				
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3a (7/8/2012)	Telstra (Locked Bag	Comment Telstra requires more time to assess this	<p>beneficial agreement if common ground can be found. However, should an agreement not be reached for Lot 10854, Verve Energy will consider either relocating turbines away from the boundary of Lot 10854 or accepting that there is a commercial risk that if a house or noise sensitive premises is constructed on nearby land in the future that the turbines may need to be limited to reduce their noise to comply with noise regulations at these new premises.</p> <p>The Development Application Report states- 1.9.4 Verve Energy is negotiating wind farm neighbour agreements with the owners of adjacent Lots (Lots 10849, 10854, 10877, & 10878) to ensure the areas of these lots where the wind farm will be generating noise exceeding 35dB(A) or 5dB(A) above background noise, whichever is greater, will not cause any conflict with any possible future noise sensitive premises.</p> <p>1.9.5 It should be noted that the final design of the wind farm and its capacity will be dependent on these agreements. Should one or more wind farm neighbour agreements not be reached this will not affect the ability to operate a wind farm, only the position and overall number of turbines within the wind farm envelope. This is discussed more fully in Chapter 4."</p>	Note submission.

Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1 Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge			
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment
		Recommendation	
3b (10/8/2012)	2525 PERTH WA 6001)	<p>proposal. An engineering study needs to be undertaken to assess the impact to our network. As you can appreciate this is not a trivial exercise. As such we will require 6 weeks to complete this task.</p>	<p>any extension to the submission period as the matter was required to be placed before the 15/8/2012 Council meeting and then be sent to the Development Assessment Panel in order to comply with the timeframe established by the <i>Development Assessment Panel Regulations 2011</i>.</p> <p>Shire staff advised Verve Energy of Telstra's concerns so that the applicant might make contact with Telstra to establish whether they may be able to assist them in addressing their concerns prior to the 10/8/2012 submission deadline.</p> <p>The applicant has been provided with a 21 day period in which to make comment upon the application, which is an extension of the minimum 14 day period as per the requirements of the Scheme.</p> <p>The submitted Development Application includes Annexure 6 'Warradarge Wind Farm - Investigation of Possible Impacts on Broadcasting and Radiocommunication Services' prepared by Lawrence Derrick & Associates, Engineering Consultants & RF Frequency Assigners. Section 14 of Annexure 6 states:</p> <p>"The power generated by the wind turbines will be exported to the transmission grid via purpose built substations and high voltage transmission lines using conventional designs meeting standards applying to the State network at large. Substations will be designed and sited to reduce the electric and magnetic fields to acceptable levels at the</p>
	Telstra (Locked Bag 2525 PERTH WA 6001)	<p><i>Comment</i></p> <p>I have been in contact with Verve Energy and they have provided me with a comprehensive feasibility report and that has put my mind at ease to some extent. Whilst it does cover our radio sites we have a country exchange located about 2.5 km from the south west corner of the wind farm area. It is not a radio site but I am still concerned about induced noise and more importantly induced EMF from the wind farm.</p> <p>I will have our design team check the impact to our country exchange and also verify the findings of the report. Unfortunately they will not be able to complete this investigation by close of business today.</p> <p>As I don't have the time to complete an engineering impact study I do not feel comfortable stating that I have no objections to the development.</p>	<p>Note submission and provide copy of Telstra's submissions to the applicant so that they are made aware of its issues.</p> <p>Recommend that any development approval for the Warradarge Wind Farm be made subject to the following advice note:</p> <p>"The applicant is advised that this planning approval does not negate the requirement for any additional approvals which may be required under separate legislation including but not limited to the Building Code of Australia, <i>Building Act 2012</i>,</p>

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		It is unfortunate that circumstances have prevented me from having more time to investigate this development proposal.	boundary fence. The internal wind farm reticulation will employ underground cables of up to 33 kV in voltage. These will have no significant EMI emission above ground. The main transmission lines from the wind farm substation to the grid will employ 330 kV overhead lines. All transmission lines will be built to specifications consistent with the HV lines throughout the State network. The height of the lines and the easement width will be in accordance with power authority recommendations which will ensure magnetic and electric fields will be within acceptable limits for human exposure and for electromagnetic interference levels at dwellings in the area and for accessible public access areas. HV power lines and substations are required to meet the Australian Standard AS/NZS 2344: 1997 Amendment 1:2007 limits for EMI which protects broadcasting and radiocommunications reception from unacceptable interference."	<i>Health Act 1911, Health (Treatment of Sewerage and Disposal of Effluent and Liquid Waste) Regulations 1974, Environmental Protection (Clearing of Native Vegetation) Regulations 2004, Environmental Protection (Noise) Regulation 1997, Traffic Act 2000, Aboriginal Heritage Act 1972 and the obtaining of a works licence from the Department of Environment and Conservation if required. It is the applicant's responsibility to obtain any additional approvals required before the development/use lawfully commences."</i>
4 (9/8/2012)	Department of Environment & Conservation (PO Box 72 GERALDTON WA 6531)	<i>Comment</i> The DEC is unable to provide comment at this time. In providing advice DEC would need to refer to the EPA who is the lead agency for this application. DEC would need to take into account the Office of EPA comments and recommendations for this project, and unfortunately they are yet to assess this application.	It should also be noted that in addition to the development approval process under the <i>Planning and Development Act 2005</i> administered by the Local Government and the Development Assessment Panel, the applicant is also subject to the environmental approval process under the <i>Environmental Protection Act 1986</i> administered by the DEC and the EPA. The applicant must comply with the requirements of the EPA, the <i>Environmental Protection Act 1986</i> and the <i>Environmental Protection (Noise) Regulations</i>	As per Submission 3b.

Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1				
Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge				
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment	Recommendation
5 (13/8/2012)	Department of Transport (PO Box 68 GERALDTON WA 6531)	<p><i>Support</i></p> <p>The proposal for the Warradarge Wind Farm will have a positive impact on the sustainability of the State should it go ahead. The Department of Transport supports the idea though we will not have any direct involvement in the development.</p>	1997 both for the construction and operational phases irrespective of any conditions related to noise applied by the Local Government or Development Assessment Panel.	Note submission.
6 (13/8/2012)	Main Roads WA (PO Box 165 GERALDTON WA 6531)	<p><i>Comment</i></p> <p>MRWA supports the provision of renewable energy developments and is satisfied that principle of the development in this location would be acceptable.</p> <p>Notwithstanding the above, MRWA has some concerns over potential impacts of the proposal on the MRWA network as a result of the type and number of additional vehicle movements generated, particularly in association with the construction and decommissioning stages. It is considered, however, that the production of a Traffic Management Plan including condition surveys would address MRWA concerns regarding:</p> <ul style="list-style-type: none"> - Ability of route and intersection to accommodate volume and nature of traffic. This would be resolved through the identification and subsequent implementation of upgrades as necessary; and - Potential for damage at intersections and repair of any damage associated with development construction/decommissioning, which would be addressed by the 	<p>Shire staff were contacted by MRWA during the submission period to discuss the areas of their concern.</p> <p>Shire and MRWA staff have jointly worked on preparing draft conditions and advice notes that might be applied in the event that the Development Assessment Panel resolved to approve the development application to address MRWA's raised issues.</p>	<p>Note submission and recommend that any development approval for the Warradarge Wind Farm be made subject to the following conditions:</p> <p>“The applicant is to prepare, submit and implement a Traffic Management Plan to the requirements of Main Roads WA and the Local Government.”</p> <p>“The applicant is to ensure that the installation of any traffic warning/safety signage in relation to the approved development during the transportation/construction phase shall be to the satisfaction of Main Roads WA and the Local Government.”</p>

Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1			
Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge			
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment
			Recommendation

		<p>Dilapidation/Condition part of the Plan.</p> <p>Furthermore, it is considered that the wording of the conditions set out in the email from Simon Lancaster (dated 6/8/2012) would satisfactorily protect the interests and assets of MRWA, although we would suggest that the wording of condition X is expanded to clarify that all 'costs' would include, inter-alia, those in relation to surveys to establish the conditions together with any costs associated with the design, construction and maintenance (over a specified defect liability period) of identified required upgrades.</p> <p>In addition to the conditions and advice set out within the aforementioned email, we would request that the following advice is also offered to the proponent:</p> <p>Any signs or additional markings on or visible from the Main Road will require the approval of MRWA's Mid West Network Operations Manager, Peter Herbert, who can be contacted on 08 9956 1208</p>	<p>"Repairing of any damage to the road network including the surface is required by reason of use of the road in connection with the development to the satisfaction of Main Roads WA and the Local Government, with all costs met by the applicant."</p> <p>Further it is recommended that the following advice notes be attached with the abovementioned conditions requiring that:</p> <p>"Prior to commencement of any site works, the applicant is responsible to ensure that the Traffic Management Plan is lodged with the Mid West Regional Manager of Main Roads WA and the Shire of Coorow for review. The Traffic Management Plan shall incorporate a Traffic Impact assessment for the transportation activities associated with the development and to ensure that intersections and impacts to the road network are addressed. The Traffic</p>
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Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1				
Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge				
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment	Recommendation
				<p>Management Plan shall set out in detail the management commitments applicable to traffic relevant to all installations, activities and processes. The Traffic Management Plan shall include if required by Main Roads WA or the Shire of Coorow the identification of any necessary road upgrading, and property access construction and the provision of a dilapidation survey prior to and at the completion of the development with any damage caused to the road network used by transport vehicles accessing the site to be repaired to the requirements of Main Roads WA and the Local Government. Once approved, the applicant from time to time is responsible to ensure, that all installations, activities and processes carried out at all times and in all respects are in accordance with the Traffic Management Plan.”</p> <p>“Main Roads WA advise that permits are required for</p>

Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1 Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge				
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment	Recommendation
				overweight and oversized vehicles associated with the proposed development.”
				“Main Roads WA advise that should the proponent undertake any works within the road reserve of its network, the proponent must submit an application to Main Roads WA to undertake works within the road reserve. Applications must conform to the Main Roads WA document titled ‘Application Form for Organisations Seeking to Undertake Works within the Road Reserve - High Complexity Works’ (application kits are available from the Main Roads' website). No works are to commence within the road reserve until Main Roads WA has approved the proponent's application seeking to undertake works within the road reserve.”
7 (15/8/2012)	Water Corporation (PO Box 165 GERALDTON WA 6531)	No objection Water Corporation has no facilities in this area and there are no objections to this development proposal.	No additional comment.	Note submission.
8 (15/8/2012)	Department of Agriculture &	No objection DAFWA does not have any objections to the Wind	The submission was received following the meetings of the Shire of Coorow and Shire of	Note submission and provide copy to the

Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1 Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge			
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment
			Recommendation
	Food (PO Box 110 GERALDTON WA 6531)	<p>Farm but would like to offer the following comments:</p> <p>Sections 1.1.10 & 1.1.11 (page 1) of the draft Environmental Management Plan discusses issues with weed hygiene, the declared weed Paterson's Curse is raised but not Skeleton Weed. This is another significant weed which has been identified in the vicinity of the Wind Farm site and is considered to be at moderate risk for infestation.</p> <p>Weed management standards need to be maintained in all aspects of the project throughout its life. This is important to ensure minimal biosecurity risk, for the landowner, the adjoining farms and along the transport route.</p> <p>The site in question is dominated by deep sands and gravelly soils and much of the area is subject to very high wind erosion. These issues appear to have been addressed in Sections 1.1.20 to 1.1.24 (pages 2 & 3) of the draft Management Plan under 'Topsoil management and rehabilitation' and 'Dust suppression'.</p>	<p>Carnamah Councils that formulated the respective Shire recommendations in regards to the Warradarge Wind Farm application.</p> <p>However, it is considered that condition (10) and advice note (g) as recommended by the Shire of Coorow Council adequately addresses the comments raised by the Department of Agriculture & Food.</p> <p>Should the Development Assessment Panel form the view that the suggested conditions and advice notes do not adequately address the comments of the Department of Agriculture & Food then the wording for condition (10) and advice note (g) could be expanded to make specific reference to the Department of Agriculture & Food being a responsible authority in addition to the Department of Environment & Conservation, and the Local Government.</p>
			<p>applicant. Recommend that any development approval for the Warradarge Wind Farm be made subject to the following condition:</p> <p>"The applicant is to prepare, submit and implement an Environmental Management Plan to the satisfaction of the Department of Environment and Conservation and the Local Government."</p> <p>Further it is recommended that the following advice note be attached with the abovementioned condition requiring that:</p> <p>"Prior to commencement of any site works, the applicant is responsible to ensure that the Environmental Management Plan is lodged with the Department of Environment and Conservation and the Local Government for its review. The Environmental Management Plan shall address the following issues:</p> <ul style="list-style-type: none"> - fuel storage, handling and spill response;

Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1 Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge				
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment	Recommendation
9 (15/8/2012)	Department of Water (PO Box 73 GERALDTON WA 6531)	<p><i>Comment</i></p> <p>The subject land is located within the Hill River and Tributaries Catchment surface water area as proclaimed under the <i>Rights in Water Irrigation Act 1914</i>. Any taking or diversion of surface water for purposes other than stock/domestic, and any interference with the bed or banks of a watercourse in this proclaimed area will require a permit from the Department of Water.</p> <p>Several small tributaries of the Hill River System traverse the subject land. It is recommended that the Shire of Coorow required the proponent to ensure that all road crossings over waterways are to be designed and constructed to minimize detrimental impact on the waterways form and function. It is also recommended that the proponent be required as a condition of approval to ensure that works do not encroach into the standard 30m foreshore buffer area on both banks of all waterways.</p> <p>The land is also located within the Arrowsmith groundwater area as proclaimed under the <i>Rights in Water and Irrigation Act 1914</i>. The applicant should be advised to ensure that all landowners</p>	<p>The submission was received following the meetings of the Shire of Coorow and Shire of Carnamah Councils that formulated the respective Shire recommendations in regards to the Warradarge Wind Farm application.</p> <p>However, it is considered that conditions (7) and (10) and advice note (g) as recommended by the Shire of Coorow Council adequately addresses the comments raised by the Department of Water.</p> <p>Should the Development Assessment Panel form the view that the suggested conditions and advice notes do not adequately address the comments of the Department of Water then the wording for conditions (7) and (10) and advice note (g) could be expanded to make specific reference to the Department of Water being a responsible authority in addition to the Department of Environment & Conservation, and the Local Government.</p>	<ul style="list-style-type: none"> - weed management; - surface, ground and stormwater management; - waste disposal; - flora and fauna; & - dust suppression and stabilisation of any soils disturbed or deposited on site." <p>Note submission and provide copy to the applicant. Recommend that any development approval for the Warradarge Wind Farm be made subject to the following condition:</p> <p>"The applicant is to ensure the design, construction (to a minimum compacted gravel standard), drainage and maintenance of the internal roads and vehicle manoeuvring areas required for the approved development shall be to the satisfaction of the Local Government."</p> <p>"The applicant is to prepare, submit and implement an Environmental Management Plan to the satisfaction of the Department of Environment and</p>

Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1 Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge				
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment	Recommendation
10 (21/8/2012)	S Sorgiovanni on behalf of	<p>have been consulted regarding potential impacts on private bores.</p> <p>In general the draft Environmental Management Plan provided adequately addresses other water management issues, such as stormwater management and contamination risks.</p>		<p>Conservation and the Local Government.”</p> <p>Further it is recommended that the following advice note be attached with the abovementioned condition requiring that:</p> <p>“Prior to commencement of any site works, the applicant is responsible to ensure that the Environmental Management Plan is lodged with the Department of Environment and Conservation and the Local Government for its review. The Environmental Management Plan shall address the following issues:</p> <ul style="list-style-type: none"> - fuel storage, handling and spill response; - weed management; - surface, ground and stormwater management; - waste disposal; - flora and fauna; & - dust suppression and stabilisation of any soils disturbed or deposited on site.” <p>Note submission and recommend that any</p>

Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1 Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge			
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment Recommendation
	B Sorgiovanni (250 Anstey Road FORREST- DALE WA 6112) Subject Property: Lot 1 Garibaldi Willis Road, Warradarge	<p>consultation by the Shire to the affected landowners impacted by the proposed development considering it is probably the largest financial development in the Shire. My parents have not received any correspondence from the Shire regarding this issue and seeking their comment. We were also not advised of the public consultation period by either the Shire or Verve Energy.</p> <p>Hope you appreciate that having received the 18 emails only late yesterday afternoon, we have not had sufficient time to read everything that was sent to us. However, from what we have read, it shows that our father's property is significantly impacted by the proposed development a lot more than what was explained to him or us by Verve.</p>	<p>development approval for the Warradarge Wind Farm be made subject to the following condition:</p> <p>“The applicant is to prepare, submit and implement a Noise Management Plan to the satisfaction of the Department of Environment and Conservation and the Local Government.”</p> <p>Further it is recommended that advice notes be attached with the abovementioned condition requiring that:</p> <p>“prior to commencement of any site works, the applicant is responsible to ensure that the Noise Management Plan is lodged with the Department of Environment and Conservation and the Local Government for its review. The Noise Management Plan shall set out in detail the management commitments applicable to noise minimisation relevant to all installations, activities and processes, based on sound level measurements</p>

Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1 Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge			
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment
Recommendation			

			<p>assistance to the respondent.</p> <p>The Shire also advised the respondent that it was its understanding that a person who wishes to make a presentation at the DAP meeting must provide a request in writing to the DAP Secretariat at least 72 hours before the commencement of the meeting.</p> <p>The Shire has offered its apologies to the respondent that they were not advised directly in writing of the proposal by the Shire at the commencement of the advertising period. However, it should be noted that once being made aware of the situation the Shire has made efforts to provide all relevant information to the landowner and enable the landowner opportunity to make comment.</p> <p>It should also be noted that the Warradarge Wind Farm application did not require advertising under either the Shire of Coorow or Shire of Carnamah Town Planning Schemes, and has been advertised arising from a decision of Council at the respective 18 July 2012 Council meetings. Further the submission period for the Wind Farm advertising period was extended from the 14 days prescribed by the Shire of Coorow Town Planning Scheme to 21 days. It should also be noted that the requirements of both the Shire of Coorow and Shire of Carnamah Town Planning Schemes is that advertising shall include one, or more, of the following actions:</p> <ul style="list-style-type: none"> - notice being provided to nearby
			<p>of plant, both individually and in combination. The Noise Management Plan shall take proper account of tonal components, amplitude or frequency modulations or impulses, and the Noise Management Plan shall demonstrate that noise emissions will achieve compliance with the requirements of the South Australian guidelines Environmental Protection Authority – Wind Farms Environmental Noise. Once approved, the applicant from time to time as directed by the Local Government is responsible to ensure that all installations, activities and processes carried out at all times and in all respects are in accordance with the Noise Management Plan.”</p> <p>“The applicant is to implement and maintain reporting mechanisms and monitoring for noise complaints throughout the duration of the operation of the development. In event of a substantiated complaint being received the applicant</p>

Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1 Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge				
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment	Recommendation
			<p>owners/occupiers;</p> <ul style="list-style-type: none"> - notice being published in a newspaper circulating in the Scheme area; - notice being displayed on a sign on-site. <p>Although the application was not required to be advertised, the advertising of the Warradarge Wind Farm application was undertaken in accordance with the advertising requirements of the Schemes by being available for public comment for a period of 21 days through the placement of an advisory sign on-site, and a notice being displayed in the Geraldton Guardian on 20 July 2012.</p> <p>It is also noted that in addition to this the advertising actions included the placement of a notice in the Mid West Times on 26 July 2012, and the Mid West Times also ran an article on the Warradarge Wind Farm development application on 2 August 2012. A copy of the development application was displayed at the Shire of Coorow (Leeman) and Shire of Carnamah (Carnamah) offices and the following parties were written to and provided with a complete copy of the application and invited to make comment:</p> <ul style="list-style-type: none"> - All landowners within 5km of the Warradarge Wind Farm site (with the exception of Mr Sorgiovanni who was found to have been omitted through administrative error and was provided with the application information immediately upon the Shire being made aware of this and provided with opportunity to make 	<p>is required to demonstrate mitigation responses to the requirements of the Department of Environment and Conservation and the Local Government. Such responses will be treated as required modifications to the Noise Management Plan.”</p> <p>Recommend that any development approval for the Warradarge Wind Farm be made subject to the following condition:</p> <p>“The applicant is to prepare, submit and implement an Environmental Management Plan to the satisfaction of the Department of Environment and Conservation and the Local Government.”</p> <p>Further it is recommended that the following advice note be attached with the abovementioned condition requiring that:</p> <p>“Prior to commencement of any site works, the applicant is responsible to ensure that the</p>

Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1			
Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge			
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment
			Recommendation

		<p>submission));</p> <ul style="list-style-type: none">- Alinta Gas;- Civil Aviation Safety Authority;- Department of Agriculture & Food;- Department of Environment and Conservation;- Department of Indigenous Affairs;- Department of Mines and Petroleum;- Department of Planning;- Department of Regional Development & Lands;- Department of State Development;- Department of Transport;- Department of Water;- Fire & Emergency Services Authority;- Main Roads WA;- Mid West Development Commission;- State Heritage Office;- Telstra;- Water Corporation;- Western Power. <p>These actions are in addition to the public consultation undertaken by the applicant as outlined in Section 2.3 of their submitted development application report, including direct contact; production of newsletters, mail-outs and e-mails; newspaper notices; surveys; and public information sessions.</p> <p>The respondent's property is zoned 'Rural' under the Shire of Coorow Town Planning Scheme No.2 and the following land uses are listed under the Scheme Zoning Table for this zone as either (P) permitted, (D) discretion, or (A) special notice:</p>	<p>Environmental Management Plan is lodged with the Department of Environment and Conservation and the Local Government for its review. The Environmental Management Plan shall address the following issues:</p> <ul style="list-style-type: none">- fuel storage, handling and spill response;- weed management;- surface, ground and stormwater management;- waste disposal;- flora and fauna; &- dust suppression and stabilisation of any soils disturbed or deposited on site."
	<p>The proposed wind farm development will impact my father's property by:-</p> <ul style="list-style-type: none">- Restricting and almost eliminating any future development of the property. We have had 2 companies over the last few years interested in the property. One was for setting up chalets		

Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1			
Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge			
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment
			Recommendation

		<p>for ecotourism for wild flowers and farm stays and the other was for a cattle feed lot. Both proposals would have required construction of accommodation to house guests or workers. Neither of these interested parties would look this option now if a buffer/easement is on the property to the magnitude that Verve is intending.</p> <ul style="list-style-type: none"> - Significantly impacting any future sale of the property and commercial value to potential buyers. - Ruining the aesthetics of the area and creating an unsightly visual impact. - Destroying the peace and tranquility of the local area during the construction <p>I have decided to provide our comment via email as my father would like his opposition to the proposal tabled at the upcoming DAP meeting and forwarded to the Councillors and any upcoming development approval committee that is to assess this proposal.</p>	<p>(P) Uses:</p> <p>Animal Establishment Aquaculture Dwelling-Single Rural Pursuit Stables</p> <p>(D) Uses:</p> <p>Aged Persons Hostel Caravan Park Caretaker's Dwelling Carpark Dwelling-Grouped Home Occupation Industry Rural Public Utility Zoological Gardens</p> <p>(A) Uses:</p> <p>Agriculture Intensive Consulting Room Dog Kennels Educational Establishment Funeral Parlour Hospital Hotel Industry Cottage Industry Extractive Industry Hazardous Industry Light Industry Service Milk Depot Motel Motor Vehicle Repair Office</p>	
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Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1 Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge			
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment
			Recommendation

			<p>Place of Worship Reception Centre Recreation Private Restaurant Service Station Shop Transport Depot Veterinary Centre</p> <p>The above list does not include land uses that may not be listed within the Zoning Table but may be considered by Council under Section 4.4.2 of the Coorow Scheme.</p> <p>The approval of the Wind Farm application does not preclude the lodgement and potential approval (if in accordance with the requirements of the Scheme) of development applications upon surrounding properties.</p> <p>It should be noted that the landowner of Lot 1 could make application for a habitable building (e.g. accommodation to house guests or workers for a cattle feed lot) upon their property and such a building upon completion would be treated as a 'noise sensitive premise' and in the event that emissions from any neighbouring operation exceed regulatory criteria (be they noise, dust, vibration, odour etc.) then it is the responsibility of the emitter to modify their actions to meet the prescribed limits and not the responsibility of the receiver.</p> <p>The Noise Impact Assessment prepared by Herring Storer Acoustics has logged the</p>	
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Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1 Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge			
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment
			Recommendation

			<p>existing background noise on-site (over a period of six weeks) and models the proposed noise impact (and low frequency noise and infrasound projections) and concludes that the Warradarge Wind Farm will meet with the requirements of the Noise Regulations and the 'Wind Farms—Environmental Noise Guidelines—July 2009' (EPA of South Australia) which are the guidelines recognised by the DEC. The modelling has been undertaken using the conservative criteria of the wind turbine design that emits greatest noise (which may not be utilised for this project) and incorporates all wind conditions. The closest residence to the proposed wind farm would, under the most noise conducive conditions, experience 35dB(A) which is in compliance with the relevant regulations and guidelines for noise sensitive premises. It should be noted that in the event that the modelling is found to be inaccurate (undervalued) upon operation of the wind farm it would be the responsibility of the operator to modify the turbine(s) until compliant with the <i>Environmental Protection (Noise) Regulations 1997</i>.</p> <p>The Noise Assessment does indicate that there are some land areas within the 35dB(A) noise contour (being the minimum background noise criteria) which are owned by non-participants of the wind farm development. This includes the north-western portion of Lot 1 and this presents a risk to the Wind Farm applicant in the absence of a</p>
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Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1			
Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge			
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment
			Recommendation

		<p>The only correspondence my father has received in the past 6 months is a very onerous and binding deed of agreement with an unacceptable offer considering the significant impact the proposed development has on my father's property and any future or potential development of Lot 1. The area Verve have indicated on the documents previously sent to my father have not been as clear as the documents that were sent to my brother and I only yesterday. So the quality of their consultation is questionable as it appears Verve are only showing the affected land owners what they want to show to suit the approval of the proposal.</p> <p>A letter that accompanied the deed of agreement</p>	<p>statutory buffer, as noise sensitive premises would be permitted to 'encroach' into the 35dB(A) noise contour.</p> <p>It is considered appropriate given the issues raised by the objector that any approval of the Warradarge Wind Farm, both for the construction and operational phases of the project, should be subject to the applicant preparing and adhering to a Noise Management Plan.</p> <p>The Landscape and Visual Impact Assessment prepared by GHD does demonstrate that 80-100 turbines would be visible from Lot 1, however an assertion that that this would restrict and almost eliminate any neighbouring development is considered difficult to substantiate.</p> <p>The applicant was advised of the nature of the objection received and provided with the opportunity to make comment upon the issues raised in Submission 10. The comments of Verve Energy in relation to the specific issues that have been raised are provided in <i>italic font</i> in this comments section.</p> <p><i>"Community consultation and engagement is a critical component of all of our project developments. Verve Energy has actively engaged with all of the surrounding landowners of the proposed Warradarge Wind Farm and presented our plans to the local communities of Eneabba and</i></p>
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Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1			
Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge			
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment
			Recommendation

		<p>sent by Verve, was not very clear in clarifying whether the area that impacts my father's property is to be a 'development buffer' or an 'easement' as both terms were used to describe the area and each having an significant effect on any future development of my father's property. The area of my father's farm impacted is almost the entire property, and from the documents sent yesterday, no other property is affected by this proposal like my father's property is affected.</p> <p>Therefore, I request that you record our total DISAPPROVAL of the proposed Warradarge Wind Farm by Verve Energy. We will be seeking legal advice over the next couple of weeks and request that <u>no approval</u> be given to Verve until all of the affected land owners have been properly consulted and informed of the actual impact of this proposal.</p> <p>We look forward your future consultation regarding this proposed development.</p>	<p>Warradarge.</p> <p>Verve Energy initially met with the owners of Lot 1, Mr Bruno Sorgiovanni and Mrs Carmella Sorgiovanni in November 2011 informing them of the proposed Warradarge Wind Farm. They advised at the time their property was up for sale, to which Verve Energy explained that we were not in a position to purchase land.</p> <p>Since then, Verve Energy has spoken to their other son Mr Ross Sorgiovanni on several occasions and kept him informed of the wind farm development and our intention to enter into a Neighbour Agreement. An agreement was sent to Mr Bruno Sorgiovanni via Mr R. Sorgiovanni mid February 2012 for consideration.</p> <p>Newsletter updates advising of the upcoming March Public Information Sessions were sent to the owner's residence in Forrestdale in February and March 2012. Mr R. Sorgiovanni spoke to me to ask what was at the Public Information Sessions and I advised that I could send through the presentation and offered to meet with any of the owners to share our information we collected from our environmental studies. Following the Public Information Sessions, Verve Energy sent through to Mr R. Sorgiovanni a copy of the presentation that was on display as well as offered to meet to further discuss the project if required.</p>
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Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1			
Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge			
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment
Recommendation			

			<p>We spoke to Mr R. Sorgiovanni last week to advise on the project status and we believed that we were waiting to hear from Mr B. Sorgiovanni's legal advisor about our proposed Neighbour Agreement we issued earlier in the year.</p> <p>The Noise Impact Assessment for the Proposal has been carried out in accordance with Western Australian Planning Bulletin 67 and the Department of Environment and Conservation WA which recommends using the EPA of South Australia "Wind Farms – Environmental noise guidelines – July 2009" as the guidelines for the assessment of wind farms. The Noise Impact Assessment was provided in Annex 4 of the Development Application Report (DAR).</p> <p>The noise limits for new wind farm developments is that the predicted noise level must not exceed the greater of either 35 dB(A) or 5 dB(A) above the background noise at any nearby homes or other noise sensitive receiver premises during night-time hours. The noise limits have been assessed for all nearby lots including Lot 1 and are predicted to be below these levels.</p> <p>The wind farm noise on areas of land on Lot 1 could be greater than either 35 dB(A) or 5 dB(A) above the background noise. It is good practice for Wind Farm proponents to enter Neighbour Agreements to agree that no new homes or other noise sensitive receiver premises will be constructed during the</p>
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Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1 Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge			
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment
			Recommendation

			<p><i>lifetime of the wind farm in these areas. These areas are known as noise buffer areas. In the Neighbour Agreement, it was illustrated that the noise buffer area which corresponds to the extent of predicted noise above 35dB(A), would encompass around a quarter of Lot 1 and not encompass the existing farm house or buildings.</i></p> <p><i>It is our hope that we are still able to achieve a suitable agreement, however, the project has been developed in such a way that we can minimise the impact on Lot 1 if such an agreement cannot be reached. Verve Energy can do this be either:</i></p> <ol style="list-style-type: none"> 1 Relocating the turbines to non optimal locations such that under all scenarios Verve Energy will never exceed the noise limits imposed by the Environmental Protection Authority (EPA) on nearby land. For Lot 1 this would mean moving the turbines away from the eastern boundary towards the centre of the wind farm; or 2 Accepting the commercial risk that if Verve Energy proceeds with the optimal locations for the wind turbines within the project area and if a new house or other noise sensitive property is built near the wind farm, the wind turbines may need to have their output turned down at night to meet the statutory noise limits imposed by the EPA.
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Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1			
Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge			
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment
Recommendation			

			<p><i>Throughout the DAR and public consultation process we have stressed that the wind farm design is flexible and we have presented a worst case scenario in terms of turbine spacing, visual impact and noise. If a Neighbour Agreement cannot be reached with Mr B. Sorgiovanni for Lot 1 Verve Energy will need to consider its options which may include relocating wind turbines away from the north eastern boundary of the wind farm.</i></p> <p><i>Verve Energy welcomes the opportunity to discuss this letter with the Council if required, and reiterate our intention to continue to positively engage with the owner of Lot 1 to reach a mutually beneficial agreement.”</i></p>	
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SUBMISSION 1

From: Lauren Taylor [<mailto:Lauren.Taylor@stateheritage.wa.gov.au>]
Sent: Friday, 3 August 2012 11:25 AM
To: Leonie Quantock
Subject: Attn: David Hadden - Proposed Warradarge Wind Farm

Hi David

Thank you for your referral for the abovementioned proposal, received 23 July 2012.

I wish to advise that we have no comment in relation to the proposal, as it does not appear to impact upon any place of State cultural heritage significance.

Kind regards,

Lauren Taylor
Planning Officer
State Heritage Office
Tel: +61 8 6552 4152
Fax: +61 8 6552 4001
Email: Lauren.Taylor@stateheritage.wa.gov.au
Web: www.stateheritage.wa.gov.au



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SUBMISSION 2

Ms L Marche
280 Kooyong Road
KEWDALE WA 6105

6 August 2012

**By fax and mail – fax number 9952 1173
and by email - admin@coorow.wa.gov.au**

The Chief Executive Officer and all Council Members
Shire of Coorow
Main Street
PO Box 42
COOROW WA 6515

Dear Sir,

**RE: PROPOSED WIND FARM – VERVE ENERGY
IMPACT ON LOT 10854 GARIBALDI WILLIS ROAD, WARRADARGE**

I am writing to inform you that I am now the registered proprietor of Lot 10854 Garibaldi Willis Road, Coorow ("my property"). That property was transferred to me, from my mother Nardia Marche, in June 2012, and I am her Enduring Power of Attorney also.

I refer to the Minutes of Meeting of Council on 18 July 2012, and in particular *Item 10.2.1 Proposed Wind Farm – Lots 10850 & 10853 Garibaldi Willis Road & Lots 1048 & 10851 Rose Thomas Road, Warradarge*, and the Application lodged by Verve Energy to establish this wind farm on the property adjacent to my property. I am writing to both object to this application being granted and to also inform your office of the inconsistencies that have been portrayed by Verve Energy to both your office and that of the EPA.

I am writing to you to inform you and the Council at the next meeting scheduled for 15 August 2012 that I not only object to the application lodged by Verve Energy for the proposed Wind Farm being established at Warradarge but also set out details of my reasons, which should be conveyed to the Council at that meeting, in accordance with the advertising and notice requirements of the relevant legislation.

The proposed wind farm will adversely affect not only the value but also the only possible use available to me for my property. As you will no doubt be aware, my property although located in a rural precinct is not able to be used for farming

purposes because the entire 5000 acres comprises of natural vegetation and/or remnant bush land. My property has not been able to be used for agricultural purposes for the last twenty years and unless the current legislation is over turned, it is unlikely that it could be farmed during the course of the next twenty years. That is the laws in place prohibiting clearing of land, whether it be natural vegetation or regrowth bush, prevents me from clearing my property. Therefore the only conceivable use for my property is that of a "lifestyle" property, attributable to its seclusion, peace, tranquillity, flora and fauna.

However, if the proposed wind farm proceeds the only use available to me for my property will not only be lost but the value of my property will be devalued for the entire duration of the wind farm, some 20 to 25 years. The placement of the wind turbines on the adjacent property (Lot 10853) will destroy the visual and aesthetic qualities of my property and will also hinder any possibility of living on my property due to the noise from the wind turbines being a nuisance and interfering with the peace and tranquillity of my property.

I am extremely concerned that the documentation submitted by Verve Energy to the Environmental Protection Authority (and to the Shire of Coorow), has misrepresented my property as being "cleared agricultural/rural" land when almost the entire 5000 acres is natural vegetation/nature reserve. A fact that has been conveyed to Verve Energy on several occasions

Over the years my property has been enjoyed as a "lifestyle/recreational" parkland with extended family and friends frequently camping and caravanning at the shed located on my property, which has been shown as a "non-residence". Verve Energy are aware that the shed is where we stay when we camp at my property but did not mention this in their application, probably because the shed is right in the middle of their noise buffer zone.

Further, if the proposed wind farm proceeds any prospect of an economically future tourism development on my property will be rendered impossible. The visual landscape of my property will be adversely affected by the location of the 100 turbines. I note that from the documentation lodged by Verve Energy my property is the only property upon which between 80 to 100% of the turbines will be seen/viewed at all times.

The estimated noise implications for my property (as shown in the documentation lodged with the application) indicate that noise attenuation of between 39 dB at my boundary fence which adjoins Lot 10853, will also impact across the entire length and breadth of my property, with an estimate of 25dB at the opposite boundary fence. The noise alone is going to adversely affect the use and enjoyment of my

property. From information available about existing wind farms it is likely that the noise impact could be far greater once the turbines are in full operation and during various weather conditions, which will put off anyone from wanting to sleep over at my property, let alone stay there during day light hours. Not to mention possible health concerns being another issue altogether.

When the previous owners (my parents) lodged an application for permission to clear my property in about 2010 with the Department of Environment and Conservation, the DEC expressed concern about possible interference with the breeding habitats of the natural wildlife and birds inhabiting my property in particular mention was made of the endangered Carnaby's Black Cockatoos. No consideration whatsoever has been given by Verve Energy as to how the wind farm will affect the fauna and bird life on my property. Environmental impact studies for noise, landscape & visual, and flora & fauna, particularly in relation to Lot 10854, (that is, my property) have to be undertaken prior to the application for construction of the Warradarge Wind Farm Proposal being approved.

From the documentation provided by Verve Energy, my property – not being a participant in the wind farm, is the only property that will be greatly affected by the noise, land and visual impacts of the wind farm.

For the record, neither my mother, nor my father nor myself have agreed to enter into any Noise Neighbour Agreement or any other agreement with Verve Energy, nor have we consented to the Wind Farm being proposed.

A copy of this letter has been faxed and emailed to your office and the original has been posted to ensure that the letter arrives by the closing date (which I note is 10 August 2012), and in time for the Council Meeting on 15 August 2012.

I look forward to hearing from you once council have considered the contents of this letter.

Yours faithfully,



.....
Liana Marche

APPLICANT RESPONSE TO SUBMISSION 2



Our Ref: DMS#3477122
Enquiries: James Townsend
Telephone: (08) 9424 1889 / 0417 644 218
Email: james.townsend@verveenergy.com.au

10 August 2012

Mr Darren Friend
Chief Executive Officer
Shire of Coorow
PO Box 42
Coorow WA 6515

Dear Sir,

RE: DEVELOPMENT APPLICATION – PROPOSED WARRADARGE WIND FARM

Thank you for the opportunity to provide further information to the Council following the correspondence your office received from Ms Liana Marche, owner of Lot 10854, who is adjacent and to the south of Verve Energy's proposed Warradarge Wind Farm.

There are a number of points raised in Ms Marche's letter on which we would like to provide some clarification to the Council. These points have been collated into a table and attached to this letter with our clarifying comments. It should be noted that the points raised by Ms Marche are detailed in the Development Application Report (DAR) that was submitted by Verve Energy for this project and this table points to the location of this information in the DAR.

Verve Energy is a leading renewable energy developer in Western Australia having developed commercial wind farm projects in the State since 1987 when it built Australia's first wind farm at Salmon Beach near Esperance. Verve Energy is accountable for achieving industry best practice in the identification, selection and development of wind farm projects that balance the social, environmental and commercial drivers of a project and is highly regarded for its success. The proposed Warradarge Wind Farm project is no exception. Verve Energy has selected the project site using best practice techniques to identify a site with:

- Cleared and grazed pastures such that remnant vegetation disturbance can be minimised;
- A suitable wind resource;
- The potential for the wind farm to be sized such that economies of scale can be realised;
- Cost effective electrical connection access to the 330kV transmission network;

- Suitable landownership and usage patterns including sufficient distance from permanent habitable premises;
- A high level of social acceptance for a prospective wind farm; and
- Ease of construction.

Community consultation and engagement is a critical component of all of our project developments. Verve Energy has actively engaged with all of the surrounding landowners of the proposed Warradarge Wind Farm and presented our plans to the local communities of Eneabba and Warradarge. Verve Energy has spoken and met with Ms Marche's father (Mr Eric Marche) on several occasions and kept him informed of the wind farm development and our intention to enter into a Good Neighbour Agreement. It is our hope that we are still able to achieve a suitable agreement, however, the project has been developed in such a way that we can minimise the impact on the Marche property (Lot 10854) if such an agreement cannot be reached.

Verve Energy intends to negotiate Good Neighbour Agreements with all relevant neighbours of the wind farm. Should a Good Neighbour Agreement not be reached with Ms Marche for Lot 10854, or any other landowner for that matter, Verve Energy will consider:

1. Relocating the turbines to non optimal locations such that under all scenarios Verve Energy will never exceed the noise limits imposed by the Environmental Protection Authority (EPA) on the adjoining land. For Lot 10854 this would mean moving the turbines away from southern boundary towards the centre of the wind farm; or
2. Accepting the commercial risk that if Verve Energy proceeds with the optimal locations for the wind turbines within the project area and if a new house or other noise sensitive property is built near the wind farm, the wind turbines may need to have their output turned down at night to meet the statutory noise limits imposed by the EPA.

Throughout the DAR and public consultation process we have stressed that the wind farm design is flexible and we have presented a worst case scenario in terms of turbine spacing, visual impact and noise. If a Good Neighbour Agreement cannot be reached with Ms Marche for Lot 10854 Verve Energy will need to consider its options which may include relocating wind turbines away from the Northern boundary of her property.

Verve Energy welcomes the opportunity to discuss this letter and its attachment with the Council if required, and reiterate our intention to continue to positively engage with the owner of Lot 10854 to reach a mutually beneficial agreement,

Yours Sincerely



JAMES TOWNSEND
SENIOR PROJECT DEVELOPER

Concern raised by Ms L Marche	Verve Energy response with reference to relevant section(s) in Development Application Report
<p>I am extremely concerned that the documentation submitted by Verve Energy to the Environmental Protection Authority (and to the Shire of Coorow), has misrepresented my property as being "cleared agricultural/rural" land when almost the entire 5000 acres is natural vegetation/nature reserve. A fact that has been conveyed to Verve Energy on several occasions</p>	<p>Figures 4 and 6 in the Development Application Report show Lot 10854 is predominantly vegetated. Verve Energy does not believe the Development Application Report shows it is "cleared agricultural/rural" land. Additionally, although Lot 10854 has a good wind resource, in our site selection process as discussed in section 1.8, we sought to select land that minimised any vegetation clearing.</p>
<p>Over the years my property has been enjoyed as a "lifestyle/recreational" parkland with extended family and friends frequently camping and caravanning at the shed located on my property, which has been shown as a "non-residence". Verve Energy are aware that the shed is where we stay when we camp at my property but did not mention this in their application, probably because the shed is right in the middle of their noise buffer zone.</p>	<p>Verve Energy is aware that the land owners of Lot 10854 do use their existing shed for occasional residential purposes as shown in Figure 17.</p> <p>We have also assessed this location as a potential house labelled Receiver Point 12 in the Noise Impact Assessment, Annex 4. It is shown that the wind turbines will comply with the limits at this point.</p>
<p>Further, if the proposed wind farm proceeds any prospect of an economically future tourism development on my property will be rendered impossible. The visual landscape of my property will be adversely affected by the location of the 100 turbines. I note that from the documentation lodged by Verve Energy my property is the only property upon which between 80 to 100% of the turbines will be seen/viewed at all times.</p>	<p>Verve Energy has shown in Figures 5 and 6 of the LVI/A report (Annex 2) a Zone of Theoretical Visibility (ZTV) of the potential wind turbine layout. If that layout were adopted, there are a number of surrounding properties from which, theoretically, between 80% and 100% of the turbines could be visible. It is also noted that this ZTV is theoretical only, and does not take into account existing built form and vegetation which may provide screening.</p> <p>The Development Application Report states-</p> <p><i>4.2.7 A Zone of Theoretical Visibility ("ZTV") for both tip and hub height has been produced for the Proposal and these are shown in Figures 5 and 6 in Annex 2. A ZTV is the area around a designated point in the landscape from which that point is visible. It is calculated using elevation data such as a Digital Elevation Model and does not take account of buildings or vegetation</i></p>

	<p>screening. It represents a worst case view of how many turbines or blade tips can be seen at the location.</p> <p>4.2.8 Figures 5 and 6 in Annex 2 shows the turbines that are visible from the hub (100m) upwards and the tip height (152m). These figures show that beyond 10km from the wind farm the number of turbines visible to the west reduces to zero except on a few elevated areas. In areas to the south and north the turbines are theoretically visible out to 15km, beyond which it they are only seen in isolated areas. To the west the tips of the turbines are theoretically visible to 25km except in lower areas of the landform but it can be seen that the hubs are not as visible beyond 15km, and this is due to the screening effect of the topography.</p> <p>4.2.9 In should be noted that the ZTV is a tool to assess theoretical visibility only and that vegetation and built structures will influence what is actually visible from various locations. It is for this reason that a number of viewpoints are selected to represent what the actual change of view will be and these are shown as photomontages. The viewpoints are selected in areas that theoretically have a view of at least 80% of the wind turbines.</p>
<p>The estimated noise implications for my property (as shown in the documentation lodged with the application) indicate that noise attenuation of between 39 dB at my boundary fence which adjoins Lot 10853, will also impact across the entire length and breadth of my property, with an estimate of 25dB at the opposite boundary fence. The noise alone is going to adversely affect the use and enjoyment of my property. From information available about existing wind farms it is likely that the noise impact could be far greater once the turbines are in full operation and during various weather conditions, which will put off anyone from wanting to sleep over at my property, let alone stay their during day light hours. Not to mention possible health concerns being another issue altogether.</p>	<p>The Noise Impact Assessment has been carried out in accordance with Western Australian Planning Bulletin 67 and the Department of Environment and Conservation WA which recommends using the EPA of South Australia "Wind Farms – Environmental noise guidelines – July 2009" as the guidelines for the assessment of wind farms. The Noise Impact Assessment was provided in Annex 4 of the DAR.</p> <p>The noise limits for new wind farm developments is that the predicted noise level must not exceed the greater of either 35 dB(A) or 5 dB(A) above the background noise at any nearby homes or other noise sensitive receiver premises during night-time hours. The noise limits have been assessed for all nearby lots including Lot 10854 and are predicted to be below these levels at</p>

	<p>the existing sheds. The wind farm complies with the noise limits at the current sheds which were given the same importance as a house.</p> <p>The wind farm noise on areas of vegetated land of Lot 10854 closer to the turbines than the sheds could be greater than either 35 dB(A) or 5 dB(A) above the background noise. It is good practice for Wind Farm proponents to enter Good Neighbour Agreements to agree that no new homes or other noise sensitive receiver premises will be constructed during the lifetime of the wind farm in these areas. These areas are known as noise buffer areas.</p>
<p>Environmental impact studies for noise, landscape & visual, and flora & fauna, particularly in relation to Lot 10854, (that is, my property) have to be undertaken prior to the application for construction of the Warradarge Wind Farm Proposal being approved.</p>	<p>Verve Energy conducted a Noise Impact Assessment, Background Noise Monitoring, Flora, Vegetation and Fauna Assessment and a Landscape and Visual Impact Assessment (LVIA) on the proposed wind farm development site. The noise assessments and LVIA considers the impact on adjacent properties, however, a flora and fauna survey was not conducted on Lot 10854 as Verve Energy does not propose to clear any vegetation on that land.</p> <p>The Development Application Report states-</p> <p><i>4.3.1 Biota Environmental Sciences undertook a Flora, Vegetation and Fauna Assessment of the wind farm envelope and a possible transmission line route. This comprised a desktop review, field survey and flora specimen identification and this report is provided in Annex 3. The field survey was conducted over two trips in the October and November of 2011 and comprised a total of 12 days. The land area of the wind farm envelope and area of transmission line corridor is 5,010 hectares, Biota surveyed 3,650 hectares of land which was the entire wind farm envelope and one possible line route within the transmission line corridor.</i></p> <p><i>4.4.3 Verve Energy engaged specialist consultant Herring Storer Acoustics ("HSA") to undertake Noise Impact Assessment for the Warradarge Wind Farm. A prediction of worst case noise propagation from the proposed wind</i></p>

	<p><i>farm was undertaken and background noise measurements undertaken. The Noise Impact Assessment is in Annex 4. The background noise measurements took place over 6 weeks and the results of these have set the noise limits to be applied to nearby noise sensitive premises such as residential properties, this report is in Annex 5.</i></p> <p><i>4.2.2 Following the initial wind farm design, GHD have undertaken a landscape and visual impact assessment and this is attached in Annex 2. The assessment covers a 25km radius study area from the Proposal and it investigates the various effects the wind farm has on the landscape and people in the study area at seven different publicly accessible locations.</i></p> <p><i>4.2.3 To assess the Proposal, the wind farm is designed with the greatest likely footprint and the north-south/east-west extents are shown as spaced across the greatest amount of overall land area within the wind farm envelope, as shown in Figures 5 and 6. This is deemed the worst case design from a visual point of view.</i></p> <p><i>4.2.4 As such, the width of any view of the wind farm is greatest from any viewpoint. Therefore, smaller or fewer number of turbines within the wind farm envelope or 100 turbines located in different locations within the wind farm envelope are also encompassed by the assessment.</i></p>
<p>For the record, neither my mother, nor my father nor myself have agreed to enter into any Noise Neighbour Agreement or any other agreement with Verve Energy, nor have we consented to the Wind Farm being proposed.</p>	<p>Verve Energy has not stated at any point that a Good Neighbour (noise buffer) Agreement has been signed with the land owner of Lot 10854. However such an agreement has been among the topics discussed at meetings with Mr Eric Marche</p> <p>Verve Energy commenced discussions with various land owners on 16 June 2011 regarding the proposed wind farm and the potential for a noise buffer (if applicable).</p> <p>Verve Energy met Mr Eric Marche in June 2011, November 2011 and in June</p>

2012, with various correspondence and conversations in between. During this time a draft agreement was presented for consideration and a counter proposal received. Verve Energy is open to continuing discussions with the owner of Lot 10854 to come to a mutually beneficial agreement if common ground can be found. However, should an agreement not be reached for Lot 10854, Verve Energy will consider either relocating turbines away from the boundary of Lot 10854 or accepting that there is a commercial risk that if a house or noise sensitive premises is constructed on nearby land in the future that the turbines may need to be limited to reduce their noise to comply with noise regulations at these new premises.

The Development Application Report states-

1.9.4 Verve Energy is negotiating wind farm neighbour agreements with the owners of adjacent Lots (Lots 10849, 10854, 10877, & 10878) to ensure the areas of these lots where the wind farm will be generating noise exceeding 35dB(A) or 5dB(A) above background noise, whichever is greater, will not cause any conflict with any possible future noise sensitive premises.

1.9.5 It should be noted that the final design of the wind farm and its capacity will be dependent on these agreements. Should one or more wind farm neighbour agreements not be reached this will not affect the ability to operate a wind farm, only the position and overall number of turbines within the wind farm envelope. This is discussed more fully in Chapter 4.

SUBMISSION 3A



DEVELOPMENT APPLICATION SUBMISSION FORM

**PROPOSED WARRADARGE WIND FARM & TRANSMISSION LINE
LOTS 10850 & 10853 GARIBALDI WILLIS ROAD & LOTS 10847, 10848 &
10851 ROSE THOMSON ROAD, WARRADARGE**

Name: DAVID JONAS

Postal Address: LOCKED BAG 2525 PERTH WA 6001

Phone Number: (08) 6224 6268

SUBMISSION: ☐ Support ☐ Object ☐ Indifferent

Please give in full your comments and any arguments supporting your comments
(if insufficient space, please attach additional sheets) -

* TELSTRA REQUIRES MORE TIME TO ASSESS THIS PROPOSAL *

AN ENGINEERING STUDY NEEDS TO BE UNDERTAKEN TO
ASSESS THE IMPACT TO OUR NETWORK. AS YOU CAN
APPRECIATE THIS IS NOT A TRIVIAL EXERCISE. AS SUCH
WE WILL REQUIRE 6WKS TO COMPLETE THIS TASK.
THANK YOU FOR YOUR UNDERSTANDING.

PLEASE FEEL FREE TO CONTACT ME IF YOU WISH
TO DISCUSS THIS FURTHER. THANKS.

REMARKS,
[Signature] Date: 6/8/2012

Please return to either: Chief Executive Officer
Shire of Coorow
PO Box 238
LEEMAN WA 6514

Chief Executive Officer
Shire of Carnamah
PO Box 80
CARNAMAH WA 6517

NOTE: The local government in determining the application will take into account the submissions received but is not obliged to support those views.

Submissions Close: 4pm Friday 10 August 2012

SUBMISSION 3B

From: Jonas, David R [mailto:David.Jonas@team.telstra.com]
Sent: Friday, 10 August 2012 3:21 PM
To: Simon Lancaster
Cc: MRS@coorow.wa.gov.au; Kathryn Jackson
Subject: RE: Warradarge Wind Farm - Shire of Coorow

Simon,

I have been in contact with Verve Energy and they have provided me with a comprehensive feasibility report and that has put my mind at ease to some extent. Whilst it does cover our radio sites we have a country exchange located about 2.5 km from the south west corner of the wind farm area. It is not a radio site but I am still concerned about induced noise and more importantly induced EMF from the wind farm.

I will have our design team check the impact to our country exchange and also verify the findings of the report. Unfortunately they will not be able complete this investigation by CoB today.

As I don't have the time to complete a engineering impact study I do not feel comfortable stating that I have no objections to the development.

It is unfortunate that circumstances have prevented me from having more time to investigate this development proposal.

Regards,



David Jonas Area Planning Manager WA
Area Planning WA | Fixed & Data Access Engineering | Telstra Operations
P 08 6224 6268 | M 0438 934 894 | E david.jonas@team.telstra.com | W www.telstra.com

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SUBMISSION 4



Government of Western Australia
Department of Environment and Conservation

Your ref. A1492/A1493 DH/GM
Our ref. 32709
Enquiries Liz Rushforth
Telephone: 08 9652 1911
Fax. 08 9652 1922
Email: elizabeth.rushforth@dec.wa.gov.au

Mr Dave Hadden
Manager Regulatory Services
Shire of Coorow
PO Box 42
COOROW WA 6515

Dear Mr Hadden

APPLICATION NO A1492/A1493 DH/GM – PROPOSED WARRADARGE WIND FARM

Thank you for your letter of 19 July 2012 regarding the above application.

The Department of Environment and Conservation (DEC) is unable to provide comment at this time. In providing advice DEC would need to refer to the Office of Environmental Protection Authority (EPA) who is the lead environmental agency for this application. DEC would need to take into account the Office of EPA comments and recommendations for this project, and unfortunately they are yet to assess this application.

Yours sincerely

Nigel Sercombe
REGIONAL MANAGER
Midwest Region

9 August 2012

SUBMISSION 5



DEVELOPMENT APPLICATION SUBMISSION FORM

**PROPOSED WARRADARGE WIND FARM & TRANSMISSION LINE
LOTS 10850 & 10853 GARIBALDI WILLIS ROAD & LOTS 10847, 10848 &
10851 ROSE THOMSON ROAD, WARRADARGE**

Name: DEPT OF TRANSPORT

Postal Address: PO BOX 68 GERALDTON WA 6531

Phone Number: (08) 99560110

SUBMISSION: ☒ Support ☐ Object ☐ Indifferent

Please give in full your comments and any arguments supporting your comments
(if insufficient space, please attach additional sheets) -

The proposal for the Warradarge Wind Farm will have a positive impact on the sustainability of the State should it go ahead. The Dept of Transport supports the idea even though we will not have any direct involvement in the development.

Signature: V McCrory Date: 13.8.12

Please return to either: Chief Executive Officer
Shire of Coorow
PO Box 238
LEEMAN WA 6514

Chief Executive Officer
Shire of Carnamah
PO Box 80
CARNAMAH WA 6517

NOTE: The local government in determining the application will take into account the submissions received but is not obliged to support those views.

Submissions Close: 4pm Friday 10 August 2012

SUBMISSION 6

Enquiries: Naomi Mynott on 08 9956 1205
Our Ref: 06/1393
Your Ref: A1492/A1493 DH/GM

9 August 2012

Chief Executive Officer
Shire of Coorow
PO Box 238
LEEMAN WA 6514

ATTENTION: MR D HADDEN, MANAGER REGULATORY SERVICES

Dear Sir

PROPOSED WARRADARGE WIND FARM & TRANSMISSION LINE

Thank you for consulting Main Roads Western Australia (MRWA) on the proposed development of a wind farm at Warradarge. We have had the opportunity to review the submitted details comprising the Development Application Report (dated June 2012) and supporting plans and reports and have the following comments to make.

MRWA supports the provision of renewable energy developments and is satisfied that principle of the development in this location would be acceptable.

Notwithstanding the above, MRWA has some concerns over potential impacts of the proposal on the Main Roads network as a result of the type and number of additional vehicle movements generated, particularly in association with the construction and decommissioning stages. It is considered, however, that the production of a Traffic Management Plan including condition surveys would address MRWA concerns regarding:

- Ability of route and intersection to accommodate volume and nature of traffic. This would be resolved through the identification and subsequent implementation of upgrades as necessary; and
- Potential for damage at intersections and repair of any damage associated with development construction/decommissioning, which would be addressed by the Dilapidation/Condition part of the Plan.

Furthermore, it is considered that the wording of the conditions set out in the email from Simon Lancaster (dated 6 August 2012) would satisfactorily protect the interests and assets of MRWA, although we would suggest that the wording of condition X is expanded to clarify that all 'costs' would include, inter-alia, those in relation to surveys to establish the conditions together with any costs associated with the design, construction and maintenance (over a specified defect liability period) of identified required upgrades.

In addition to the conditions and advice set out within the aforementioned email, we would request that the following advice is also offered to the proponent:

- Any signs or additional markings on or visible from the Main Road will require the approval of MRWA's Mid West Network Operations Manager, Peter Herbert, who can be contacted on 08 9956 1208

If you require any further information please contact Naomi Mynott on 08 9956 1205.

Yours faithfully

Bernie Miller
REGIONAL MANAGER MID WEST REGION

SUBMISSION 7

watercorporation.com.au

Mid West Region

45 Cathedral Avenue
Geraldton WA 6530

PO Box 43
Geraldton WA 6531

Faults, Emergencies and Security 13 13 75

Account Enquiries 13 13 85

Building and Subdivision 13 13 95

ADMOS19 ICR125547

Your Ref: A1492/A1493 DH/GM
Our Ref: GN1 2002 00033 V01 DOC 7393402
Enquiries: Phil Gale
Direct Tel: 08 9923 4942
Fax: 08 9923 4966

15 AUG 2012



13 August 2012

Shire Of Coorow
PO BOX 42
COOROW WA 6515

Attention: Dave Hadden

**SHIRE OF COOROW
LOTS 10850, 10853, 10848 & 10851 GARIBALDI WILLIS & ROSE THOMSON RDS
WARRADARGE - WARRADARGE WIND FARM**

I refer to your letter of 19 July 2012 regarding the above proposed Wind Farm in Warradarge.

The Water Corporation has no facilities in this area and there are no objections to this development proposal.

Should you have any queries, please do not hesitate to contact the Enquiries Officer.

A handwritten signature in black ink that reads "Phil Gale".

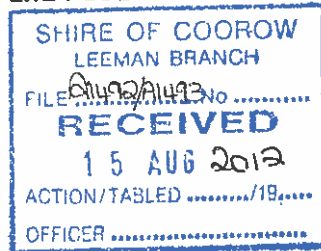
PHIL GALE
LAND SERVICING CONSULTANT
DEVELOPMENT SERVICES



Government of Western Australia
Department of Agriculture and Food



Chief Executive Officer
Shire of Coorow
PO Box 238
LEEMAN WA 6514



Your Ref: A1492/A1493 DH/GM
Our Ref: GE100173V1
Enquiries: A. Stuart-Street
Date: 9 August 2012

Dear Sir

Re: PROPOSED WARRADARGE WIND FARM

Thank you for the opportunity to comment on the Proposed Warradarge Wind Farm. The Department of Agriculture and Food (DAFWA) does not have any objection to the Wind Farm, but would like to offer the following comments:

Page one of the Draft Environmental Management Plan (sections 1.1.10 and 1.1.11) discusses issues with Weed hygiene. The declared weed Paterson's Curse is raised in the report, but no mention is made of Skeleton Weed. This is another significant declared weed which has been identified in the vicinity of the wind farm site (both to the east and west of the proposed wind farm location), if not actually on the site. The site is considered to be at moderate risk for infestation.

Weed management standards need to be maintained in all aspects of the project throughout its life. This is important to ensure a minimal biosecurity risk for the land owner, the adjoining farms and along the transport route. See the attached link to DAFWA's website for further information about Biosecurity guidelines.
http://www.agric.wa.gov.au/PC_93003.html?s=700803442.

The site in question is dominated by deep sands and gravelly soils and much of the area is subject to a very high risk of wind erosion. These issues appear to have been addressed in the Draft Environmental Management Plan under Topsoil management and rehabilitation; and Dust suppression; in sections 1.1.20 to 1.1.24.

I trust these comments inform the Council's decision on this matter. If you need specific advice on biosecurity issues please contact Dave Lisle on (08) 9956 8569. If you have queries regarding other comments, please contact Angela Stuart-Street on (08) 9956 8547.

Yours sincerely,

Pam l'Anson
Acting Regional Director
Northern Agricultural Region

ADM0519

ICR125558



Government of Western Australia
Department of Water



Your Ref: ADM0519
Address: All our water needs

Our Ref: RF6388

Enquiries: Ms Kerry Wray

(08) 9965 7400

Manager Regulatory Services
Shire of Coorow
PO Box 42
COOROW WA 6515

Attn: Manager Regulatory Services

Dear Dave

PROPOSED WARRADARGE WIND FARM

Thank you for the referral of the above proposal dated 19 July 2012. The Department of Water (DoW) has assessed the proposal and provides the following advice and recommendations.

The subject land is located within the Hill River and Tributaries Catchment surface water area as proclaimed under the Rights in Water and Irrigation Act (1914). Any taking or diversion of surface water for purposes other than stock/domestic, and any interference with the bed or banks of a watercourse in this proclaimed area will require a permit from the DoW.

Several small tributaries of the Hill River system traverse the subject land. It is recommended that the Shire of Coorow require the proponent to ensure that all road crossings over waterways are to be designed and constructed to minimise detrimental impact on the waterways form and function. It is also recommended that the proponent be required as a condition of approval to ensure that works do not encroach into the standard 30m foreshore buffer area on both banks of all waterways.

The land is also located within the Arrowsmith groundwater area as proclaimed under the Rights in Water and Irrigation Act (1914). The applicant should be advised to ensure that all landowners have been consulted regarding potential impacts to private bores.

In general, the Draft Environmental Management Plan provided adequately addresses other water management issues, such as stormwater management and contamination risks. If you wish to discuss this issue further please contact the Mid West Gascoyne Region office on (08) 9965 7400.

Yours sincerely

Katherine Tutt
Program Manager
Mid West Gascoyne

August 15, 2012

SUBMISSION 10

From: Sam Sorgiovanni [mailto:Sam.Sorgiovanni@Kwinana.wa.gov.au]
Sent: Tuesday, 21 August 2012 4:13 PM
To: Simon Lancaster; MRS@coorow.wa.gov.au
Cc: 'rosss@stockerpreston.com.au'
Subject: Proposed Warradarge Wind Farm
Importance: High

Dear Mr. Lancaster and Mr. Hadden

I am responding on behalf of my father Mr. Bruno Sorgiovanni, Owner of Lot 1 Garrabaldi-Willis Road Warradarge, in relation to the proposed Warradarge wind farm.

Firstly we wish to express our disappointment with the lack of consultation by the shire to the affected land owners impacted by the proposed development considering it is probably the largest financial development in the Shire. My parents have not received any correspondence from the shire regarding this issue and seeking their comment. We were also not advised of the public consultation period by either the Shire of Coorow or Verve energy.

Also I hope you appreciate that having received the 18 emails only late yesterday afternoon, we have not had sufficient time to read everything that was sent to us. However, from what we have read, it shows that our fathers property is significantly impacted by the proposed development a lot more than what was explained to him or us by Verve.

The proposed wind farm development will impact my fathers property by:-

1. Restricting and almost eliminating any future development of the property. As discussed with Mr. Hadden yesterday, we have had 2 companies over the last few years interested in the property. One was for setting up chalets for eco tourism for wild flowers and farm stays and the other was for a cattle feed lot. Both proposals would have required construction of accommodation to house guests or workers. Neither of these interested parties would look this option now if a buffer/easement is on the property to the magnitude that Verve is intending.
2. Significantly impacting any future sale of the property and commercial value to potential buyers.
3. Ruining the aesthetics of the area and creating an unsightly visual impact.
4. Destroying the peace and tranquility of the local area during the construction

I have decided to provide our comment via email as my father would like his opposition to the proposal tabled at the upcoming DAP meeting and forwarded to the councilors and any upcoming development approval committee that is to assess this proposal.

The only correspondence my father has received in the past 6 months is a very onerous and binding deed of agreement with an unacceptable offer considering the significant impact the proposed development has on my fathers property and any future or potential development of Lot 1. The area Verve have indicated on the documents previously sent to my father have not been as clear as the documents that were sent to my brother and I only yesterday. So the quality of their consultation is questionable as it appears Verve are only showing the affected land owners what they want to show to suit the approval of the proposal.

A letter that accompanied the deed of Agreement sent by Verve, was not very clear in clarifying whether the area that impacts my fathers property is to be a 'development buffer' or an 'easement' as both terms were used to describe the area and each having an significant effect on any future development of my fathers property. The area of my fathers farm impacted is almost the entire

property, and from the documents sent yesterday, no other property is affected by this proposal like my fathers property is affected.

Therefore, I request that you record our Total DISAPPROVAL of the proposed Warradarge wind farm by Verve energy. We will be seeking legal advice over the next couple of weeks and request that no approval be given to Verve until all of the affected land owners have been properly consulted and informed of the actual impact of this proposal.

I request that any future correspondence regarding my fathers property be addressed to:-

Mr. Bruno Sorgiovanni
250 Anstey Road
Forrestdale WA 6112

We look forward your future consultation regarding this proposed development.

Yours Sincerely

Sam Sorgiovanni

APPLICANT RESPONSE TO SUBMISSION 10



Our Ref: DMS#3480956
Enquiries: James Townsend
Telephone: (08) 9424 1889 / 0417 644 216
Email: james.townsend@verveenergy.com.au

23 August 2012

Mr Darren Friend
Chief Executive Officer
Shire of Coorow
PO Box 42
Coorow WA 6515

Dear Sir,

RE: DEVELOPMENT APPLICATION – PROPOSED WARRADARGE WIND FARM

Thank you for the opportunity to provide further information to the Council following the correspondence your office received from Mr Sam Sorgiovanni on behalf of the owner (his father, Mr Bruno Sorgiovanni) of Lot 1, to the east of Verve Energy's proposed Warradarge Wind Farm.

There are some points raised in Mr S. Sorgiovanni's letter on which we would like to provide some clarification to the Council.

Previous Consultation

Community consultation and engagement is a critical component of all of our project developments. Verve Energy has actively engaged with all of the surrounding landowners of the proposed Warradarge Wind Farm and presented our plans to the local communities of Eneabba and Warradarge.

Verve Energy initially met with the owners of Lot 1, Mr Bruno Sorgiovanni and Mrs Carmella Sorgiovanni in November 2011 informing them of the proposed Warradarge Wind Farm. They advised at the time their property was up for sale, to which Verve Energy explained that we were not in a position to purchase land.

Since then, Verve Energy has spoken to their other son Mr Ross Sorgiovanni on several occasions and kept him informed of the wind farm development and our intention to enter into a Neighbour Agreement. An agreement was sent to Mr Bruno Sorgiovanni via Mr R. Sorgiovanni mid February 2012 for consideration.

Newsletter updates advising of the upcoming March Public Information Sessions were sent to the owner's residence in Forrestdale in February and March 2012. Mr R. Sorgiovanni spoke to me to ask what was at the Public Information Sessions and I advised that I could send through the presentation and offered to meet with any of the owners to share our information we collected from our environmental studies. Following the Public Information Sessions, Verve Energy sent through to Mr R. Sorgiovanni a copy of the presentation that was on display as well as offered to meet to further discuss the project if required.

We spoke to Mr R. Sorgiovanni last week to advise on the project status and we believed that we were waiting to hear from Mr B. Sorgiovanni's legal advisor about our proposed Neighbour Agreement we issued earlier in the year.

Neighbour Agreement

The Noise Impact Assessment for the Proposal has been carried out in accordance with Western Australian Planning Bulletin 67 and the Department of Environment and Conservation WA which recommends using the EPA of South Australia "Wind Farms – Environmental noise guidelines – July 2009" as the guidelines for the assessment of wind farms. The Noise Impact Assessment was provided in Annex 4 of the Development Application Report (DAR).

The noise limits for new wind farm developments is that the predicted noise level must not exceed the greater of either 35 dB(A) or 5 dB(A) above the background noise at any nearby homes or other noise sensitive receiver premises during night-time hours. The noise limits have been assessed for all nearby lots including Lot 1 and are predicted to be below these levels.

The wind farm noise on areas of land on Lot 1 could be greater than either 35 dB(A) or 5 dB(A) above the background noise. It is good practice for Wind Farm proponents to enter Neighbour Agreements to agree that no new homes or other noise sensitive receiver premises will be constructed during the lifetime of the wind farm in these areas. These areas are known as noise buffer areas. In the Neighbour Agreement, it was illustrated that the noise buffer area which corresponds to the extent of predicted noise above 35dB(A), would encompass around a quarter of Lot 1 and not encompass the existing farm house or buildings.

It is our hope that we are still able to achieve a suitable agreement, however, the project has been developed in such a way that we can minimise the impact on Lot 1 if such an agreement cannot be reached. Verve Energy can do this be either:

1. Relocating the turbines to non optimal locations such that under all scenarios Verve Energy will never exceed the noise limits imposed by the Environmental Protection Authority (EPA) on nearby land. For Lot 1 this would mean moving the turbines away from the eastern boundary towards the centre of the wind farm; or
2. Accepting the commercial risk that if Verve Energy proceeds with the optimal locations for the wind turbines within the project area and if a new house or other noise sensitive property is built near the wind farm, the wind turbines may need to have their output turned down at night to meet the statutory noise limits imposed by the EPA.

Throughout the DAR and public consultation process we have stressed that the wind farm design is flexible and we have presented a worst case scenario in terms of turbine spacing, visual impact and noise. If a Neighbour Agreement cannot be reached with Mr B. Sorgiovanni for Lot 1 Verve Energy will need to consider its options which may include relocating wind turbines away from the north eastern boundary of the wind farm.

Verve Energy welcomes the opportunity to discuss this letter with the Council if required, and reiterate our intention to continue to positively engage with the owner of Lot 1 to reach a mutually beneficial agreement,

Yours Sincerely



JAMES TOWNSEND
SENIOR PROJECT DEVELOPER



Form 1 - Responsible Authority Report (Regulation 12)

Application Details:	Warradarge Wind Farm Transmission Line
Property Location:	Lots 10847 & 10848 Rose Thomson Road, Warradarge
DAP Name:	Mid West Joint Development Assessment Panel
Applicant:	Verve Energy
Owner:	Judeen Nominees Pty Ltd
LG Reference:	ADM0273
Responsible Authority:	Shire of Carnamah
Authorising Officer:	Simon Lancaster
Application No and File No:	DP 12/00624
Report Date:	24 August 2012
Application Receipt Date:	6 June 2012
Application Process Days:	58 days
Attachment(s):	Attachment 1 - Location Plan (Drawing No.WAW-AA-GA-G/002 SH001) Attachment 2 - Site Plan overlaid upon Aerial Photograph (Drawing No. WAW-AA-GA-G/001 SH001) Attachment 3 – Transmission Line Tower Elevation Plan (Drawing No. WAW-SS-PT-E/001 SH001) Attachment 4 – Development Area Plan (Drawing No. WAW-AA-GA-G/001 SH003) Attachment 5 - Photomontage from both Garibaldi Willis Road (Drawing No.61-27826-SK004) and Rose Thomson Road (Drawing No.61-27826-SK006) Attachment 6 - Schedule of Submissions Attachment 7 - Copy of Submissions

Recommendation:

That the Mid West Joint Development Assessment Panel resolves to **Approve** DAP Application reference DP12/00624 submitted by Verve Energy to develop the Warradarge Wind Farm 330kV transmission line upon Lots 10847 & 10848 Rose Thomson Road, Warradarge as received by the Shire of Carnamah on 6 June 2012 and accompanying plans (WAW-AA-GA-G/001 SH001, WAW-AA-GA-G/001 SH002, WAW-AA-GA-G/002 SH001, WAW-AA-GA-G/002 SH004, WAW-AA-GA-G/005 SH001, WAW-SS-PT-E/001 SH001) in accordance with Section 3.3.5(b) of the Shire of Carnamah Town Planning Scheme No.1, subject to the following conditions and advice notes:

Conditions of Approval

- 1 The approved development shall be undertaken generally in accordance with the plans and undertakings provided by Verve Energy and forming the Application for Planning Consent unless expressly altered by a condition attached to the approval.

- 2 The approved development shall be substantially commenced within a period of 5 years from the date of this approval and if the development is not substantially commenced the approval shall lapse and be of no further effect. Where an approval has so lapsed, no development shall be carried out without the further approval of the responsible authority having first been sought and obtained.
- 3 In the event that the proposed development requires the use of any roads under the management of the Shire of Carnamah the applicant is required to undertake the following at their expense to the satisfaction of the Shire of Carnamah:
 - 3.1 Prepare, submit and implement a Traffic Management Plan to the satisfaction of the Shire of Carnamah;
 - 3.2 Ensure that the location, design and construction of the access point from the development site onto the road network shall be to the satisfaction of the Shire of Carnamah;
 - 3.3 Ensure that the installation of any traffic warning/safety signage in relation to the approved development during the transportation and construction phases shall be to the satisfaction of the Shire of Carnamah;
 - 3.4 Repairing of any damage to the road network including the surface is required by reason of use of the road in connection with the development to the satisfaction of the Shire of Carnamah;
 - 3.5 No signs or hoardings are to be erected on the entrance to the development without the separate approval of the Local Government.
- 4 The applicant is to prepare, submit and implement a Fire Management Plan to the satisfaction of the Fire and Emergency Services Authority and the Local Government.
- 5 All lighting devices must be installed and shaded in such a way as to not cause undue light spill to passing motorists or neighbouring residences.

Advice Notes

- (a) In relation to condition 3 (if required), prior to commencement of any site works, the applicant is responsible to ensure that the Traffic Management Plan is lodged with the Shire of Carnamah for review. The Traffic Management Plan shall incorporate a Traffic Impact assessment for the transportation activities associated with the development and to ensure that intersections and impacts to the road network are addressed. The Traffic Management Plan shall set out in detail the management commitments applicable to traffic relevant to all installations, activities and processes. The Traffic Management Plan shall include if required by the Shire of Carnamah the identification of any necessary road upgrading, and property access construction and the provision of a dilapidation survey prior to and at the completion of the development with any damage caused to the road network used by transport vehicles accessing the site to be repaired to the requirements of the Shire of Carnamah. Once approved, the applicant from time to time is responsible to ensure, that all installations, activities and processes carried out at all times and in all respects are in accordance with the Traffic Management Plan.

- (b) In relation to condition 4, prior to commencement of any site works, the applicant is responsible to ensure that the Fire Management Plan is lodged with the Fire & Emergency Services Authority and the Local Government for its review. The Fire Management Plan shall address the obtaining of any relevant approvals/licences from the Department of Water, in relation to water abstraction for fire management purposes if necessary.
- (c) The applicant is advised that this planning approval does not negate the requirement for any additional approvals which may be required under separate legislation including but not limited to the Building Code of Australia, *Building Act 2012*, *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*, *Environmental Protection (Noise) Regulation 1997*, *Traffic Act 2000*, *Aboriginal Heritage Act 1972* and the obtaining of a works licence from the Department of Environment and Conservation if required. It is the applicant's responsibility to obtain any additional approvals required before the development/use lawfully commences.
- (d) The discretions listed to the Shire of Carnamah and the Fire and Emergency Services Authority under the conditions of approval shall be exercised by those parties in a reasonable manner. Any dispute on conditions may be referred back to the Development Assessment Panel.
- (e) In relation to condition 3.5 (if required), signs that are required for traffic management and occupational safety and health and as agreed in the Environmental Management Plan, Traffic Management Plan, and Noise Management Plan can be erected for use throughout the construction period.
- (f) If the applicant is aggrieved by this determination there is a right (pursuant to the *Planning and Development Act 2005*) to have the decision reviewed by the State Administrative Tribunal. Such application must be lodged within 28 days from the date of determination.

Background:

Property Address:	Lots 10847 & 10848 Rose Thomson Road, Warradarge
Zoning	RS: Not Applicable
	TPS: Rural
Use Class:	Public Utility (as per Table 1 of the Scheme); or Wind Farm Transmission Line (as per Section 3.3.5(b) of the Scheme)
Strategy Policy:	Not Applicable
Development Scheme:	Not Applicable
Lot Sizes:	Lot 10847 – 1,806.4ha Lot 10848 – 1,441.4ha
Existing Land Use:	Rural
Value of Development:	\$7.5million

The subject site has not previously been subject to the lodgement of a major development application and is presently used for farming purposes.

Details: outline of development application

The application seeks to establish a 330kV spur transmission line running off the Eneabba-Karara transmission line south-east for a distance of 10km across Lots 10847 and 10848 Rose Thomson Road, Warradarge to link with the proposed Warradarge Wind Farm. The section of the transmission line within the Shire of Carnamah would be approximately 5.5km in length. The transmission line would require 22 steel lattice towers measuring 50-63m in height with approximately 500-600m spacing between each tower.

The transmission line would enable the proposed Warradarge Wind Farm to connect into the South-West Interconnected System. The Warradarge Wind Farm project in the neighbouring Shire of Coorow proposes 100 wind turbines producing on average 875 million Kilowatt-hours of electricity annually (equivalent to the average annual electricity needs of 140,000 West Australian homes), with a design life of 25 years, to be established 15km south-east of Eneabba.

The application for a transmission line forms part of the larger \$600 million Warradarge Wind Farm application. The transmission line portion of the project that is located within the Shire of Carnamah has an estimated value of \$7.5 million.

The following Attachments have been provided with this report:

Attachment 1 - Location Plan for the proposed Warradarge Wind Farm site that also illustrates the proposed construction site access;

Attachment 2 - Site plan for the proposed Warradarge Wind Farm site overlaid upon an aerial photograph that also illustrates the proposed transmission line alignment;

Attachment 3 - Typical Elevation Plan for the proposed 330kV transmission line towers;

Attachment 4 - The applicant has advised that the exact route of the transmission line is not finalised and final alignment will depend on Western Power's connection requirements and the type and number of towers used. The applicant is therefore seeking approval for the transmission line within a corridor as shown in Attachment 4;

Attachment 5 - Photomontage from Rose Thomson Road that demonstrates the impact of the proposed transmission line at its most visible from a publically accessible location, emphasising that the proposal is a spur line off the existing Karara transmission line;

Attachment 6 - Schedule of Submissions; &

Attachment 7 - Copies of the received submissions.

A copy of the complete application for the total Warradarge Wind Farm project (inclusive of the transmission line component) has been provided separately to Development Assessment Panel members on disc format due to the large (43MB) size of the application. The submitted development application report includes the following technical documents:

- Planning and Context Statement (Urbis);
- Landscape and Visual Impact Assessment (GHD);
- Flora, Vegetation and Fauna Assessment (Biota Environmental Sciences);
- Noise Impact Assessment (Herring Storer Acoustics);
- Background Noise Monitoring (Herring Storer Acoustics);
- Investigation of Possible Impacts on Broadcasting and Radiocommunication Services (Lawrence Derrick & Associates);
- Aviation Impact Statement Assessment (AECOM);

- Planning Compliance Report (Urbis);
- Verve Health and Safety Policy (Verve Energy);
- Verve Environmental Policy (Verve Energy);
- Draft Environmental Management Plan (Verve Energy); &
- Stakeholder Consultation Report (Verve Energy).

In support of their proposal the applicant has supplied the following additional information:

“The Eneabba to Karara line currently crosses Lot 10847 and our line would either connect directly into this line at the connection point or at the onsite substation. There are tentative plans from Western Power to construct a new Eneabba substation on a piece of land they acquired adjacent to Lot 10847. If we are required to connect into this substation this transmission line corridor route would still be utilised.... The first tower is likely to be adjacent to the substation within Lot 10850. The rest of the towers will be routed through 10851, 10847 and 10848 to the grid connection point. The final detailed design of the towers and routing of the transmission will be determined by the principal contractor and Proponent prior to construction.”

Legislation & policy:

Legislation

Planning and Development Act 2005;
Shire of Carnamah Town Planning Scheme No.1;
Environmental Protection (Clearing of Native Vegetation) Regulations 2004.

State Government Policies

WAPC Planning Bulletin No.67 - Guidelines for Wind Farm Development.

Local Policies

Not Applicable.

Consultation:

As discussed in the Planning Assessment section of this report, this application could have been determined without advertising, however, the applicant has stated their preference for the proposal to be formally advertised under the Shire of Carnamah Town Scheme Planning Scheme No.1 ('the Scheme') and Council agreed at its 18 July 2012 meeting, resolving by an absolute majority as follows (Minute Reference: 364494):

“That Council resolve that the application for a 330kV transmission line upon Lots 10847 and 10848 Rose Thomson Road, Warradarge be determined under Section 3.3.5(b) of Shire of Carnamah Town Planning Scheme No.1 and advertised as per Section 6.2.3 of the Scheme for a period of 21 days with the matter to be returned to its 15 August 2012 meeting as a Late Item for its further consideration.”

Section 6.2.3 of the Scheme requires that where Council decides to give notice of an application it shall cause one or more of the following to be carried out:

- “(a) notice of the proposed development to be served on the owners and occupiers of land within an area determined by the Council as likely to be affected by the granting of planning consent stating that submission may be made to the Council within twenty-one days of the service of such notice;*
- (b) notice of the proposed development to be published in a newspaper circulating in the Scheme area stating that submissions may be made to the Council within twenty-one days from the publication thereof;*
- (c) a sign or signs displaying notice of the proposed development to be erected in a conspicuous position on the land for a period of twenty-one days from the date of publication of the notice referred to in paragraph b) of this clause.”*

Given that both the transmission line application within the Shire of Carnamah and the wind farm application within the Shire of Coorow are required to be submitted to a Development Assessment Panel and to avoid confusion for consulted parties, the total Warradarge Wind Farm application was advertised concurrently by the Shire of Carnamah and the Shire of Coorow. The advertising period ran from Friday 20 July 2012 until Friday 10 August 2012 with an advisory sign being displayed on-site during the advertising period. Notices were displayed in the Geraldton Guardian on 20 July 2012 and the Mid West Times on 26 July 2012, and the Mid West Times also ran an article on the Warradarge Wind Farm development application on 2 August 2012. A copy of the development application was displayed at the Shire of Carnamah office and the Shire of Coorow (Leeman) office.

10 submissions have been received in relation to the total Warradarge Wind Farm project. 8 of these submissions were received from government agencies all offering no objection to the application (with some providing minor technical comment that has been incorporated into the recommended conditions of approval and advice notes). 2 submissions were received in objection to the Warradarge Wind Farm project from neighbouring landowners. Review of the issues raised within the objections confirms that they are largely concerned with the perceived impact upon their properties arising from noise and the visual appearance of the Wind Farm itself rather than the associated transmission line.

The objecting landowners are located to the south and east of the proposed Wind Farm and the application within the Shire of Carnamah is for the associated transmission line, which is located north-west of the Wind Farm site. The nearest of the objecting landowners is located 6km from the transmission line and 9km from the portion of the transmission line within the Shire of Carnamah.

Nevertheless, a Schedule of Submissions has been prepared and included as **Attachment 6** to this report, the Schedule identifies the respondents, summarises the matters raised, provides individual comment upon the matters raised, and a recommendation in regard to each. The applicant was provided with a copy of the submissions received, in order to have the opportunity to respond to the issues raised, and a copy of the applicant's responses to the issues raised in objection have been inserted into the Schedule of Submissions also.

Copies of the received submissions have been provided in **Attachment 7**.

Public Consultation

In addition to the required advertising actions listed above, at the commencement of the advertising period, all landowners within 5km of the Warradarge Wind Farm Transmission Line alignment were written to by the Shire and provided with a complete copy of the application and invited to make comment.

The applicant has also undertaken extensive public consultation as outlined in Section 2.3 of their submitted development application report, including direct contact, production of newsletters, mail-outs and e-mails, newspaper notices, surveys, and public information sessions.

Consultation with other Agencies or Consultants

At the commencement of the advertising period the following agencies were written to and provided with a complete copy of the application and invited to make comment:

- Alinta Gas;
- Civil Aviation Safety Authority;
- Department of Agriculture & Food;
- Department of Environment and Conservation;
- Department of Indigenous Affairs;
- Department of Mines and Petroleum;
- Department of Planning;
- Department of Regional Development & Lands;
- Department of State Development;
- Department of Transport;
- Department of Water;
- Fire & Emergency Services Authority;
- Main Roads WA;
- Mid West Development Commission;
- State Heritage Office;
- Telstra;
- Water Corporation; &
- Western Power.

The applicant has also undertaken direct consultation with an extensive range of government departments and service authorities prior to lodgement of the development application, and this has been detailed in Section 2.2 of their submitted development application report. The applicant's prior consultation and the submissions received during the advertising period identified no significant agency concerns with the Warradarge Wind Farm project.

Planning assessment:

Shire of Coorow Town Planning Scheme No.2

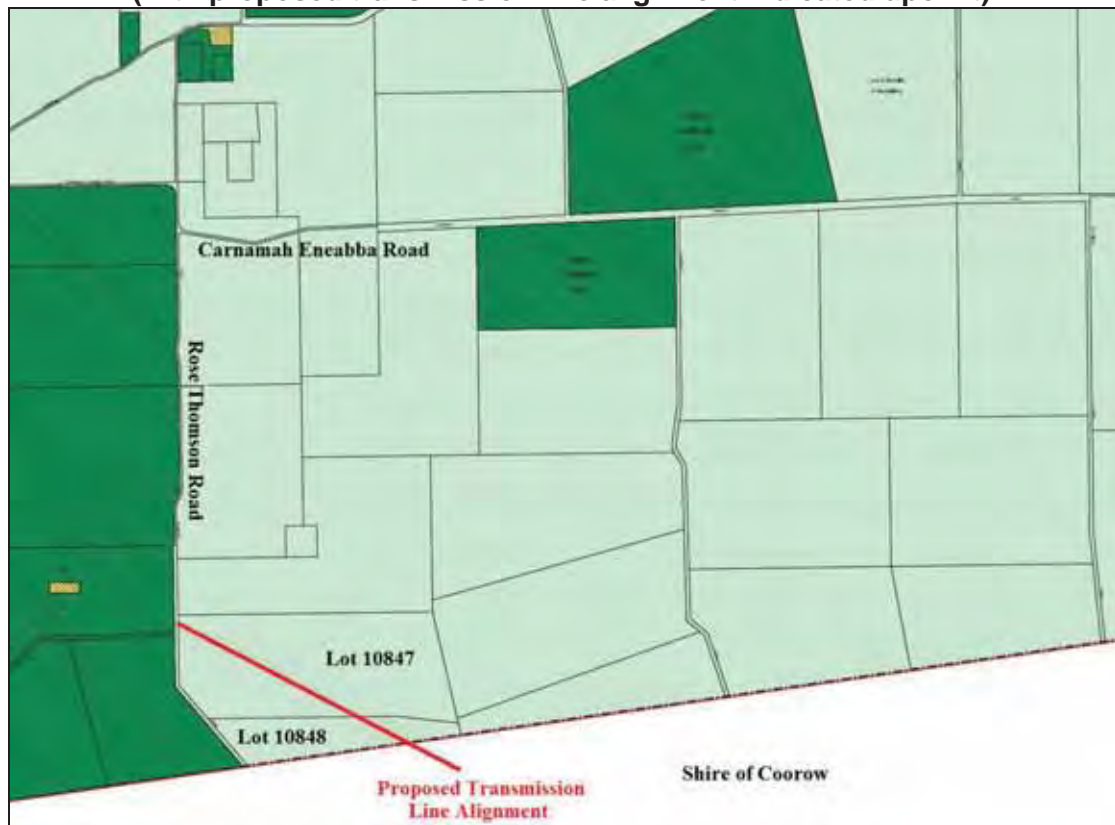
Lots 10847 and 10848 are zoned 'Rural' under Shire of Carnamah Town Planning Scheme No.1.

Section 3.2.5 of the Scheme lists the objective for the 'Rural' zone as being:

- “(a) To give priority to the continuation of viable agriculture production in a manner consistent with sound land use and management practices;*
- (b) To provide for and monitor mining activities and associated works;*
&
- (c) Without necessarily limiting the activities at (a) and (b), to conserve and preserve natural bushland, waterways, and indigenous flora and fauna so that the viability of any natural ecosystem is not adversely affected.”*

Given that the proposed transmission line would require minimal clearing only (0.7ha) and would not require loss of undue land area from agricultural production for the transmission towers it is not considered that the proposed application is contrary to the objectives for the ‘Rural’ zone.

Figure 1 - Extract from Shire of Carnamah Town Planning Scheme No.1 Map (with proposed transmission line alignment indicated upon it)



Section 5.7 of the Scheme requires that:

“In considering applications for planning consent, subdivision or rezoning within a Rural zone, Council shall have regard to:

- (a) The need to ensure that the continuation of rural land use is protected, encouraging where appropriate, the retention and expansion of agricultural activities, and supporting proposals to which promote the retention of the predominant lot sizes in the locality;*

- (b) *The need to preserve the rural character and rural appearance of the land within this zone;*
- (c) *The need to protect, preserve and enhance any natural undeveloped areas throughout the zones by requiring as conditions on any planning consent issued, the planting of vegetation which will assist in the balancing of the greenhouse effect, provision for shade, prevention or erosion, reduction in salinity, or the provision of habitats for fauna; and*
- (d) *The State Planning Commission's Policy DC3.4 Rural Land Use Planning Policy."*

The development of transmission line towers would generally be considered to have impact upon the rural appearance of an area, but it should be noted in this instance that the transmission line would effectively be a 'spur' line off the existing Eneabba to Karara 330kV transmission line that runs through this area.

The application, as lodged, would meet with the definition of a 'Public Utility' which is listed as a permitted use within the 'Rural' zone under Table 1 of the Scheme.

'Public Utility' is defined by Schedule 1 of the Scheme as follows:

"means any work or undertaking constructed or maintained by a public authority or the council as may be required to provide water, sewerage, electricity, gas, drainage, communications or other similar services but does not include nuclear power generation."

The applicant, in correspondence submitted to the Shire of Carnamah on 18 June 2012 sought Council's determination of the application as a 'use not listed' as per Section 3.3.5 of the Scheme. The applicant was aware that this would require the advertising of their application and may involve delays in determination of their project but expressed no objection to this. The applicant, being a public authority, would normally allow for determination of the application as a 'public utility' (permitted use) but Verve Energy are seeking the determination of the application under the 'use not listed' requirements of the Scheme for the following reasons:

- advertising the wind farm proposal is preferred from an overall transparency perspective; and
- there is potential in the future for Verve Energy to enter into a joint venture agreement with a private entity for financing purposes.

The consideration of the application as a 'use not listed' would enable greater flexibility for Verve Energy in that they could pursue a joint venture partner from the private sector which would not be catered for under the definition of a 'public utility' under the Scheme.

Section 3.3.5 of the Scheme states that:

"3.3.5 If the use of land for a particular purpose is not specifically mentioned in the Zoning Table and cannot reasonably be determined as falling within the interpretation of one of the use categories the Council may:

- a) *Determine that the use is not consistent with the objectives of the particular zone and is therefore not permitted; or*
- b) *Determine by absolute majority that the proposed use may be consistent with the objectives and purpose of the zone and thereafter follow the advertising procedures of clause 6.2 in considering an application for planning consent."*

Environmental Protection (Clearing of Native Vegetation) Regulations 2004

The proposed transmission line is estimated to require the clearing of 0.7ha of native vegetation and this may require the applicant to obtain a clearing permit from the Department of Environment and Conservation. It is noted that there may be exemption under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* from this requirement given that the proposed clearing would be under 1ha and does not impact upon any threatened ecological communities and the alignment has been selected to avoid a Priority 4 species in this area.

Section 5 of the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* addresses the issue of prescribed clearing with Regulation 5 Item 1 listing:

"Clearing of a site for the lawful construction of a building or other structure on a property, being clearing which does not, together with all other limited clearing on the property in the financial year in which the clearing takes place, exceed 1 ha, if —

- (a) the clearing is to the extent necessary; and*
- (b) the vegetation is not riparian vegetation."*

Visual Appearance:

The issue of the visual appearance of the proposed Warradarge Wind Farm was raised as a source of objection during the consultation period, although this largely related to the 100 proposed wind turbines within the neighbouring Shire of Coorow rather than segment of associated transmission line within the Shire of Carnamah (the Schedule of Submissions included as **Attachment 6** provides further detail on the issues of objection).

The Landscape and Visual Assessment prepared by GHD for the applicant demonstrates that the Warradarge Wind Farm and associated transmission line would not be visible from the Eneabba townsite and would be largely obscured from the Brand Highway. The Visual Assessment does conclude that the visual impact of the Wind Farm will be high within 5km of the site, i.e. the Garibaldi Willis Road and Rose Thomson Road areas, and intervening vegetation and variation in topography will reduce the visibility of the Wind Farm significantly as the radius extends out to 15km, then 25km.

In relation to the specific issue of the proposed transmission line, the Landscape and Visual Assessment demonstrates that its immediate proximity to (and connection into) the existing Eneabba to Karara 330kV transmission line should be a consideration as to the visual impact this specific proposal will have on the surrounding rural landscape. Further the area in which the proposed transmission

line would be sited is not specifically identified as a place of scenic value in either the Coorow or Carnamah Town Planning Schemes or strategic level planning document.

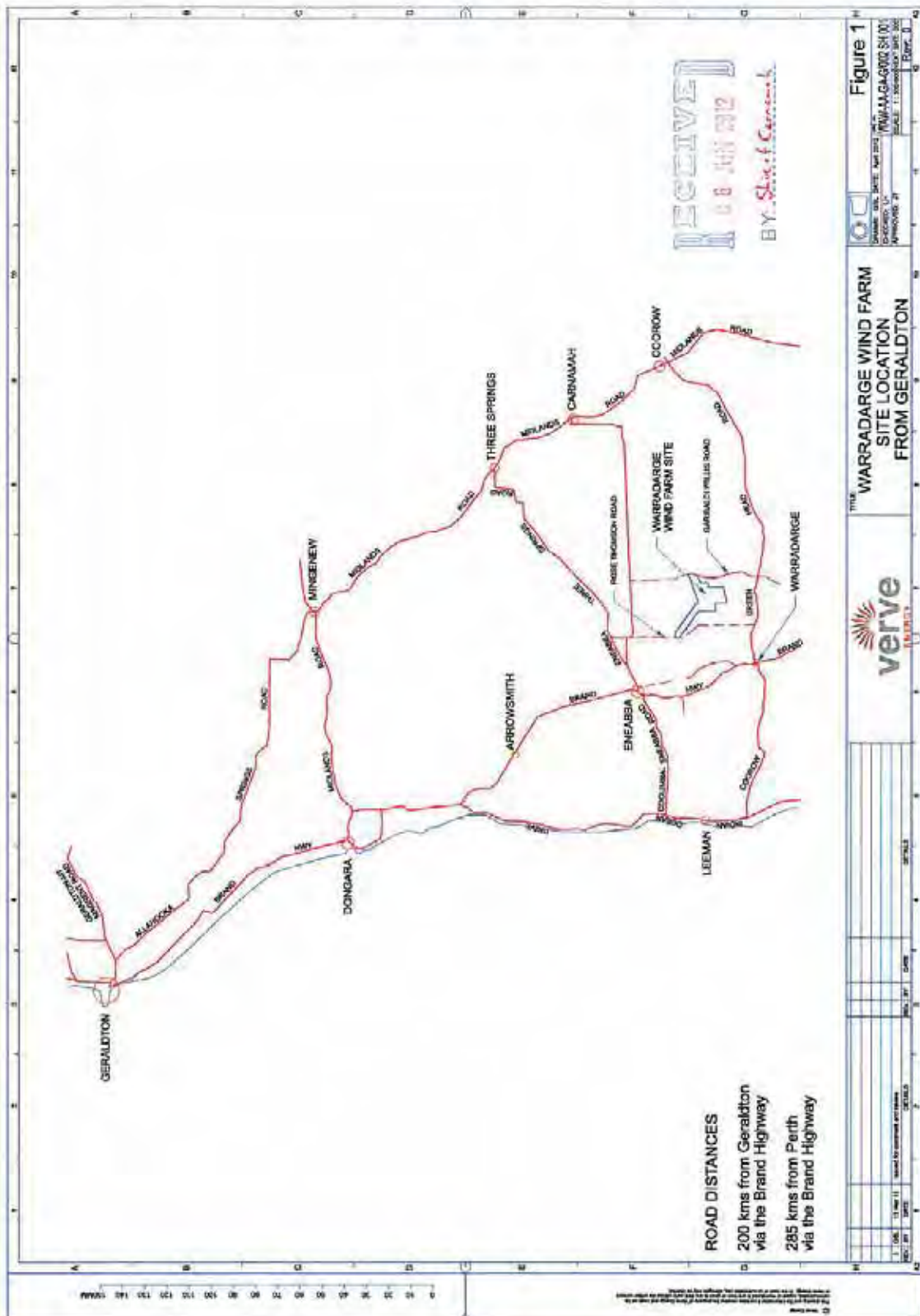
It is considered that the local economic benefits and the wider regional and state benefits to the environment presented by the project, and the analysis provided by the submitted Landscape and Visual Impact Assessment, provide sufficient grounds for approval of the application.

Options/Alternatives

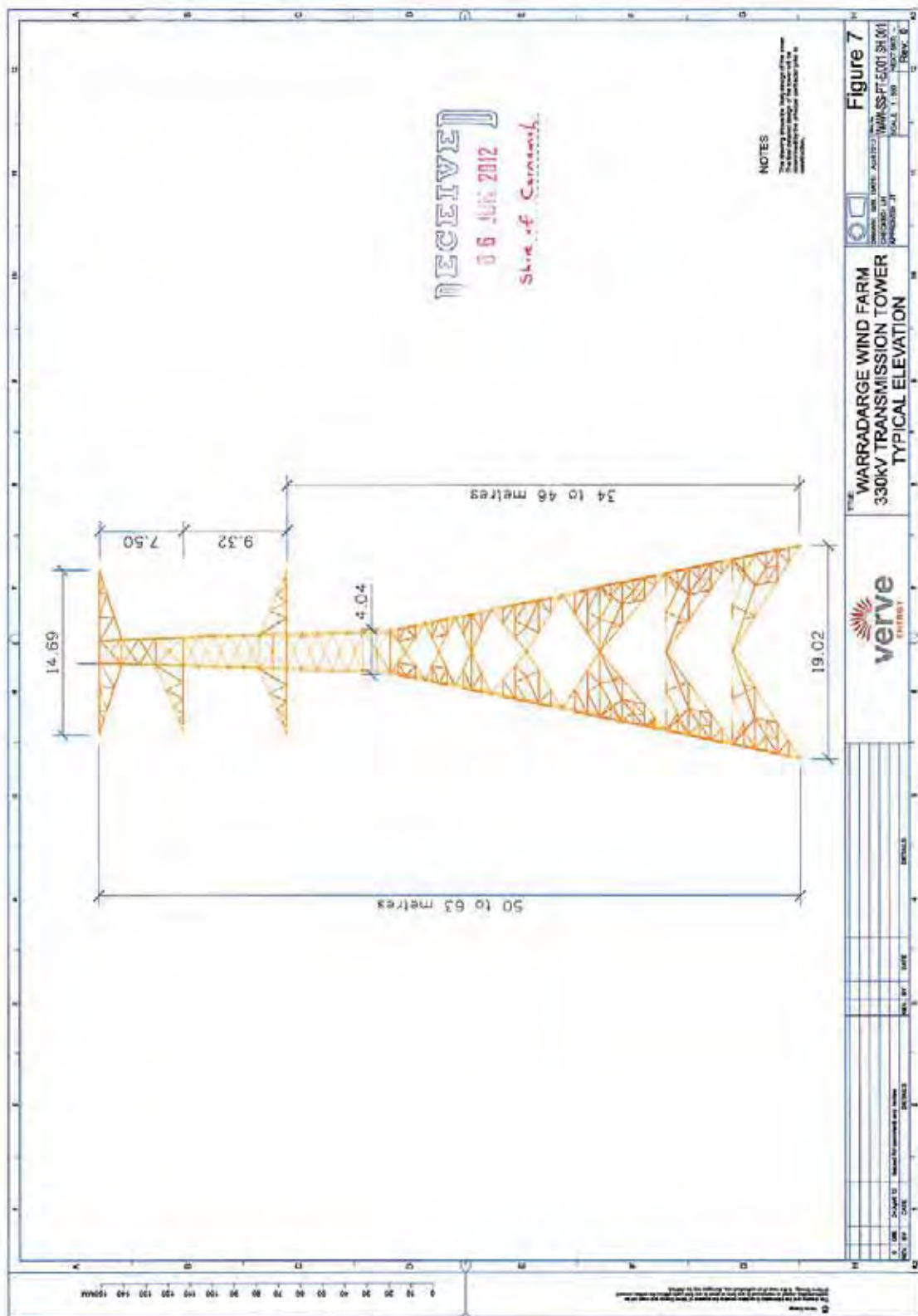
The Shire of Carnamah does not consider that there are grounds for refusal of the application.

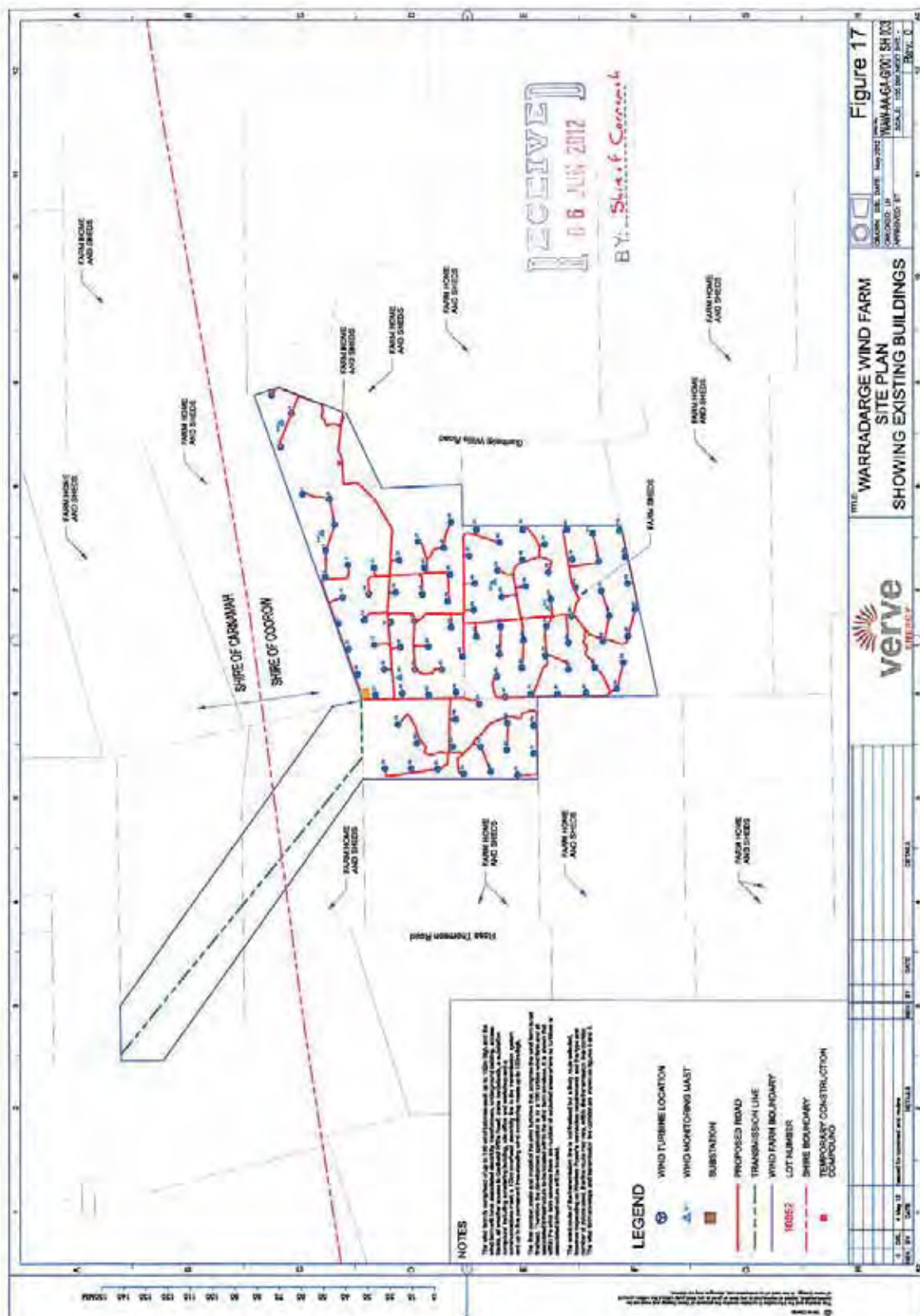
Conclusion:

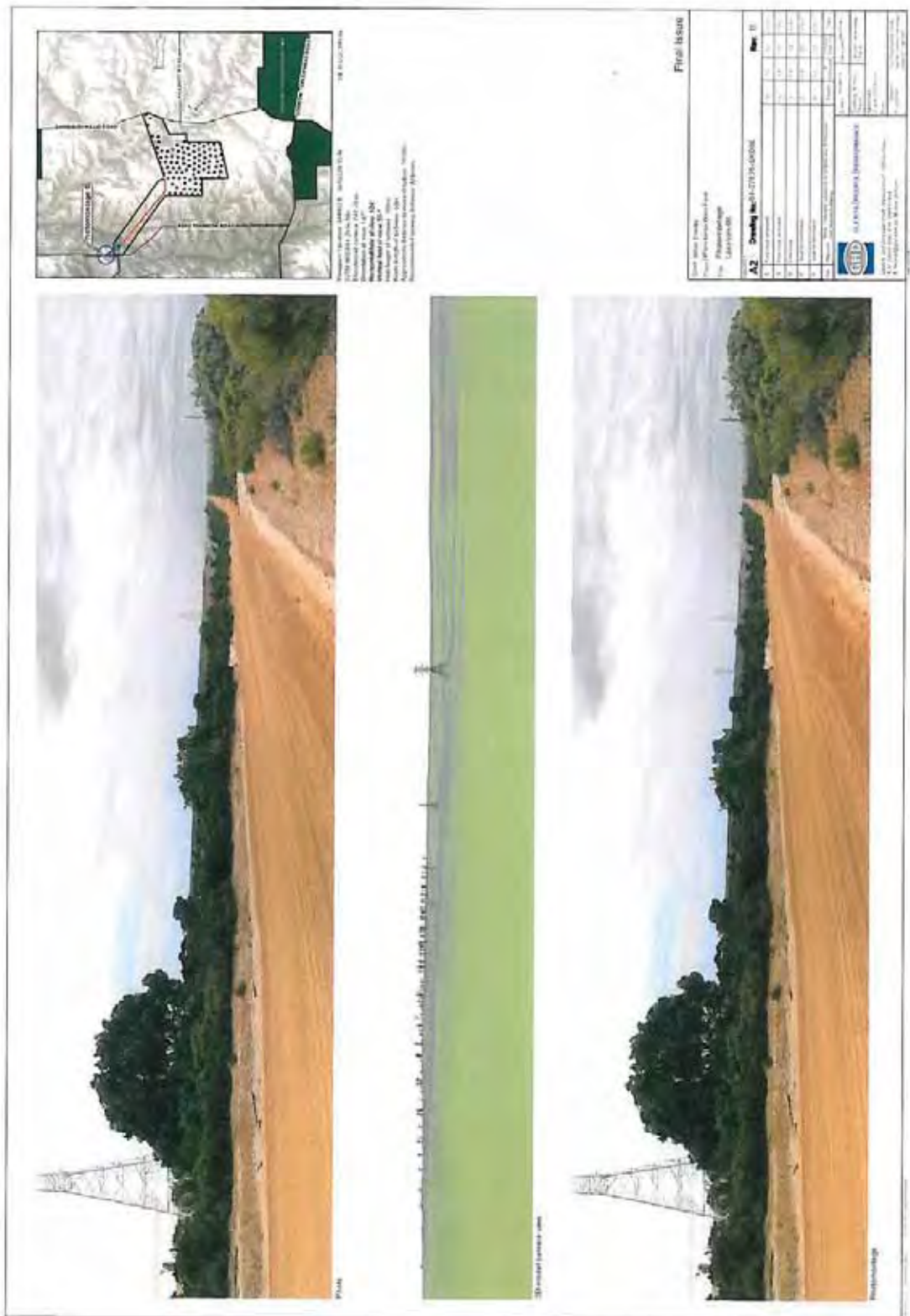
The Shire of Carnamah recommends conditional approval of the proposed Warradarge Wind Farm Transmission Line development.











Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1 Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge				
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment	Recommendation
1 (3/8/2012)	State Heritage Office (PO Box 7479 Cloisters Square PERTH WA 6850)	<i>No objection</i> Proposal does not appear to impact upon any place of state cultural heritage significance.	No additional comment.	Note submission.
2 (6/8/2012)	L Marche (280 Kooyong Road KEWDALE WA 6105) Subject Property: Lot 10854 Garibaldi Willis Road, Warradarge	<i>Objection</i> Object to this application and inform your office of the inconsistencies that have been portrayed by Verve Energy to both your office and that of the EPA. The proposed wind farm will adversely affect not only the value but also the only possible use available for my property. My property although located in a rural precinct is not able to be used for farming purposes because the entire 5000 acres comprises of natural vegetation and/or remnant bush land. My property has not been able to be used for agricultural purposes for the last 20 years and unless the current legislation is over turned, it is unlikely that it could be farmed during the course of the next 20 years. The laws in place prohibiting clearing of land, whether it be natural vegetation or regrowth bush, prevents me from clearing my property. Therefore the only conceivable use for my property is that of a "lifestyle" property, attributable to its seclusion, peace, tranquility, flora and fauna. If the proposed wind farm proceeds the only use available for my property will not only be lost but the value of my property will be devalued for the entire 20-25 year duration of the wind farm. The placement of the wind turbines on the adjacent	The objector's property of Lot 10854 is zoned 'Rural' under the Shire of Coorow Town Planning Scheme No.2 and there are a number of uses listed under the Scheme Zoning Table for this zone that are either (P) permitted, (D) discretion, or (A) special notice. It is not considered that the presumption that the objector's property could only be used for "lifestyle" purposes has been verified through lodgement of development applications for these listed uses. It is noted that Section 5 of the <i>Environmental Protection (Clearing of Native Vegetation) Regulations 2004</i> addresses the issue of prescribed clearing with Regulation 5 Item 1 listing: "Clearing of a site for the lawful construction of a building or other structure on a property, being clearing which does not, together with all other limited clearing on the property in the financial year in which the clearing takes place, exceed 1 ha, if — (a) the clearing is to the extent necessary; and (b) the vegetation is not riparian vegetation."	Note submission and recommend that any development approval for the Warradarge Wind Farm be made subject to the following condition: "The applicant is to prepare, submit and implement a Noise Management Plan to the satisfaction of the Department of Environment and Conservation and the Local Government." Further it is recommended that advice notes be attached with the abovementioned condition requiring that: "Prior to commencement of any site works, the applicant is responsible to ensure that the Noise Management Plan is lodged with the Department of Environment and Conservation and the Local

Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1			
Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge			
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment
			Recommendation

		<p>property (Lot 10853) will destroy the visual and aesthetic qualities of my property and will also hinder any possibility of living on my property due to the noise from the wind turbines being a nuisance and interfering with the peace and tranquility of my property.</p> <p>Extremely concerned that the documentation submitted by Verve Energy to the EPA (and to the Shire of Coorow), has misrepresented my property as being "cleared agricultural/rural" land when almost the entire 5,000 acres is natural vegetation/nature reserve. A fact that has been conveyed to Verve Energy on several occasions.</p>	<p>The applicant was advised of the nature of the objection received and provided with the opportunity to make comment upon the issues raised in Submission 2. The comments of Verve Energy in relation to the specific issues that have been raised are provided in italic font in this comments section.</p> <p><i>"Figures 4 and 6 in the Development Application Report show Lot 10854 is predominantly vegetated. Verve Energy does not believe the Development Application Report shows it is "cleared agricultural/rural" land. Additionally, although Lot 10854 has a good wind resource, in our site selection process as discussed in section 1.8, we sought to select land that minimised any vegetation clearing."</i></p>	<p>Government for its review. The Noise Management Plan shall set out in detail the management commitments applicable to noise minimisation relevant to all installations, activities and processes, based on sound level measurements of plant, both individually and in combination. The Noise Management Plan shall take proper account of tonal components, amplitude or frequency modulations or impulses, and the Noise Management Plan shall demonstrate that noise emissions will achieve compliance with the requirements of the South Australian guidelines Environmental Protection Authority – Wind Farms Environmental Noise. Once approved, the applicant from time to time as directed by the Local Government is responsible to ensure, that all installations, activities and processes carried out at all times and in all respects are in accordance with the Noise Management Plan."</p>
		<p>Over the years my property has been enjoyed as a "lifestyle/recreational" parkland with extended family and friends frequently camping and caravanning at the shed located on my property, which has been shown as a "non-residence". Verve Energy are aware that the shed is where we stay when we camp at my property but did not mention this is in their application, probably because the shed is right in the middle of their</p>	<p>The Shire of Coorow has no record of a structure upon Lot 10854 being approved or subsequently constructed to a Class 1 (habitable) standard as per the Building Code of Australia. However, it is noted that a dwelling is listed as a permitted use under the Scheme Zoning Table for the 'Rural' zone. On this basis the landowner of Lot 10854 could make application for a habitable</p>	

Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1			
Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge			
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Recommendation

		noise buffer zone.	building to be constructed upon the property and such a building upon completion would be treated as a 'noise sensitive premise' and in the event that emissions from any neighbouring operation exceed regulatory criteria (be they noise, dust, vibration, odour etc.) then it is the responsibility of the emitter to modify their actions to meet the prescribed limits and not the responsibility of the receiver.	“The applicant is to implement and maintain reporting mechanisms and monitoring for noise complaints throughout the duration of the operation of the development. In event of a substantiated complaint being received the applicant is required to demonstrate mitigation responses to the requirements of the Department of Environment and Conservation and the Local Government. Such responses will be treated as required modifications to the Noise Management Plan.”
		If the proposed wind farm proceeds any prospect of a future tourism development on my property will be rendered impossible. The visual landscape of my property will be adversely affected by the location of the 100 turbines. I note that from the documentation lodged by Verve Energy my property is the only property upon which between 80 to 100% of the turbines will be seen/viewed at all times.	<p>“Verve Energy is aware that the land owners of Lot 10854 do use their existing shed for occasional residential purposes as shown in Figure 17.</p> <p>We have also assessed this location as a potential house labelled Receiver Point 12 in the Noise Impact Assessment, Annex 4. It is shown that the wind turbines will comply with the limits at this point.”</p> <p>Whilst it is acknowledged that the Warradarge Wind Farm would be visible from Lot 10854 a statement that this would render any neighbouring tourism development impossible is considered difficult to substantiate.</p> <p>“Verve Energy has shown in Figures 5 and 6 of the LVIA report (Annex 2) a Zone of Theoretical Visibility (ZTV) of the potential wind turbine layout. If that layout were adopted, there are a number of surrounding properties from which, theoretically, between 80% and 100% of the turbines could be</p>	<p>Recommend that any development approval for the Warradarge Wind Farm be made subject to the following condition:</p> <p>“The applicant is to prepare, submit and implement an Environmental Management Plan to the satisfaction of the Department of Environment and Conservation and the Local Government.”</p> <p>Further it is recommended</p>

Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1 Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge			
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment
Recommendation			

			<p>visible. It is also noted that this ZTV is theoretical only, and does not take into account existing built form and vegetation which may provide screening.</p> <p>The Development Application Report states- 4.2.7 A Zone of Theoretical Visibility ("ZTV") for both tip and hub height has been produced for the Proposal and these are shown in Figures 5 and 6 in Annex 2. A ZTV is the area around a designated point in the landscape from which that point is visible. It is calculated using elevation data such as a Digital Elevation Model and does not take account of buildings or vegetation screening. It represents a worst case view of how many turbines or blade tips can be seen at the location.</p> <p>4.2.8 Figures 5 and 6 in Annex 2 shows the turbines that are visible from the hub (100m) upwards and the tip height (152m). These figures show that beyond 10km from the wind farm the number of turbines visible to the west reduces to zero except on a few elevated areas. In areas to the south and north the turbines are theoretically visible out to 15km, beyond which it they are only seen in isolated areas. To the west the tips of the turbines are theoretically visible to 25km except in lower areas of the landform but it can be seen that the hubs are not as visible beyond 15km, and this is due to the screening effect of the topography.</p>
			<p>that the following advice note be attached with the abovementioned condition requiring that:</p> <p>"Prior to commencement of any site works, the applicant is responsible to ensure that the Environmental Management Plan is lodged with the Department of Environment and Conservation and the Local Government for its review. The Environmental Management Plan shall address the following issues:</p> <ul style="list-style-type: none"> - fuel storage, handling and spill response; - weed management; - surface, ground and stormwater management; - waste disposal; - flora and fauna; & - dust suppression and stabilisation of any soils disturbed or deposited on site."

Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1 Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge			
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Recommendation

		<p>The estimated noise implications for my property indicate that noise attenuation of between 39dB at my boundary fence which adjoins Lot 10853, will also impact across the entire length and breadth of my property, with an estimate of 25dB at the opposite boundary fence. The noise alone is going to adversely affect the use and enjoyment of my property. From information available about existing wind farms it is likely that the noise impact could be far greater once the turbines are in full operation and during various weather conditions, which will put off anyone from wanting to sleep over at my property, let alone stay their during daylight hours. Not to mention possible health concerns being another issue altogether.</p>	<p>4.2.9 In should be noted that the ZTV is a tool to assess theoretical visibility only and that vegetation and built structures will influence what is actually visible from various locations. It is for this reason that a number of viewpoints are selected to represent what the actual change of view will be and these are shown as photomontages. The viewpoints are selected in areas that theoretically have a view of at least 80% of the wind turbines."</p> <p>It should also be noted that in addition to the development approval process under the <i>Planning and Development Act 2005</i> administered by the Local Government and the Development Assessment Panel, the applicant is also subject to the environmental approval process under the <i>Environmental Protection Act 1986</i> administered by the DEC and the EPA. The applicant must comply with the requirements of the EPA, the <i>Environmental Protection Act 1986</i> and the <i>Environmental Protection (Noise) Regulations 1997</i> both for the construction and operational phases irrespective of any conditions related to noise applied by the Local Government or Development Assessment Panel.</p> <p>The Noise Impact Assessment prepared by Herring Storer Acoustics has logged the existing background noise on-site (over a period of six weeks) and models the proposed noise impact (and low frequency</p>

Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1			
Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge			
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment
			Recommendation

			<p>noise and infrasound projections) and concludes that the Warradarge Wind Farm will meet with the requirements of the Noise Regulations and the 'Wind Farms—Environmental Noise Guidelines—July 2009' (EPA of South Australia) which are the guidelines recognised by the DEC. The modelling has been undertaken using the conservative criteria of the wind turbine design that emits greatest noise (which may not be utilised for this project) and incorporates all wind conditions. The closest residence to the application would under the most noise conducive conditions experience 35dB(A) which is in compliance with the relevant regulations and guidelines for noise sensitive premises. It should be noted that in the event that the modelling is found to be inaccurate (undervalued) upon operation of the wind farm it would be the responsibility of the operator to modify the turbine(s) until compliant with the <i>Environmental Protection (Noise) Regulations 1997</i>.</p> <p>The Noise Assessment does indicate that there are some land areas within the 35dB(A) noise contour (being the minimum background noise criteria) which are owned by non-participants of the wind farm development. These areas are within Lots 10849, 10854, 10877, 10878, 10855 and 11017 and this presents a risk to the applicant in the absence of a statutory buffer, as noise sensitive premises would be permitted to 'encroach' into the 35dB(A) noise contour.</p>
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Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1 Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge			
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment
			Recommendation

			<p>It is considered appropriate given the issues raised by the objector that any approval and operation of the Warradarge Wind Farm should be subject to the applicant preparing and adhering to a Noise Management Plan.</p> <p><i>"The Noise Impact Assessment has been carried out in accordance with Western Australian Planning Bulletin 67 and the Department of Environment and Conservation WA which recommends using the EPA of South Australia "Wind Farms – Environmental noise guidelines – July 2009" as the guidelines for the assessment of wind farms. The Noise Impact Assessment was provided in Annex 4 of the DAR.</i></p> <p><i>The noise limits for new wind farm developments is that the predicted noise level must not exceed the greater of either 35 dB(A) or 5 dB(A) above the background noise at any nearby homes or other noise sensitive receiver premises during night-time hours. The noise limits have been assessed for all nearby lots including Lot 10854 and are predicted to be below these levels at the existing sheds. The wind farm complies with the noise limits at the current sheds which were given the same importance as a house.</i></p> <p><i>The wind farm noise on areas of vegetated land of Lot 10854 closer to the turbines than the sheds could be greater than either 35 dB(A) or 5 dB(A) above the background noise. It is good practice for Wind Farm proponents to enter Good Neighbour Agreements to agree that no new homes or</i></p>
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Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1			
Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge			
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment
			Recommendation

		<p>When the previous owners (my parents) lodged an application for permission to clear my property in about 2010, the DEC expressed concern about possible interference with the breeding habitats of the natural wildlife and birds inhabiting my property in particular mention was made of the endangered Carnabys Black Cockatoos. No consideration whatsoever has been given by Verve Energy as to how the wind farm will affect the fauna and bird life on my property. Environmental impact studies for noise, landscape & visual, and flora & fauna, particularly in relation to Lot 10854, have to be undertaken prior to the application for construction of the Warradarge Wind Farm proposal being approved.</p> <p>From the documentation provided by Verve Energy, my property - not being a participant in the wind farm, is the only property that will be greatly affected by the noise, land and visual impacts of the wind farm.</p>	<p><i>other noise sensitive receiver premises will be constructed during the lifetime of the wind farm in these areas. These areas are known as noise buffer areas."</i></p> <p>The submitted development application report includes a visual impact assessment, flora and fauna assessment, noise impact assessment, aviation impact assessment, environmental management plan, and outline of the stakeholder consultation undertaken by the applicant to date.</p> <p>"Verve Energy conducted a Noise Impact Assessment, Background Noise Monitoring, Flora, Vegetation and Fauna Assessment and a Landscape and Visual Impact Assessment (LVIA) on the proposed wind farm development site. The noise assessments and LVIA considers the impact on adjacent properties, however, a flora and fauna survey was not conducted on Lot 10854 as Verve Energy does not propose to clear any vegetation on that land.</p> <p>The Development Application Report states- 4.3.1 Biota Environmental Sciences undertook a Flora, Vegetation and Fauna Assessment of the wind farm envelope and a possible transmission line route. This comprised a desktop review, field survey and flora specimen identification and this report is provided in Annex 3. The field survey was conducting over two trips in the October and November of 2011 and comprised a total of 12 days. The</p>	
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Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1			
Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge			
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment
			Recommendation

			<p>land area of the wind farm envelope and area of transmission line corridor is 5,010 hectares, Biota surveyed 3,650 hectares of land which was the entire wind farm envelope and one possible line route within the transmission line corridor.</p> <p>4.4.3 Verve Energy engaged specialist consultant Herring Storer Acoustics ("HSA") to undertake Noise Impact Assessment for the Warradarge Wind Farm. A prediction of worst case noise propagation from the proposed wind farm was undertaken and background noise measurements undertaken. The Noise Impact Assessment is in Annex 4. The background noise measurements took place over 6 weeks and the results of these have set the noise limits to be applied to nearby noise sensitive premises such as residential properties, this report is in Annex 5.</p> <p>4.2.2 Following the initial wind farm design, GHD have undertaken a landscape and visual impact assessment and this is attached in Annex 2. The assessment covers a 25km radius study area from the Proposal and it investigates the various effects the wind farm has on the landscape and people in the study area at seven different publicly accessible locations.</p> <p>4.2.3 To assess the Proposal, the wind farm is designed with the greatest likely footprint and the</p>
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Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1			
Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge			
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment
			Recommendation

			<p>north-south/east-west extents are shown as spaced across the greatest amount of overall land area within the wind farm envelope, as shown in Figures 5 and 6. This is deemed the worst case design from a visual point of view.</p> <p>4.2.4 As such, the width of any view of the wind farm is greatest from any viewpoint. Therefore, smaller or fewer number of turbines within the wind farm envelope or 100 turbines located in different locations within the wind farm envelope are also encompassed by the assessment.”</p> <p>“Verve Energy has not stated at any point that a Good Neighbour (noise buffer) Agreement has been signed with the land owner of Lot 10854. However such an agreement has been among the topics discussed at meetings with Mr Eric Marche.</p> <p>Verve Energy commenced discussions with various land owners on 16 June 2011 regarding the proposed wind farm and the potential for a noise buffer (if applicable).</p> <p>Verve Energy met Mr Eric Marche in June 2011, November 2011 and in June 2012, with various correspondence and conversations in between. During this time a draft agreement was presented for consideration and a counter proposal received. Verve Energy is open to continuing discussions with the owner of Lot 10854 to come to a mutually</p>
		<p>For the record, neither my mother, nor my father nor myself have agreed to enter into any Noise Neighbour Agreement or any other agreement with Verve Energy, nor have we consented to the Wind Farm being proposed.</p>	

Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1 Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge				
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment	Recommendation
3a (7/8/2012)	Telstra (Locked Bag	Comment Telstra requires more time to assess this	<p>beneficial agreement if common ground can be found. However, should an agreement not be reached for Lot 10854, Verve Energy will consider either relocating turbines away from the boundary of Lot 10854 or accepting that there is a commercial risk that if a house or noise sensitive premises is constructed on nearby land in the future that the turbines may need to be limited to reduce their noise to comply with noise regulations at these new premises.</p> <p>The Development Application Report states- 1.9.4 Verve Energy is negotiating wind farm neighbour agreements with the owners of adjacent Lots (Lots 10849, 10854, 10877, & 10878) to ensure the areas of these lots where the wind farm will be generating noise exceeding 35dB(A) or 5dB(A) above background noise, whichever is greater, will not cause any conflict with any possible future noise sensitive premises.</p> <p>1.9.5 It should be noted that the final design of the wind farm and its capacity will be dependent on these agreements. Should one or more wind farm neighbour agreements not be reached this will not affect the ability to operate a wind farm, only the position and overall number of turbines within the wind farm envelope. This is discussed more fully in Chapter 4."</p>	Note submission.

Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1 Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge			
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	2525 PERTH WA 6001)	proposal. An engineering study needs to be undertaken to assess the impact to our network. As you can appreciate this is not a trivial exercise. As such we will require 6 weeks to complete this task.	any extension to the submission period as the matter was required to be placed before the 15/8/2012 Council meeting and then be sent to the Development Assessment Panel in order to comply with the timeframe established by the <i>Development Assessment Panel Regulations 2011</i> . Shire staff advised Verve Energy of Telstra's concerns so that the applicant might make contact with Telstra to establish whether they may be able to assist them in addressing their concerns prior to the 10/8/2012 submission deadline.
3b (10/8/2012)	Telstra (Locked Bag 2525 PERTH WA 6001)	<i>Comment</i> I have been in contact with Verve Energy and they have provided me with a comprehensive feasibility report and that has put my mind at ease to some extent. Whilst it does cover our radio sites we have a country exchange located about 2.5 km from the south west corner of the wind farm area. It is not a radio site but I am still concerned about induced noise and more importantly induced EMF from the wind farm. I will have our design team check the impact to our country exchange and also verify the findings of the report. Unfortunately they will not be able to complete this investigation by close of business today. As I don't have the time to complete an engineering impact study I do not feel comfortable stating that I have no objections to the development.	The applicant has been provided with a 21 day period in which to make comment upon the application, which is an extension of the minimum 14 day period as per the requirements of the Scheme. The submitted Development Application includes Annexure 6 'Warradarge Wind Farm - Investigation of Possible Impacts on Broadcasting and Radiocommunication Services' prepared by Lawrence Derrick & Associates, Engineering Consultants & RF Frequency Assigners. Section 14 of Annexure 6 states: "The power generated by the wind turbines will be exported to the transmission grid via purpose built substations and high voltage transmission lines using conventional designs meeting standards applying to the State network at large. Substations will be designed and sited to reduce the electric and magnetic fields to acceptable levels at the
			Note submission and provide copy of Telstra's submissions to the applicant so that they are made aware of its issues. Recommend that any development approval for the Warradarge Wind Farm be made subject to the following advice note: "The applicant is advised that this planning approval does not negate the requirement for any additional approvals which may be required under separate legislation including but not limited to the Building Code of Australia, <i>Building Act 2012</i> ,

Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1 Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge				
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment	Recommendation
		It is unfortunate that circumstances have prevented me from having more time to investigate this development proposal.	boundary fence. The internal wind farm reticulation will employ underground cables of up to 33 kV in voltage. These will have no significant EMI emission above ground. The main transmission lines from the wind farm substation to the grid will employ 330 kV overhead lines. All transmission lines will be built to specifications consistent with the HV lines throughout the State network. The height of the lines and the easement width will be in accordance with power authority recommendations which will ensure magnetic and electric fields will be within acceptable limits for human exposure and for electromagnetic interference levels at dwellings in the area and for accessible public access areas. HV power lines and substations are required to meet the Australian Standard AS/NZS 2344: 1997 Amendment 1:2007 limits for EMI which protects broadcasting and radiocommunications reception from unacceptable interference."	<i>Health Act 1911, Health (Treatment of Sewerage and Disposal of Effluent and Liquid Waste) Regulations 1974, Environmental Protection (Clearing of Native Vegetation) Regulations 2004, Environmental Protection (Noise) Regulation 1997, Traffic Act 2000, Aboriginal Heritage Act 1972 and the obtaining of a works licence from the Department of Environment and Conservation if required. It is the applicant's responsibility to obtain any additional approvals required before the development/use lawfully commences."</i>
4 (9/8/2012)	Department of Environment & Conservation (PO Box 72 GERALDTON WA 6531)	<i>Comment</i> The DEC is unable to provide comment at this time. In providing advice DEC would need to refer to the EPA who is the lead agency for this application. DEC would need to take into account the Office of EPA comments and recommendations for this project, and unfortunately they are yet to assess this application.	It should also be noted that in addition to the development approval process under the <i>Planning and Development Act 2005</i> administered by the Local Government and the Development Assessment Panel, the applicant is also subject to the environmental approval process under the <i>Environmental Protection Act 1986</i> administered by the DEC and the EPA. The applicant must comply with the requirements of the EPA, the <i>Environmental Protection Act 1986</i> and the <i>Environmental Protection (Noise) Regulations</i>	As per Submission 3b.

Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1 Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge				
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment	Recommendation
5 (13/8/2012)	Department of Transport (PO Box 68 GERALDTON WA 6531)	<p><i>Support</i> The proposal for the Warradarge Wind Farm will have a positive impact on the sustainability of the State should it go ahead. The Department of Transport supports the idea though we will not have any direct involvement in the development.</p>	1997 both for the construction and operational phases irrespective of any conditions related to noise applied by the Local Government or Development Assessment Panel. No additional comment.	Note submission.
6 (13/8/2012)	Main Roads WA (PO Box 165 GERALDTON WA 6531)	<p><i>Comment</i> MRWA supports the provision of renewable energy developments and is satisfied that principle of the development in this location would be acceptable.</p> <p>Notwithstanding the above, MRWA has some concerns over potential impacts of the proposal on the MRWA network as a result of the type and number of additional vehicle movements generated, particularly in association with the construction and decommissioning stages. It is considered, however, that the production of a Traffic Management Plan including condition surveys would address MRWA concerns regarding:</p> <ul style="list-style-type: none"> - Ability of route and intersection to accommodate volume and nature of traffic. This would be resolved through the identification and subsequent implementation of upgrades as necessary; and - Potential for damage at intersections and repair of any damage associated with development construction/decommissioning, which would be addressed by the 	<p>Shire staff were contacted by MRWA during the submission period to discuss the areas of their concern.</p> <p>Shire and MRWA staff have jointly worked on preparing draft conditions and advice notes that might be applied in the event that the Development Assessment Panel resolved to approve the development application to address MRWA's raised issues.</p>	<p>Note submission and recommend that any development approval for the Warradarge Wind Farm be made subject to the following conditions:</p> <p>“The applicant is to prepare, submit and implement a Traffic Management Plan to the requirements of Main Roads WA and the Local Government.”</p> <p>“The applicant is to ensure that the installation of any traffic warning/safety signage in relation to the approved development during the transportation/construction phase shall be to the satisfaction of Main Roads WA and the Local Government.”</p>

Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1			
Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge			
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment
			Recommendation

		<p>Dilapidation/Condition part of the Plan.</p> <p>Furthermore, it is considered that the wording of the conditions set out in the email from Simon Lancaster (dated 6/8/2012) would satisfactorily protect the interests and assets of MRWA, although we would suggest that the wording of condition X is expanded to clarify that all 'costs' would include, inter-alia, those in relation to surveys to establish the conditions together with any costs associated with the design, construction and maintenance (over a specified defect liability period) of identified required upgrades.</p> <p>In addition to the conditions and advice set out within the aforementioned email, we would request that the following advice is also offered to the proponent:</p> <p>Any signs or additional markings on or visible from the Main Road will require the approval of MRWA's Mid West Network Operations Manager, Peter Herbert, who can be contacted on 08 9956 1208</p>	
			<p>"Repairing of any damage to the road network including the surface is required by reason of use of the road in connection with the development to the satisfaction of Main Roads WA and the Local Government, with all costs met by the applicant."</p> <p>Further it is recommended that the following advice notes be attached with the abovementioned conditions requiring that:</p> <p>"Prior to commencement of any site works, the applicant is responsible to ensure that the Traffic Management Plan is lodged with the Mid West Regional Manager of Main Roads WA and the Shire of Coorow for review. The Traffic Management Plan shall incorporate a Traffic Impact assessment for the transportation activities associated with the development and to ensure that intersections and impacts to the road network are addressed. The Traffic</p>

Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1				
Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge				
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment	Recommendation
				<p>Management Plan shall set out in detail the management commitments applicable to traffic relevant to all installations, activities and processes. The Traffic Management Plan shall include if required by Main Roads WA or the Shire of Coorow the identification of any necessary road upgrading, and property access construction and the provision of a dilapidation survey prior to and at the completion of the development with any damage caused to the road network used by transport vehicles accessing the site to be repaired to the requirements of Main Roads WA and the Local Government. Once approved, the applicant from time to time is responsible to ensure, that all installations, activities and processes carried out at all times and in all respects are in accordance with the Traffic Management Plan.”</p> <p>“Main Roads WA advise that permits are required for</p>

Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1 Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge				
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment	Recommendation
				overweight and oversized vehicles associated with the proposed development.”
				“Main Roads WA advise that should the proponent undertake any works within the road reserve of its network, the proponent must submit an application to Main Roads WA to undertake works within the road reserve. Applications must conform to the Main Roads WA document titled ‘Application Form for Organisations Seeking to Undertake Works within the Road Reserve - High Complexity Works’ (application kits are available from the Main Roads’ website). No works are to commence within the road reserve until Main Roads WA has approved the proponent’s application seeking to undertake works within the road reserve.”
7 (15/8/2012)	Water Corporation (PO Box 165 GERALDTON WA 6531)	No objection Water Corporation has no facilities in this area and there are no objections to this development proposal.	No additional comment.	Note submission.
8 (15/8/2012)	Department of Agriculture &	No objection DAFWA does not have any objections to the Wind	The submission was received following the meetings of the Shire of Coorow and Shire of	Note submission and provide copy to the

Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1				
Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge				
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment	Recommendation
	Food (PO Box 110 GERALDTON WA 6531)	<p>Farm but would like to offer the following comments:</p> <p>Sections 1.1.10 & 1.1.11 (page 1) of the draft Environmental Management Plan discusses issues with weed hygiene, the declared weed Paterson's Curse is raised but not Skeleton Weed. This is another significant weed which has been identified in the vicinity of the Wind Farm site and is considered to be at moderate risk for infestation.</p> <p>Weed management standards need to be maintained in all aspects of the project throughout its life. This is important to ensure minimal biosecurity risk, for the landowner, the adjoining farms and along the transport route.</p> <p>The site in question is dominated by deep sands and gravelly soils and much of the area is subject to very high wind erosion. These issues appear to have been addressed in Sections 1.1.20 to 1.1.24 (pages 2 & 3) of the draft Management Plan under 'Topsoil management and rehabilitation' and 'Dust suppression'.</p>	<p>Carnamah Councils that formulated the respective Shire recommendations in regards to the Warradarge Wind Farm application.</p> <p>However, it is considered that condition (10) and advice note (g) as recommended by the Shire of Coorow Council adequately addresses the comments raised by the Department of Agriculture & Food.</p> <p>Should the Development Assessment Panel form the view that the suggested conditions and advice notes do not adequately address the comments of the Department of Agriculture & Food then the wording for condition (10) and advice note (g) could be expanded to make specific reference to the Department of Agriculture & Food being a responsible authority in addition to the Department of Environment & Conservation, and the Local Government.</p>	<p>applicant. Recommend that any development approval for the Warradarge Wind Farm be made subject to the following condition:</p> <p>“The applicant is to prepare, submit and implement an Environmental Management Plan to the satisfaction of the Department of Environment and Conservation and the Local Government.”</p> <p>Further it is recommended that the following advice note be attached with the abovementioned condition requiring that:</p> <p>“Prior to commencement of any site works, the applicant is responsible to ensure that the Environmental Management Plan is lodged with the Department of Environment and Conservation and the Local Government for its review. The Environmental Management Plan shall address the following issues:</p> <ul style="list-style-type: none">- fuel storage, handling and spill response;

Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1 Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge				
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment	Recommendation
9 (15/8/2012)	Department of Water (PO Box 73 GERALDTON WA 6531)	<p><i>Comment</i></p> <p>The subject land is located within the Hill River and Tributaries Catchment surface water area as proclaimed under the <i>Rights in Water Irrigation Act 1914</i>. Any taking or diversion of surface water for purposes other than stock/domestic, and any interference with the bed or banks of a watercourse in this proclaimed area will require a permit from the Department of Water.</p> <p>Several small tributaries of the Hill River System traverse the subject land. It is recommended that the Shire of Coorow required the proponent to ensure that all road crossings over waterways are to be designed and constructed to minimize detrimental impact on the waterways form and function. It is also recommended that the proponent be required as a condition of approval to ensure that works do not encroach into the standard 30m foreshore buffer area on both banks of all waterways.</p> <p>The land is also located within the Arrowsmith groundwater area as proclaimed under the <i>Rights in Water and Irrigation Act 1914</i>. The applicant should be advised to ensure that all landowners</p>	<p>The submission was received following the meetings of the Shire of Coorow and Shire of Carnamah Councils that formulated the respective Shire recommendations in regards to the Warradarge Wind Farm application.</p> <p>However, it is considered that conditions (7) and (10) and advice note (g) as recommended by the Shire of Coorow Council adequately addresses the comments raised by the Department of Water.</p> <p>Should the Development Assessment Panel form the view that the suggested conditions and advice notes do not adequately address the comments of the Department of Water then the wording for conditions (7) and (10) and advice note (g) could be expanded to make specific reference to the Department of Water being a responsible authority in addition to the Department of Environment & Conservation, and the Local Government.</p>	<ul style="list-style-type: none"> - weed management; - surface, ground and stormwater management; - waste disposal; - flora and fauna; & - dust suppression and stabilisation of any soils disturbed or deposited on site." <p>Note submission and provide copy to the applicant. Recommend that any development approval for the Warradarge Wind Farm be made subject to the following condition:</p> <p>"The applicant is to ensure the design, construction (to a minimum compacted gravel standard), drainage and maintenance of the internal roads and vehicle manoeuvring areas required for the approved development shall be to the satisfaction of the Local Government."</p> <p>"The applicant is to prepare, submit and implement an Environmental Management Plan to the satisfaction of the Department of Environment and</p>

Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1 Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge				
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment	Recommendation
10 (21/8/2012)	S Sorgiovanni on behalf of	<p>have been consulted regarding potential impacts on private bores.</p> <p>In general the draft Environmental Management Plan provided adequately addresses other water management issues, such as stormwater management and contamination risks.</p>		<p>Conservation and the Local Government.”</p> <p>Further it is recommended that the following advice note be attached with the abovementioned condition requiring that:</p> <p>“Prior to commencement of any site works, the applicant is responsible to ensure that the Environmental Management Plan is lodged with the Department of Environment and Conservation and the Local Government for its review. The Environmental Management Plan shall address the following issues:</p> <ul style="list-style-type: none"> - fuel storage, handling and spill response; - weed management; - surface, ground and stormwater management; - waste disposal; - flora and fauna; & - dust suppression and stabilisation of any soils disturbed or deposited on site.” <p>Note submission and recommend that any</p>

Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1 Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge			
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment Recommendation
	B Sorgiovanni (250 Anstey Road FORREST- DALE WA 6112) Subject Property: Lot 1 Garibaldi Willis Road, Warradarge	<p>consultation by the Shire to the affected landowners impacted by the proposed development considering it is probably the largest financial development in the Shire. My parents have not received any correspondence from the Shire regarding this issue and seeking their comment. We were also not advised of the public consultation period by either the Shire or Verve Energy.</p> <p>Hope you appreciate that having received the 18 emails only late yesterday afternoon, we have not had sufficient time to read everything that was sent to us. However, from what we have read, it shows that our father's property is significantly impacted by the proposed development a lot more than what was explained to him or us by Verve.</p>	<p>development approval for the Warradarge Wind Farm be made subject to the following condition:</p> <p>“The applicant is to prepare, submit and implement a Noise Management Plan to the satisfaction of the Department of Environment and Conservation and the Local Government.”</p> <p>Further it is recommended that advice notes be attached with the abovementioned condition requiring that:</p> <p>“prior to commencement of any site works, the applicant is responsible to ensure that the Noise Management Plan is lodged with the Department of Environment and Conservation and the Local Government for its review. The Noise Management Plan shall set out in detail the management commitments applicable to noise minimisation relevant to all installations, activities and processes, based on sound level measurements</p>

Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1 Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge			
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment
Recommendation			

			<p>assistance to the respondent.</p> <p>The Shire also advised the respondent that it was its understanding that a person who wishes to make a presentation at the DAP meeting must provide a request in writing to the DAP Secretariat at least 72 hours before the commencement of the meeting.</p> <p>The Shire has offered its apologies to the respondent that they were not advised directly in writing of the proposal by the Shire at the commencement of the advertising period. However, it should be noted that once being made aware of the situation the Shire has made efforts to provide all relevant information to the landowner and enable the landowner opportunity to make comment.</p> <p>It should also be noted that the Warradarge Wind Farm application did not require advertising under either the Shire of Coorow or Shire of Carnamah Town Planning Schemes, and has been advertised arising from a decision of Council at the respective 18 July 2012 Council meetings. Further the submission period for the Wind Farm advertising period was extended from the 14 days prescribed by the Shire of Coorow Town Planning Scheme to 21 days. It should also be noted that the requirements of both the Shire of Coorow and Shire of Carnamah Town Planning Schemes is that advertising shall include one, or more, of the following actions:</p> <ul style="list-style-type: none"> - notice being provided to nearby
			<p>of plant, both individually and in combination. The Noise Management Plan shall take proper account of tonal components, amplitude or frequency modulations or impulses, and the Noise Management Plan shall demonstrate that noise emissions will achieve compliance with the requirements of the South Australian guidelines Environmental Protection Authority – Wind Farms Environmental Noise. Once approved, the applicant from time to time as directed by the Local Government is responsible to ensure that all installations, activities and processes carried out at all times and in all respects are in accordance with the Noise Management Plan.”</p> <p>“The applicant is to implement and maintain reporting mechanisms and monitoring for noise complaints throughout the duration of the operation of the development. In event of a substantiated complaint being received the applicant</p>

Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1 Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge				
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment	Recommendation
			<p>owners/occupiers;</p> <ul style="list-style-type: none"> - notice being published in a newspaper circulating in the Scheme area; - notice being displayed on a sign on-site. <p>Although the application was not required to be advertised, the advertising of the Warradarge Wind Farm application was undertaken in accordance with the advertising requirements of the Schemes by being available for public comment for a period of 21 days through the placement of an advisory sign on-site, and a notice being displayed in the Geraldton Guardian on 20 July 2012.</p> <p>It is also noted that in addition to this the advertising actions included the placement of a notice in the Mid West Times on 26 July 2012, and the Mid West Times also ran an article on the Warradarge Wind Farm development application on 2 August 2012. A copy of the development application was displayed at the Shire of Coorow (Leeman) and Shire of Carnamah (Carnamah) offices and the following parties were written to and provided with a complete copy of the application and invited to make comment:</p> <ul style="list-style-type: none"> - All landowners within 5km of the Warradarge Wind Farm site (with the exception of Mr Sorgiovanni who was found to have been omitted through administrative error and was provided with the application information immediately upon the Shire being made aware of this and provided with opportunity to make 	<p>is required to demonstrate mitigation responses to the requirements of the Department of Environment and Conservation and the Local Government. Such responses will be treated as required modifications to the Noise Management Plan.”</p> <p>Recommend that any development approval for the Warradarge Wind Farm be made subject to the following condition:</p> <p>“The applicant is to prepare, submit and implement an Environmental Management Plan to the satisfaction of the Department of Environment and Conservation and the Local Government.”</p> <p>Further it is recommended that the following advice note be attached with the abovementioned condition requiring that:</p> <p>“Prior to commencement of any site works, the applicant is responsible to ensure that the</p>

Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1			
Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge			
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment
Recommendation			

		<p>submission));</p> <ul style="list-style-type: none">- Alinta Gas;- Civil Aviation Safety Authority;- Department of Agriculture & Food;- Department of Environment and Conservation;- Department of Indigenous Affairs;- Department of Mines and Petroleum;- Department of Planning;- Department of Regional Development & Lands;- Department of State Development;- Department of Transport;- Department of Water;- Fire & Emergency Services Authority;- Main Roads WA;- Mid West Development Commission;- State Heritage Office;- Telstra;- Water Corporation;- Western Power. <p>These actions are in addition to the public consultation undertaken by the applicant as outlined in Section 2.3 of their submitted development application report, including direct contact; production of newsletters, mail-outs and e-mails; newspaper notices; surveys; and public information sessions.</p> <p>The respondent's property is zoned 'Rural' under the Shire of Coorow Town Planning Scheme No.2 and the following land uses are listed under the Scheme Zoning Table for this zone as either (P) permitted, (D) discretion, or (A) special notice:</p>	<p>Environmental Management Plan is lodged with the Department of Environment and Conservation and the Local Government for its review. The Environmental Management Plan shall address the following issues:</p> <ul style="list-style-type: none">- fuel storage, handling and spill response;- weed management;- surface, ground and stormwater management;- waste disposal;- flora and fauna; &- dust suppression and stabilisation of any soils disturbed or deposited on site."
	<p>The proposed wind farm development will impact my father's property by:-</p> <ul style="list-style-type: none">- Restricting and almost eliminating any future development of the property. We have had 2 companies over the last few years interested in the property. One was for setting up chalets		

Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1			
Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge			
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment
			Recommendation

		<p>for ecotourism for wild flowers and farm stays and the other was for a cattle feed lot. Both proposals would have required construction of accommodation to house guests or workers. Neither of these interested parties would look this option now if a buffer/easement is on the property to the magnitude that Verve is intending.</p> <ul style="list-style-type: none"> - Significantly impacting any future sale of the property and commercial value to potential buyers. - Ruining the aesthetics of the area and creating an unsightly visual impact. - Destroying the peace and tranquility of the local area during the construction <p>I have decided to provide our comment via email as my father would like his opposition to the proposal tabled at the upcoming DAP meeting and forwarded to the Councillors and any upcoming development approval committee that is to assess this proposal.</p>	<p>(P) Uses:</p> <p>Animal Establishment Aquaculture Dwelling-Single Rural Pursuit Stables</p> <p>(D) Uses:</p> <p>Aged Persons Hostel Caravan Park Caretaker's Dwelling Carpark Dwelling-Grouped Home Occupation Industry Rural Public Utility Zoological Gardens</p> <p>(A) Uses:</p> <p>Agriculture Intensive Consulting Room Dog Kennels Educational Establishment Funeral Parlour Hospital Hotel Industry Cottage Industry Extractive Industry Hazardous Industry Light Industry Service Milk Depot Motel Motor Vehicle Repair Office</p>	
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Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1 Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge			
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment
			Recommendation

			<p>Place of Worship Reception Centre Recreation Private Restaurant Service Station Shop Transport Depot Veterinary Centre</p> <p>The above list does not include land uses that may not be listed within the Zoning Table but may be considered by Council under Section 4.4.2 of the Coorow Scheme.</p> <p>The approval of the Wind Farm application does not preclude the lodgement and potential approval (if in accordance with the requirements of the Scheme) of development applications upon surrounding properties.</p> <p>It should be noted that the landowner of Lot 1 could make application for a habitable building (e.g. accommodation to house guests or workers for a cattle feed lot) upon their property and such a building upon completion would be treated as a 'noise sensitive premise' and in the event that emissions from any neighbouring operation exceed regulatory criteria (be they noise, dust, vibration, odour etc.) then it is the responsibility of the emitter to modify their actions to meet the prescribed limits and not the responsibility of the receiver.</p> <p>The Noise Impact Assessment prepared by Herring Storer Acoustics has logged the</p>	
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Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1			
Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge			
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment
			Recommendation

			<p>existing background noise on-site (over a period of six weeks) and models the proposed noise impact (and low frequency noise and infrasound projections) and concludes that the Warradarge Wind Farm will meet with the requirements of the Noise Regulations and the 'Wind Farms—Environmental Noise Guidelines—July 2009' (EPA of South Australia) which are the guidelines recognised by the DEC. The modelling has been undertaken using the conservative criteria of the wind turbine design that emits greatest noise (which may not be utilised for this project) and incorporates all wind conditions. The closest residence to the proposed wind farm would, under the most noise conducive conditions, experience 35dB(A) which is in compliance with the relevant regulations and guidelines for noise sensitive premises. It should be noted that in the event that the modelling is found to be inaccurate (undervalued) upon operation of the wind farm it would be the responsibility of the operator to modify the turbine(s) until compliant with the <i>Environmental Protection (Noise) Regulations 1997</i>.</p> <p>The Noise Assessment does indicate that there are some land areas within the 35dB(A) noise contour (being the minimum background noise criteria) which are owned by non-participants of the wind farm development. This includes the north-western portion of Lot 1 and this presents a risk to the Wind Farm applicant in the absence of a</p>
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Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1			
Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge			
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment
			Recommendation

		<p>The only correspondence my father has received in the past 6 months is a very onerous and binding deed of agreement with an unacceptable offer considering the significant impact the proposed development has on my father's property and any future or potential development of Lot 1. The area Verve have indicated on the documents previously sent to my father have not been as clear as the documents that were sent to my brother and I only yesterday. So the quality of their consultation is questionable as it appears Verve are only showing the affected land owners what they want to show to suit the approval of the proposal.</p> <p>A letter that accompanied the deed of agreement</p>	<p>statutory buffer, as noise sensitive premises would be permitted to 'encroach' into the 35dB(A) noise contour.</p> <p>It is considered appropriate given the issues raised by the objector that any approval of the Warradarge Wind Farm, both for the construction and operational phases of the project, should be subject to the applicant preparing and adhering to a Noise Management Plan.</p> <p>The Landscape and Visual Impact Assessment prepared by GHD does demonstrate that 80-100 turbines would be visible from Lot 1, however an assertion that that this would restrict and almost eliminate any neighbouring development is considered difficult to substantiate.</p> <p>The applicant was advised of the nature of the objection received and provided with the opportunity to make comment upon the issues raised in Submission 10. The comments of Verve Energy in relation to the specific issues that have been raised are provided in <i>italic font</i> in this comments section.</p> <p><i>"Community consultation and engagement is a critical component of all of our project developments. Verve Energy has actively engaged with all of the surrounding landowners of the proposed Warradarge Wind Farm and presented our plans to the local communities of Eneabba and</i></p>
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Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1			
Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge			
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment
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		<p>sent by Verve, was not very clear in clarifying whether the area that impacts my father's property is to be a 'development buffer' or an 'easement' as both terms were used to describe the area and each having an significant effect on any future development of my father's property. The area of my father's farm impacted is almost the entire property, and from the documents sent yesterday, no other property is affected by this proposal like my father's property is affected.</p> <p>Therefore, I request that you record our total DISAPPROVAL of the proposed Warradarge Wind Farm by Verve Energy. We will be seeking legal advice over the next couple of weeks and request that <u>no approval</u> be given to Verve until all of the affected land owners have been properly consulted and informed of the actual impact of this proposal.</p> <p>We look forward your future consultation regarding this proposed development.</p>	<p>Warradarge.</p> <p>Verve Energy initially met with the owners of Lot 1, Mr Bruno Sorgiovanni and Mrs Carmella Sorgiovanni in November 2011 informing them of the proposed Warradarge Wind Farm. They advised at the time their property was up for sale, to which Verve Energy explained that we were not in a position to purchase land.</p> <p>Since then, Verve Energy has spoken to their other son Mr Ross Sorgiovanni on several occasions and kept him informed of the wind farm development and our intention to enter into a Neighbour Agreement. An agreement was sent to Mr Bruno Sorgiovanni via Mr R. Sorgiovanni mid February 2012 for consideration.</p> <p>Newsletter updates advising of the upcoming March Public Information Sessions were sent to the owner's residence in Forrestdale in February and March 2012. Mr R. Sorgiovanni spoke to me to ask what was at the Public Information Sessions and I advised that I could send through the presentation and offered to meet with any of the owners to share our information we collected from our environmental studies. Following the Public Information Sessions, Verve Energy sent through to Mr R. Sorgiovanni a copy of the presentation that was on display as well as offered to meet to further discuss the project if required.</p>
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Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1			
Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge			
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment
			Recommendation

			<p>We spoke to Mr R. Sorgiovanni last week to advise on the project status and we believed that we were waiting to hear from Mr B. Sorgiovanni's legal advisor about our proposed Neighbour Agreement we issued earlier in the year.</p> <p>The Noise Impact Assessment for the Proposal has been carried out in accordance with Western Australian Planning Bulletin 67 and the Department of Environment and Conservation WA which recommends using the EPA of South Australia "Wind Farms – Environmental noise guidelines – July 2009" as the guidelines for the assessment of wind farms. The Noise Impact Assessment was provided in Annex 4 of the Development Application Report (DAR).</p> <p>The noise limits for new wind farm developments is that the predicted noise level must not exceed the greater of either 35 dB(A) or 5 dB(A) above the background noise at any nearby homes or other noise sensitive receiver premises during night-time hours. The noise limits have been assessed for all nearby lots including Lot 1 and are predicted to be below these levels.</p> <p>The wind farm noise on areas of land on Lot 1 could be greater than either 35 dB(A) or 5 dB(A) above the background noise. It is good practice for Wind Farm proponents to enter Neighbour Agreements to agree that no new homes or other noise sensitive receiver premises will be constructed during the</p>
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Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1 Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge			
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment
			Recommendation

			<p><i>lifetime of the wind farm in these areas. These areas are known as noise buffer areas. In the Neighbour Agreement, it was illustrated that the noise buffer area which corresponds to the extent of predicted noise above 35dB(A), would encompass around a quarter of Lot 1 and not encompass the existing farm house or buildings.</i></p> <p><i>It is our hope that we are still able to achieve a suitable agreement, however, the project has been developed in such a way that we can minimise the impact on Lot 1 if such an agreement cannot be reached. Verve Energy can do this be either:</i></p> <ol style="list-style-type: none"> 1 Relocating the turbines to non optimal locations such that under all scenarios Verve Energy will never exceed the noise limits imposed by the Environmental Protection Authority (EPA) on nearby land. For Lot 1 this would mean moving the turbines away from the eastern boundary towards the centre of the wind farm; or 2 Accepting the commercial risk that if Verve Energy proceeds with the optimal locations for the wind turbines within the project area and if a new house or other noise sensitive property is built near the wind farm, the wind turbines may need to have their output turned down at night to meet the statutory noise limits imposed by the EPA.
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Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1			
Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge			
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment
Recommendation			

			<p><i>Throughout the DAR and public consultation process we have stressed that the wind farm design is flexible and we have presented a worst case scenario in terms of turbine spacing, visual impact and noise. If a Neighbour Agreement cannot be reached with Mr B. Sorgiovanni for Lot 1 Verve Energy will need to consider its options which may include relocating wind turbines away from the north eastern boundary of the wind farm.</i></p> <p><i>Verve Energy welcomes the opportunity to discuss this letter with the Council if required, and reiterate our intention to continue to positively engage with the owner of Lot 1 to reach a mutually beneficial agreement.”</i></p>	
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SUBMISSION 1

From: Lauren Taylor [<mailto:Lauren.Taylor@stateheritage.wa.gov.au>]
Sent: Friday, 3 August 2012 11:25 AM
To: Leonie Quantock
Subject: Attn: David Hadden - Proposed Warradarge Wind Farm

Hi David

Thank you for your referral for the abovementioned proposal, received 23 July 2012.

I wish to advise that we have no comment in relation to the proposal, as it does not appear to impact upon any place of State cultural heritage significance.

Kind regards,

Lauren Taylor
Planning Officer
State Heritage Office
Tel: +61 8 6552 4152
Fax: +61 8 6552 4001
Email: Lauren.Taylor@stateheritage.wa.gov.au
Web: www.stateheritage.wa.gov.au



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SUBMISSION 2

Ms L Marche
280 Kooyong Road
KEWDALE WA 6105

6 August 2012

**By fax and mail – fax number 9952 1173
and by email - admin@coorow.wa.gov.au**

The Chief Executive Officer and all Council Members
Shire of Coorow
Main Street
PO Box 42
COOROW WA 6515

Dear Sir,

**RE: PROPOSED WIND FARM – VERVE ENERGY
IMPACT ON LOT 10854 GARIBALDI WILLIS ROAD, WARRADARGE**

I am writing to inform you that I am now the registered proprietor of Lot 10854 Garibaldi Willis Road, Coorow ("my property"). That property was transferred to me, from my mother Nardia Marche, in June 2012, and I am her Enduring Power of Attorney also.

I refer to the Minutes of Meeting of Council on 18 July 2012, and in particular *Item 10.2.1 Proposed Wind Farm – Lots 10850 & 10853 Garibaldi Willis Road & Lots 1048 & 10851 Rose Thomas Road, Warradarge*, and the Application lodged by Verve Energy to establish this wind farm on the property adjacent to my property. I am writing to both object to this application being granted and to also inform your office of the inconsistencies that have been portrayed by Verve Energy to both your office and that of the EPA.

I am writing to you to inform you and the Council at the next meeting scheduled for 15 August 2012 that I not only object to the application lodged by Verve Energy for the proposed Wind Farm being established at Warradarge but also set out details of my reasons, which should be conveyed to the Council at that meeting, in accordance with the advertising and notice requirements of the relevant legislation.

The proposed wind farm will adversely affect not only the value but also the only possible use available to me for my property. As you will no doubt be aware, my property although located in a rural precinct is not able to be used for farming

purposes because the entire 5000 acres comprises of natural vegetation and/or remnant bush land. My property has not been able to be used for agricultural purposes for the last twenty years and unless the current legislation is over turned, it is unlikely that it could be farmed during the course of the next twenty years. That is the laws in place prohibiting clearing of land, whether it be natural vegetation or regrowth bush, prevents me from clearing my property. Therefore the only conceivable use for my property is that of a "lifestyle" property, attributable to its seclusion, peace, tranquillity, flora and fauna.

However, if the proposed wind farm proceeds the only use available to me for my property will not only be lost but the value of my property will be devalued for the entire duration of the wind farm, some 20 to 25 years. The placement of the wind turbines on the adjacent property (Lot 10853) will destroy the visual and aesthetic qualities of my property and will also hinder any possibility of living on my property due to the noise from the wind turbines being a nuisance and interfering with the peace and tranquillity of my property.

I am extremely concerned that the documentation submitted by Verve Energy to the Environmental Protection Authority (and to the Shire of Coorow), has misrepresented my property as being "cleared agricultural/rural" land when almost the entire 5000 acres is natural vegetation/nature reserve. A fact that has been conveyed to Verve Energy on several occasions

Over the years my property has been enjoyed as a "lifestyle/recreational" parkland with extended family and friends frequently camping and caravanning at the shed located on my property, which has been shown as a "non-residence". Verve Energy are aware that the shed is where we stay when we camp at my property but did not mention this in their application, probably because the shed is right in the middle of their noise buffer zone.

Further, if the proposed wind farm proceeds any prospect of an economically future tourism development on my property will be rendered impossible. The visual landscape of my property will be adversely affected by the location of the 100 turbines. I note that from the documentation lodged by Verve Energy my property is the only property upon which between 80 to 100% of the turbines will be seen/viewed at all times.

The estimated noise implications for my property (as shown in the documentation lodged with the application) indicate that noise attenuation of between 39 dB at my boundary fence which adjoins Lot 10853, will also impact across the entire length and breadth of my property, with an estimate of 25dB at the opposite boundary fence. The noise alone is going to adversely affect the use and enjoyment of my

property. From information available about existing wind farms it is likely that the noise impact could be far greater once the turbines are in full operation and during various weather conditions, which will put off anyone from wanting to sleep over at my property, let alone stay there during day light hours. Not to mention possible health concerns being another issue altogether.

When the previous owners (my parents) lodged an application for permission to clear my property in about 2010 with the Department of Environment and Conservation, the DEC expressed concern about possible interference with the breeding habitats of the natural wildlife and birds inhabiting my property in particular mention was made of the endangered Carnaby's Black Cockatoos. No consideration whatsoever has been given by Verve Energy as to how the wind farm will affect the fauna and bird life on my property. Environmental impact studies for noise, landscape & visual, and flora & fauna, particularly in relation to Lot 10854, (that is, my property) have to be undertaken prior to the application for construction of the Warradarge Wind Farm Proposal being approved.

From the documentation provided by Verve Energy, my property – not being a participant in the wind farm, is the only property that will be greatly affected by the noise, land and visual impacts of the wind farm.

For the record, neither my mother, nor my father nor myself have agreed to enter into any Noise Neighbour Agreement or any other agreement with Verve Energy, nor have we consented to the Wind Farm being proposed.

A copy of this letter has been faxed and emailed to your office and the original has been posted to ensure that the letter arrives by the closing date (which I note is 10 August 2012), and in time for the Council Meeting on 15 August 2012.

I look forward to hearing from you once council have considered the contents of this letter.

Yours faithfully,



.....
Liana Marche

APPLICANT RESPONSE TO SUBMISSION 2



Our Ref: DMS#3477122
Enquiries: James Townsend
Telephone: (08) 9424 1889 / 0417 644 218
Email: james.townsend@verveenergy.com.au

10 August 2012

Mr Darren Friend
Chief Executive Officer
Shire of Coorow
PO Box 42
Coorow WA 6515

Dear Sir,

RE: DEVELOPMENT APPLICATION – PROPOSED WARRADARGE WIND FARM

Thank you for the opportunity to provide further information to the Council following the correspondence your office received from Ms Liana Marche, owner of Lot 10854, who is adjacent and to the south of Verve Energy's proposed Warradarge Wind Farm.

There are a number of points raised in Ms Marche's letter on which we would like to provide some clarification to the Council. These points have been collated into a table and attached to this letter with our clarifying comments. It should be noted that the points raised by Ms Marche are detailed in the Development Application Report (DAR) that was submitted by Verve Energy for this project and this table points to the location of this information in the DAR.

Verve Energy is a leading renewable energy developer in Western Australia having developed commercial wind farm projects in the State since 1987 when it built Australia's first wind farm at Salmon Beach near Esperance. Verve Energy is accountable for achieving industry best practice in the identification, selection and development of wind farm projects that balance the social, environmental and commercial drivers of a project and is highly regarded for its success. The proposed Warradarge Wind Farm project is no exception. Verve Energy has selected the project site using best practice techniques to identify a site with:

- Cleared and grazed pastures such that remnant vegetation disturbance can be minimised;
- A suitable wind resource;
- The potential for the wind farm to be sized such that economies of scale can be realised;
- Cost effective electrical connection access to the 330kV transmission network;

- Suitable landownership and usage patterns including sufficient distance from permanent habitable premises;
- A high level of social acceptance for a prospective wind farm; and
- Ease of construction.

Community consultation and engagement is a critical component of all of our project developments. Verve Energy has actively engaged with all of the surrounding landowners of the proposed Warradarge Wind Farm and presented our plans to the local communities of Eneabba and Warradarge. Verve Energy has spoken and met with Ms Marche's father (Mr Eric Marche) on several occasions and kept him informed of the wind farm development and our intention to enter into a Good Neighbour Agreement. It is our hope that we are still able to achieve a suitable agreement, however, the project has been developed in such a way that we can minimise the impact on the Marche property (Lot 10854) if such an agreement cannot be reached.

Verve Energy intends to negotiate Good Neighbour Agreements with all relevant neighbours of the wind farm. Should a Good Neighbour Agreement not be reached with Ms Marche for Lot 10854, or any other landowner for that matter, Verve Energy will consider:

1. Relocating the turbines to non optimal locations such that under all scenarios Verve Energy will never exceed the noise limits imposed by the Environmental Protection Authority (EPA) on the adjoining land. For Lot 10854 this would mean moving the turbines away from southern boundary towards the centre of the wind farm; or
2. Accepting the commercial risk that if Verve Energy proceeds with the optimal locations for the wind turbines within the project area and if a new house or other noise sensitive property is built near the wind farm, the wind turbines may need to have their output turned down at night to meet the statutory noise limits imposed by the EPA.

Throughout the DAR and public consultation process we have stressed that the wind farm design is flexible and we have presented a worst case scenario in terms of turbine spacing, visual impact and noise. If a Good Neighbour Agreement cannot be reached with Ms Marche for Lot 10854 Verve Energy will need to consider its options which may include relocating wind turbines away from the Northern boundary of her property.

Verve Energy welcomes the opportunity to discuss this letter and its attachment with the Council if required, and reiterate our intention to continue to positively engage with the owner of Lot 10854 to reach a mutually beneficial agreement,

Yours Sincerely



JAMES TOWNSEND
SENIOR PROJECT DEVELOPER

Concern raised by Ms L Marche	Verve Energy response with reference to relevant section(s) in Development Application Report
<p>I am extremely concerned that the documentation submitted by Verve Energy to the Environmental Protection Authority (and to the Shire of Coorow), has misrepresented my property as being "cleared agricultural/rural" land when almost the entire 5000 acres is natural vegetation/nature reserve. A fact that has been conveyed to Verve Energy on several occasions</p>	<p>Figures 4 and 6 in the Development Application Report show Lot 10854 is predominantly vegetated. Verve Energy does not believe the Development Application Report shows it is "cleared agricultural/rural" land. Additionally, although Lot 10854 has a good wind resource, in our site selection process as discussed in section 1.8, we sought to select land that minimised any vegetation clearing.</p>
<p>Over the years my property has been enjoyed as a "lifestyle/recreational" parkland with extended family and friends frequently camping and caravanning at the shed located on my property, which has been shown as a "non-residence". Verve Energy are aware that the shed is where we stay when we camp at my property but did not mention this in their application, probably because the shed is right in the middle of their noise buffer zone.</p>	<p>Verve Energy is aware that the land owners of Lot 10854 do use their existing shed for occasional residential purposes as shown in Figure 17.</p> <p>We have also assessed this location as a potential house labelled Receiver Point 12 in the Noise Impact Assessment, Annex 4. It is shown that the wind turbines will comply with the limits at this point.</p>
<p>Further, if the proposed wind farm proceeds any prospect of an economically future tourism development on my property will be rendered impossible. The visual landscape of my property will be adversely affected by the location of the 100 turbines. I note that from the documentation lodged by Verve Energy my property is the only property upon which between 80 to 100% of the turbines will be seen/viewed at all times.</p>	<p>Verve Energy has shown in Figures 5 and 6 of the LVI/A report (Annex 2) a Zone of Theoretical Visibility (ZTV) of the potential wind turbine layout. If that layout were adopted, there are a number of surrounding properties from which, theoretically, between 80% and 100% of the turbines could be visible. It is also noted that this ZTV is theoretical only, and does not take into account existing built form and vegetation which may provide screening.</p> <p>The Development Application Report states-</p> <p><i>4.2.7 A Zone of Theoretical Visibility ("ZTV") for both tip and hub height has been produced for the Proposal and these are shown in Figures 5 and 6 in Annex 2. A ZTV is the area around a designated point in the landscape from which that point is visible. It is calculated using elevation data such as a Digital Elevation Model and does not take account of buildings or vegetation</i></p>

	<p>screening. It represents a worst case view of how many turbines or blade tips can be seen at the location.</p> <p>4.2.8 Figures 5 and 6 in Annex 2 shows the turbines that are visible from the hub (100m) upwards and the tip height (152m). These figures show that beyond 10km from the wind farm the number of turbines visible to the west reduces to zero except on a few elevated areas. In areas to the south and north the turbines are theoretically visible out to 15km, beyond which it they are only seen in isolated areas. To the west the tips of the turbines are theoretically visible to 25km except in lower areas of the landform but it can be seen that the hubs are not as visible beyond 15km, and this is due to the screening effect of the topography.</p> <p>4.2.9 In should be noted that the ZTV is a tool to assess theoretical visibility only and that vegetation and built structures will influence what is actually visible from various locations. It is for this reason that a number of viewpoints are selected to represent what the actual change of view will be and these are shown as photomontages. The viewpoints are selected in areas that theoretically have a view of at least 80% of the wind turbines.</p>
<p>The estimated noise implications for my property (as shown in the documentation lodged with the application) indicate that noise attenuation of between 39 dB at my boundary fence which adjoins Lot 10853, will also impact across the entire length and breadth of my property, with an estimate of 25dB at the opposite boundary fence. The noise alone is going to adversely affect the use and enjoyment of my property. From information available about existing wind farms it is likely that the noise impact could be far greater once the turbines are in full operation and during various weather conditions, which will put off anyone from wanting to sleep over at my property, let alone stay their during day light hours. Not to mention possible health concerns being another issue altogether.</p>	<p>The Noise Impact Assessment has been carried out in accordance with Western Australian Planning Bulletin 67 and the Department of Environment and Conservation WA which recommends using the EPA of South Australia "Wind Farms – Environmental noise guidelines – July 2009" as the guidelines for the assessment of wind farms. The Noise Impact Assessment was provided in Annex 4 of the DAR.</p> <p>The noise limits for new wind farm developments is that the predicted noise level must not exceed the greater of either 35 dB(A) or 5 dB(A) above the background noise at any nearby homes or other noise sensitive receiver premises during night-time hours. The noise limits have been assessed for all nearby lots including Lot 10854 and are predicted to be below these levels at</p>

	<p>the existing sheds. The wind farm complies with the noise limits at the current sheds which were given the same importance as a house.</p> <p>The wind farm noise on areas of vegetated land of Lot 10854 closer to the turbines than the sheds could be greater than either 35 dB(A) or 5 dB(A) above the background noise. It is good practice for Wind Farm proponents to enter Good Neighbour Agreements to agree that no new homes or other noise sensitive receiver premises will be constructed during the lifetime of the wind farm in these areas. These areas are known as noise buffer areas.</p>
<p>Environmental impact studies for noise, landscape & visual, and flora & fauna, particularly in relation to Lot 10854, (that is, my property) have to be undertaken prior to the application for construction of the Warradarge Wind Farm Proposal being approved.</p>	<p>Verve Energy conducted a Noise Impact Assessment, Background Noise Monitoring, Flora, Vegetation and Fauna Assessment and a Landscape and Visual Impact Assessment (LVIA) on the proposed wind farm development site. The noise assessments and LVIA considers the impact on adjacent properties, however, a flora and fauna survey was not conducted on Lot 10854 as Verve Energy does not propose to clear any vegetation on that land.</p> <p>The Development Application Report states-</p> <p><i>4.3.1 Biota Environmental Sciences undertook a Flora, Vegetation and Fauna Assessment of the wind farm envelope and a possible transmission line route. This comprised a desktop review, field survey and flora specimen identification and this report is provided in Annex 3. The field survey was conducted over two trips in the October and November of 2011 and comprised a total of 12 days. The land area of the wind farm envelope and area of transmission line corridor is 5,010 hectares, Biota surveyed 3,650 hectares of land which was the entire wind farm envelope and one possible line route within the transmission line corridor.</i></p> <p><i>4.4.3 Verve Energy engaged specialist consultant Herring Storer Acoustics ("HSA") to undertake Noise Impact Assessment for the Warradarge Wind Farm. A prediction of worst case noise propagation from the proposed wind</i></p>

	<p><i>farm was undertaken and background noise measurements undertaken. The Noise Impact Assessment is in Annex 4. The background noise measurements took place over 6 weeks and the results of these have set the noise limits to be applied to nearby noise sensitive premises such as residential properties, this report is in Annex 5.</i></p> <p><i>4.2.2 Following the initial wind farm design, GHD have undertaken a landscape and visual impact assessment and this is attached in Annex 2. The assessment covers a 25km radius study area from the Proposal and it investigates the various effects the wind farm has on the landscape and people in the study area at seven different publicly accessible locations.</i></p> <p><i>4.2.3 To assess the Proposal, the wind farm is designed with the greatest likely footprint and the north-south/east-west extents are shown as spaced across the greatest amount of overall land area within the wind farm envelope, as shown in Figures 5 and 6. This is deemed the worst case design from a visual point of view.</i></p> <p><i>4.2.4 As such, the width of any view of the wind farm is greatest from any viewpoint. Therefore, smaller or fewer number of turbines within the wind farm envelope or 100 turbines located in different locations within the wind farm envelope are also encompassed by the assessment.</i></p>
For the record, neither my mother, nor my father nor myself have agreed to enter into any Noise Neighbour Agreement or any other agreement with Verve Energy, nor have we consented to the Wind Farm being proposed.	<p>Verve Energy has not stated at any point that a Good Neighbour (noise buffer) Agreement has been signed with the land owner of Lot 10854. However such an agreement has been among the topics discussed at meetings with Mr Eric Marche</p> <p>Verve Energy commenced discussions with various land owners on 16 June 2011 regarding the proposed wind farm and the potential for a noise buffer (if applicable).</p> <p>Verve Energy met Mr Eric Marche in June 2011, November 2011 and in June</p>

	<p>2012, with various correspondence and conversations in between. During this time a draft agreement was presented for consideration and a counter proposal received. Verve Energy is open to continuing discussions with the owner of Lot 10854 to come to a mutually beneficial agreement if common ground can be found. However, should an agreement not be reached for Lot 10854, Verve Energy will consider either relocating turbines away from the boundary of Lot 10854 or accepting that there is a commercial risk that if a house or noise sensitive premises is constructed on nearby land in the future that the turbines may need to be limited to reduce their noise to comply with noise regulations at these new premises.</p> <p>The Development Application Report states-</p> <p><i>1.9.4 Verve Energy is negotiating wind farm neighbour agreements with the owners of adjacent Lots (Lots 10849, 10854, 10877, & 10878) to ensure the areas of these lots where the wind farm will be generating noise exceeding 35dB(A) or 5dB(A) above background noise, whichever is greater, will not cause any conflict with any possible future noise sensitive premises.</i></p> <p><i>1.9.5 It should be noted that the final design of the wind farm and its capacity will be dependent on these agreements. Should one or more wind farm neighbour agreements not be reached this will not affect the ability to operate a wind farm, only the position and overall number of turbines within the wind farm envelope. This is discussed more fully in Chapter 4.</i></p>
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SUBMISSION 3A



DEVELOPMENT APPLICATION SUBMISSION FORM

**PROPOSED WARRADARGE WIND FARM & TRANSMISSION LINE
LOTS 10850 & 10853 GARIBALDI WILLIS ROAD & LOTS 10847, 10848 &
10851 ROSE THOMSON ROAD, WARRADARGE**

Name: DAVID JONAS

Postal Address: LOCKED BAG 2525 PERTH WA 6001

Phone Number: (08) 6224 6268

SUBMISSION: ☐ Support ☐ Object ☐ Indifferent

Please give in full your comments and any arguments supporting your comments
(if insufficient space, please attach additional sheets) -

* TELSTRA REQUIRES MORE TIME TO ASSESS THIS PROPOSAL *

AN ENGINEERING STUDY NEEDS TO BE UNDERTAKEN TO
ASSESS THE IMPACT TO OUR NETWORK. AS YOU CAN
APPRECIATE THIS IS NOT A TRIVIAL EXERCISE. AS SUCH
WE WILL REQUIRE 6WKS TO COMPLETE THIS TASK.
THANK YOU FOR YOUR UNDERSTANDING.

PLEASE FEEL FREE TO CONTACT ME IF YOU WISH
TO DISCUSS THIS FURTHER. THANKS.

REMARKS,
[Signature] Date: 6/8/2012

Please return to either: Chief Executive Officer
Shire of Coorow
PO Box 238
LEEMAN WA 6514

Chief Executive Officer
Shire of Carnamah
PO Box 80
CARNAMAH WA 6517

NOTE: The local government in determining the application will take into account the submissions received but is not obliged to support those views.

Submissions Close: 4pm Friday 10 August 2012

SUBMISSION 3B

From: Jonas, David R [mailto:David.Jonas@team.telstra.com]
Sent: Friday, 10 August 2012 3:21 PM
To: Simon Lancaster
Cc: MRS@coorow.wa.gov.au; Kathryn Jackson
Subject: RE: Warradarge Wind Farm - Shire of Coorow

Simon,

I have been in contact with Verve Energy and they have provided me with a comprehensive feasibility report and that has put my mind at ease to some extent. Whilst it does cover our radio sites we have a country exchange located about 2.5 km from the south west corner of the wind farm area. It is not a radio site but I am still concerned about induced noise and more importantly induced EMF from the wind farm.

I will have our design team check the impact to our country exchange and also verify the findings of the report. Unfortunately they will not be able complete this investigation by CoB today.

As I don't have the time to complete a engineering impact study I do not feel comfortable stating that I have no objections to the development.

It is unfortunate that circumstances have prevented me from having more time to investigate this development proposal.

Regards,



David Jonas Area Planning Manager WA
Area Planning WA | Fixed & Data Access Engineering | Telstra Operations
P 08 6224 6268 | M 0438 934 894 | E david.jonas@team.telstra.com | W www.telstra.com

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SUBMISSION 4



Government of Western Australia
Department of Environment and Conservation

Your ref. A1492/A1493 DH/GM
Our ref. 32709
Enquiries Liz Rushforth
Telephone: 08 9652 1911
Fax. 08 9652 1922
Email: elizabeth.rushforth@dec.wa.gov.au

Mr Dave Hadden
Manager Regulatory Services
Shire of Coorow
PO Box 42
COOROW WA 6515

Dear Mr Hadden

APPLICATION NO A1492/A1493 DH/GM – PROPOSED WARRADARGE WIND FARM

Thank you for your letter of 19 July 2012 regarding the above application.

The Department of Environment and Conservation (DEC) is unable to provide comment at this time. In providing advice DEC would need to refer to the Office of Environmental Protection Authority (EPA) who is the lead environmental agency for this application. DEC would need to take into account the Office of EPA comments and recommendations for this project, and unfortunately they are yet to assess this application.

Yours sincerely

Nigel Sercombe
REGIONAL MANAGER
Midwest Region

9 August 2012

SUBMISSION 5



DEVELOPMENT APPLICATION SUBMISSION FORM

**PROPOSED WARRADARGE WIND FARM & TRANSMISSION LINE
LOTS 10850 & 10853 GARIBALDI WILLIS ROAD & LOTS 10847, 10848 &
10851 ROSE THOMSON ROAD, WARRADARGE**

Name: DEPT OF TRANSPORT

Postal Address: PO BOX 68 GERALDTON WA 6531

Phone Number: (08) 99560110

SUBMISSION: ☒ Support ☐ Object ☐ Indifferent

Please give in full your comments and any arguments supporting your comments
(if insufficient space, please attach additional sheets) -

The proposal for the Warradarge Wind Farm will have a positive impact on the sustainability of the State should it go ahead. The Dept of Transport supports the idea even though we will not have any direct involvement in the development.

Signature: V McCrory Date: 13.8.12

Please return to either: Chief Executive Officer
Shire of Coorow
PO Box 238
LEEMAN WA 6514

Chief Executive Officer
Shire of Carnamah
PO Box 80
CARNAMAH WA 6517

NOTE: The local government in determining the application will take into account the submissions received but is not obliged to support those views.

Submissions Close: 4pm Friday 10 August 2012

SUBMISSION 6

Enquiries: Naomi Mynott on 08 9956 1205
Our Ref: 06/1393
Your Ref: A1492/A1493 DH/GM

9 August 2012

Chief Executive Officer
Shire of Coorow
PO Box 238
LEEMAN WA 6514

ATTENTION: MR D HADDEN, MANAGER REGULATORY SERVICES

Dear Sir

PROPOSED WARRADARGE WIND FARM & TRANSMISSION LINE

Thank you for consulting Main Roads Western Australia (MRWA) on the proposed development of a wind farm at Warradarge. We have had the opportunity to review the submitted details comprising the Development Application Report (dated June 2012) and supporting plans and reports and have the following comments to make.

MRWA supports the provision of renewable energy developments and is satisfied that principle of the development in this location would be acceptable.

Notwithstanding the above, MRWA has some concerns over potential impacts of the proposal on the Main Roads network as a result of the type and number of additional vehicle movements generated, particularly in association with the construction and decommissioning stages. It is considered, however, that the production of a Traffic Management Plan including condition surveys would address MRWA concerns regarding:

- Ability of route and intersection to accommodate volume and nature of traffic. This would be resolved through the identification and subsequent implementation of upgrades as necessary; and
- Potential for damage at intersections and repair of any damage associated with development construction/decommissioning, which would be addressed by the Dilapidation/Condition part of the Plan.

Furthermore, it is considered that the wording of the conditions set out in the email from Simon Lancaster (dated 6 August 2012) would satisfactorily protect the interests and assets of MRWA, although we would suggest that the wording of condition X is expanded to clarify that all 'costs' would include, inter-alia, those in relation to surveys to establish the conditions together with any costs associated with the design, construction and maintenance (over a specified defect liability period) of identified required upgrades.

In addition to the conditions and advice set out within the aforementioned email, we would request that the following advice is also offered to the proponent:

- Any signs or additional markings on or visible from the Main Road will require the approval of MRWA's Mid West Network Operations Manager, Peter Herbert, who can be contacted on 08 9956 1208

If you require any further information please contact Naomi Mynott on 08 9956 1205.

Yours faithfully

Bernie Miller
REGIONAL MANAGER MID WEST REGION

SUBMISSION 7

watercorporation.com.au

Mid West Region

45 Cathedral Avenue
Geraldton WA 6530

PO Box 43
Geraldton WA 6531

Faults, Emergencies and Security 13 13 75

Account Enquiries 13 13 85

Building and Subdivision 13 13 95

ADM0519 ICR125547

Your Ref: A1492/A1493 DH/GM
Our Ref: GN1 2002 00033 V01 DOC 7393402
Enquiries: Phil Gale
Direct Tel: 08 9923 4942
Fax: 08 9923 4966

15 AUG 2012



13 August 2012

Shire Of Coorow
PO BOX 42
COOROW WA 6515

Attention: Dave Hadden

**SHIRE OF COOROW
LOTS 10850, 10853, 10848 & 10851 GARIBALDI WILLIS & ROSE THOMSON RDS
WARRADARGE - WARRADARGE WIND FARM**

I refer to your letter of 19 July 2012 regarding the above proposed Wind Farm in Warradarge.

The Water Corporation has no facilities in this area and there are no objections to this development proposal.

Should you have any queries, please do not hesitate to contact the Enquiries Officer.

A handwritten signature in black ink that reads "Phil Gale".

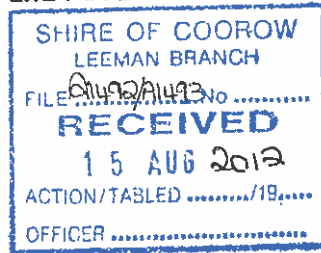
PHIL GALE
LAND SERVICING CONSULTANT
DEVELOPMENT SERVICES



Government of Western Australia
Department of Agriculture and Food



Chief Executive Officer
Shire of Coorow
PO Box 238
LEEMAN WA 6514



Your Ref: A1492/A1493 DH/GM
Our Ref: GE100173V1
Enquiries: A. Stuart-Street
Date: 9 August 2012

Dear Sir

Re: PROPOSED WARRADARGE WIND FARM

Thank you for the opportunity to comment on the Proposed Warradarge Wind Farm. The Department of Agriculture and Food (DAFWA) does not have any objection to the Wind Farm, but would like to offer the following comments:

Page one of the Draft Environmental Management Plan (sections 1.1.10 and 1.1.11) discusses issues with Weed hygiene. The declared weed Paterson's Curse is raised in the report, but no mention is made of Skeleton Weed. This is another significant declared weed which has been identified in the vicinity of the wind farm site (both to the east and west of the proposed wind farm location), if not actually on the site. The site is considered to be at moderate risk for infestation.

Weed management standards need to be maintained in all aspects of the project throughout its life. This is important to ensure a minimal biosecurity risk for the land owner, the adjoining farms and along the transport route. See the attached link to DAFWA's website for further information about Biosecurity guidelines.
http://www.agric.wa.gov.au/PC_93003.html?s=700803442.

The site in question is dominated by deep sands and gravelly soils and much of the area is subject to a very high risk of wind erosion. These issues appear to have been addressed in the Draft Environmental Management Plan under Topsoil management and rehabilitation; and Dust suppression; in sections 1.1.20 to 1.1.24.

I trust these comments inform the Council's decision on this matter. If you need specific advice on biosecurity issues please contact Dave Lisle on (08) 9956 8569. If you have queries regarding other comments, please contact Angela Stuart-Street on (08) 9956 8547.

Yours sincerely,

Pam l'Anson
Acting Regional Director
Northern Agricultural Region

ADM0519

ICR125558



Government of Western Australia
Department of Water



Your Ref: ADM0519
Address: All our water needs

Our Ref: RF6388

Enquiries: Ms Kerry Wray

(08) 9965 7400

Manager Regulatory Services
Shire of Coorow
PO Box 42
COOROW WA 6515

Attn: Manager Regulatory Services

Dear Dave

PROPOSED WARRADARGE WIND FARM

Thank you for the referral of the above proposal dated 19 July 2012. The Department of Water (DoW) has assessed the proposal and provides the following advice and recommendations.

The subject land is located within the Hill River and Tributaries Catchment surface water area as proclaimed under the Rights in Water and Irrigation Act (1914). Any taking or diversion of surface water for purposes other than stock/domestic, and any interference with the bed or banks of a watercourse in this proclaimed area will require a permit from the DoW.

Several small tributaries of the Hill River system traverse the subject land. It is recommended that the Shire of Coorow require the proponent to ensure that all road crossings over waterways are to be designed and constructed to minimise detrimental impact on the waterways form and function. It is also recommended that the proponent be required as a condition of approval to ensure that works do not encroach into the standard 30m foreshore buffer area on both banks of all waterways.

The land is also located within the Arrowsmith groundwater area as proclaimed under the Rights in Water and Irrigation Act (1914). The applicant should be advised to ensure that all landowners have been consulted regarding potential impacts to private bores.

In general, the Draft Environmental Management Plan provided adequately addresses other water management issues, such as stormwater management and contamination risks. If you wish to discuss this issue further please contact the Mid West Gascoyne Region office on (08) 9965 7400.

Yours sincerely

Katherine Tutt
Program Manager
Mid West Gascoyne

August 15, 2012

SUBMISSION 10

From: Sam Sorgiovanni [mailto:Sam.Sorgiovanni@Kwinana.wa.gov.au]
Sent: Tuesday, 21 August 2012 4:13 PM
To: Simon Lancaster; MRS@coorow.wa.gov.au
Cc: 'rosss@stockerpreston.com.au'
Subject: Proposed Warradarge Wind Farm
Importance: High

Dear Mr. Lancaster and Mr. Hadden

I am responding on behalf of my father Mr. Bruno Sorgiovanni, Owner of Lot 1 Garrabaldi-Willis Road Warradarge, in relation to the proposed Warradarge wind farm.

Firstly we wish to express our disappointment with the lack of consultation by the shire to the affected land owners impacted by the proposed development considering it is probably the largest financial development in the Shire. My parents have not received any correspondence from the shire regarding this issue and seeking their comment. We were also not advised of the public consultation period by either the Shire of Coorow or Verve energy.

Also I hope you appreciate that having received the 18 emails only late yesterday afternoon, we have not had sufficient time to read everything that was sent to us. However, from what we have read, it shows that our fathers property is significantly impacted by the proposed development a lot more than what was explained to him or us by Verve.

The proposed wind farm development will impact my fathers property by:-

1. Restricting and almost eliminating any future development of the property. As discussed with Mr. Hadden yesterday, we have had 2 companies over the last few years interested in the property. One was for setting up chalets for eco tourism for wild flowers and farm stays and the other was for a cattle feed lot. Both proposals would have required construction of accommodation to house guests or workers. Neither of these interested parties would look this option now if a buffer/easement is on the property to the magnitude that Verve is intending.
2. Significantly impacting any future sale of the property and commercial value to potential buyers.
3. Ruining the aesthetics of the area and creating an unsightly visual impact.
4. Destroying the peace and tranquility of the local area during the construction

I have decided to provide our comment via email as my father would like his opposition to the proposal tabled at the upcoming DAP meeting and forwarded to the councilors and any upcoming development approval committee that is to assess this proposal.

The only correspondence my father has received in the past 6 months is a very onerous and binding deed of agreement with an unacceptable offer considering the significant impact the proposed development has on my fathers property and any future or potential development of Lot 1. The area Verve have indicated on the documents previously sent to my father have not been as clear as the documents that were sent to my brother and I only yesterday. So the quality of their consultation is questionable as it appears Verve are only showing the affected land owners what they want to show to suit the approval of the proposal.

A letter that accompanied the deed of Agreement sent by Verve, was not very clear in clarifying whether the area that impacts my fathers property is to be a 'development buffer' or an 'easement' as both terms were used to describe the area and each having an significant effect on any future development of my fathers property. The area of my fathers farm impacted is almost the entire

property, and from the documents sent yesterday, no other property is affected by this proposal like my fathers property is affected.

Therefore, I request that you record our Total DISAPPROVAL of the proposed Warradarge wind farm by Verve energy. We will be seeking legal advice over the next couple of weeks and request that no approval be given to Verve until all of the affected land owners have been properly consulted and informed of the actual impact of this proposal.

I request that any future correspondence regarding my fathers property be addressed to:-

Mr. Bruno Sorgiovanni
250 Anstey Road
Forrestdale WA 6112

We look forward your future consultation regarding this proposed development.

Yours Sincerely

Sam Sorgiovanni

APPLICANT RESPONSE TO SUBMISSION 10



Our Ref: DMS#3480956
Enquiries: James Townsend
Telephone: (08) 9424 1889 / 0417 644 216
Email: james.townsend@verveenergy.com.au

23 August 2012

Mr Darren Friend
Chief Executive Officer
Shire of Coorow
PO Box 42
Coorow WA 6515

Dear Sir,

RE: DEVELOPMENT APPLICATION – PROPOSED WARRADARGE WIND FARM

Thank you for the opportunity to provide further information to the Council following the correspondence your office received from Mr Sam Sorgiovanni on behalf of the owner (his father, Mr Bruno Sorgiovanni) of Lot 1, to the east of Verve Energy's proposed Warradarge Wind Farm.

There are some points raised in Mr S. Sorgiovanni's letter on which we would like to provide some clarification to the Council.

Previous Consultation

Community consultation and engagement is a critical component of all of our project developments. Verve Energy has actively engaged with all of the surrounding landowners of the proposed Warradarge Wind Farm and presented our plans to the local communities of Eneabba and Warradarge.

Verve Energy initially met with the owners of Lot 1, Mr Bruno Sorgiovanni and Mrs Carmella Sorgiovanni in November 2011 informing them of the proposed Warradarge Wind Farm. They advised at the time their property was up for sale, to which Verve Energy explained that we were not in a position to purchase land.

Since then, Verve Energy has spoken to their other son Mr Ross Sorgiovanni on several occasions and kept him informed of the wind farm development and our intention to enter into a Neighbour Agreement. An agreement was sent to Mr Bruno Sorgiovanni via Mr R. Sorgiovanni mid February 2012 for consideration.

Newsletter updates advising of the upcoming March Public Information Sessions were sent to the owner's residence in Forrestdale in February and March 2012. Mr R. Sorgiovanni spoke to me to ask what was at the Public Information Sessions and I advised that I could send through the presentation and offered to meet with any of the owners to share our information we collected from our environmental studies. Following the Public Information Sessions, Verve Energy sent through to Mr R. Sorgiovanni a copy of the presentation that was on display as well as offered to meet to further discuss the project if required.

We spoke to Mr R. Sorgiovanni last week to advise on the project status and we believed that we were waiting to hear from Mr B. Sorgiovanni's legal advisor about our proposed Neighbour Agreement we issued earlier in the year.

Neighbour Agreement

The Noise Impact Assessment for the Proposal has been carried out in accordance with Western Australian Planning Bulletin 67 and the Department of Environment and Conservation WA which recommends using the EPA of South Australia "Wind Farms – Environmental noise guidelines – July 2009" as the guidelines for the assessment of wind farms. The Noise Impact Assessment was provided in Annex 4 of the Development Application Report (DAR).

The noise limits for new wind farm developments is that the predicted noise level must not exceed the greater of either 35 dB(A) or 5 dB(A) above the background noise at any nearby homes or other noise sensitive receiver premises during night-time hours. The noise limits have been assessed for all nearby lots including Lot 1 and are predicted to be below these levels.

The wind farm noise on areas of land on Lot 1 could be greater than either 35 dB(A) or 5 dB(A) above the background noise. It is good practice for Wind Farm proponents to enter Neighbour Agreements to agree that no new homes or other noise sensitive receiver premises will be constructed during the lifetime of the wind farm in these areas. These areas are known as noise buffer areas. In the Neighbour Agreement, it was illustrated that the noise buffer area which corresponds to the extent of predicted noise above 35dB(A), would encompass around a quarter of Lot 1 and not encompass the existing farm house or buildings.

It is our hope that we are still able to achieve a suitable agreement, however, the project has been developed in such a way that we can minimise the impact on Lot 1 if such an agreement cannot be reached. Verve Energy can do this be either:

1. Relocating the turbines to non optimal locations such that under all scenarios Verve Energy will never exceed the noise limits imposed by the Environmental Protection Authority (EPA) on nearby land. For Lot 1 this would mean moving the turbines away from the eastern boundary towards the centre of the wind farm; or
2. Accepting the commercial risk that if Verve Energy proceeds with the optimal locations for the wind turbines within the project area and if a new house or other noise sensitive property is built near the wind farm, the wind turbines may need to have their output turned down at night to meet the statutory noise limits imposed by the EPA.

Throughout the DAR and public consultation process we have stressed that the wind farm design is flexible and we have presented a worst case scenario in terms of turbine spacing, visual impact and noise. If a Neighbour Agreement cannot be reached with Mr B. Sorgiovanni for Lot 1 Verve Energy will need to consider its options which may include relocating wind turbines away from the north eastern boundary of the wind farm.

Verve Energy welcomes the opportunity to discuss this letter with the Council if required, and reiterate our intention to continue to positively engage with the owner of Lot 1 to reach a mutually beneficial agreement,

Yours Sincerely



JAMES TOWNSEND
SENIOR PROJECT DEVELOPER

Our Ref: DM: 11012897
Enquiries: John Lorenti
Telephone: (08) 6282 7458

1 May 2017

ATTN:

Mr Peter Crispin – Chief Executive Officer
Shire of Coorow

ceo@coorow.wa.gov.au

Ph: (08) 9953 1388

Mr Bill Atkinson – Chief Executive Officer
Shire of Carnamah

ceo@carnamah.wa.gov.au

Ph: (08) 9951 1700

Cc:

Mr Simon Lancaster – Deputy Chief Executive Officer
Mid-West Joint Development Assessment Panel, Shire of Coorow

dceo@chapmanvalley.wa.gov.au

Ph: (08) 9920 5011

Mr Trevor Brandy – Manager, Regulatory Services
Shire of Coorow

mrs@coorow.wa.gov.au

Ph: (08) 9953 1388

Mr Malcolm Pumphrey – Manager of Works and Services
Shire of Carnamah

shire@carnamah.wa.gov.au

Ph: (08) 9951 1283

Dear Chief Executive Officer

**FORM 2 SUBMISSION FOR AMENDMENT TO THE WARRADARGE WIND FARM
DEVELOPMENT APPROVALS DP/12/00625 A2370465 AND DP/12/00624 A2370626**

Synergy is writing to request an amendment to Condition 2 of the Development Approvals (DAs) DP/12/00625 A2370465 (Coorow) and DP/12/00624 A2370626 (Carnamah) for the Warradarge Wind Farm (WWF) development via submission of *Form 2* under the *Planning and Development (Development Assessment Panels) Regulations 2011*.

In 2012, Verve Energy sought relevant development and environmental approvals for the WWF project via submission of development applications to the Mid-West Joint Development Assessment Panel (JDAP). However, the WWF project was postponed in 2013 and during that time Synergy and Verve Energy merged to operate as Synergy.

Condition 2 of both DAs requires the approved development to be substantially commenced within a period of 5 years from the date of development approval (31 August 2012). Synergy advises that this condition cannot be met; therefore, Synergy is seeking to extend the approvals via the JDAP for five years in order to allow for the scheduled commencement to Project construction, currently anticipated for Q2/Q3 2018.

The WWF is being developed to supply renewable electricity into the South West Interconnected System in Western Australia.

Synergy has conducted a high level review of the current proposed design and the details outlined in the original development application submitted 6 June 2012 to the JDAP. Synergy notes the following differences in ultimate capacity and scope:

- Synergy plans to have no limits to the ultimate installed capacity released by 100 turbines (limited only by the wind turbine generator technology proposed). Synergy is not proposing any change to the total number of turbines, noise impacts and tower hub heights detailed in the original development application submitted 6 June 2012. At present, the DA envisages a 250 MW ultimate capacity (although ultimate capacity is not detailed in the DA conditions), as this was the expected ultimate capacity of a 100 turbine site with the technology available at the time of submission.
- The Transmission Line scope is now expected to be built, owned and operated by Western Power, however Synergy still wishes to seek amendment to extend the DA (DP/12/00624 A2370626) timeframe to 31 August 2022.

Synergy has determined that there are no substantial changes to the current design that will require amendment to current regulatory approvals.

Synergy will continue to liaise and consult with relevant stakeholders throughout the planning stages for the WWF. Synergy will continue to meet the remaining conditions stipulated within each of the DAs.

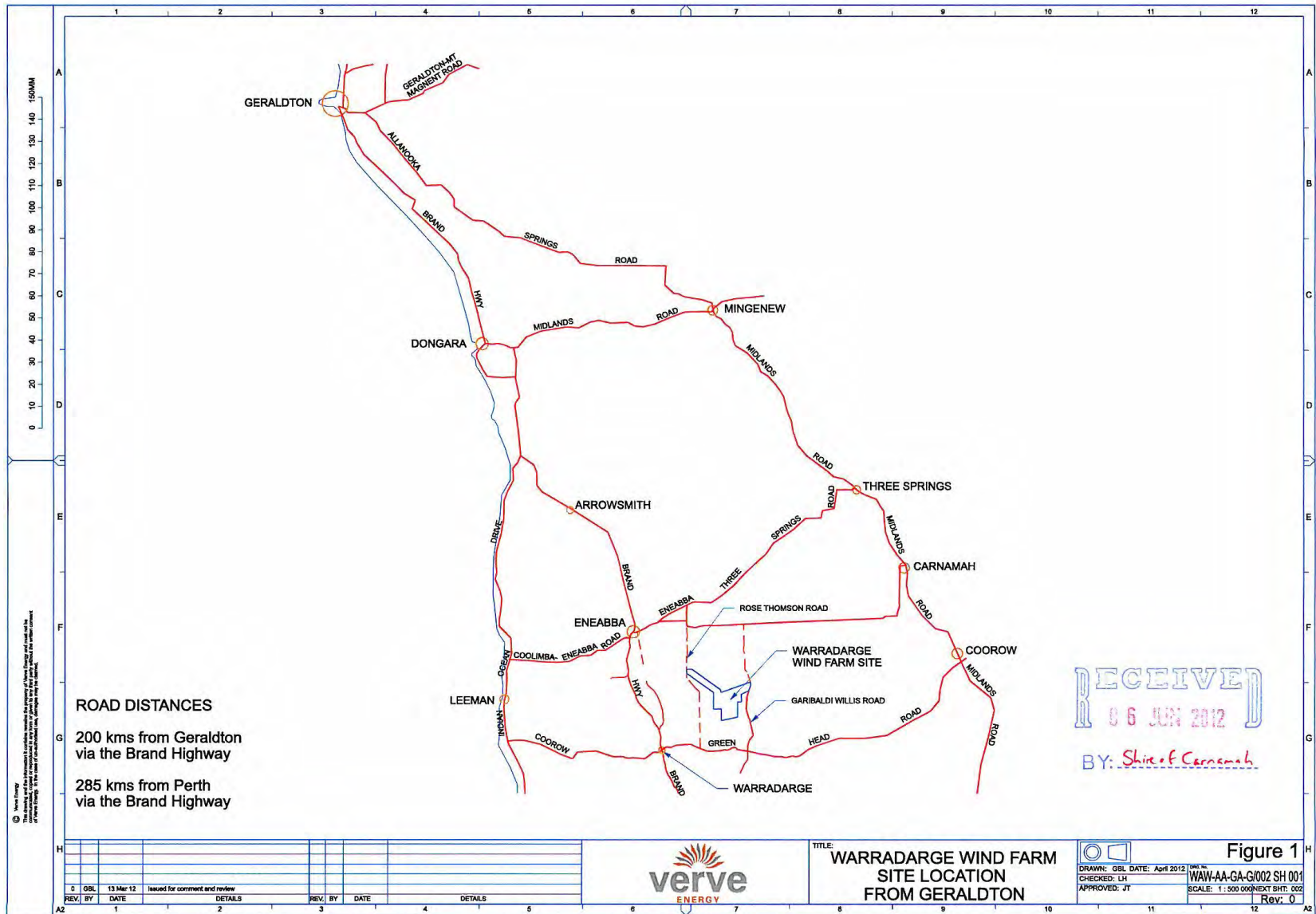
Please find attached the following to assist with the review of this application:

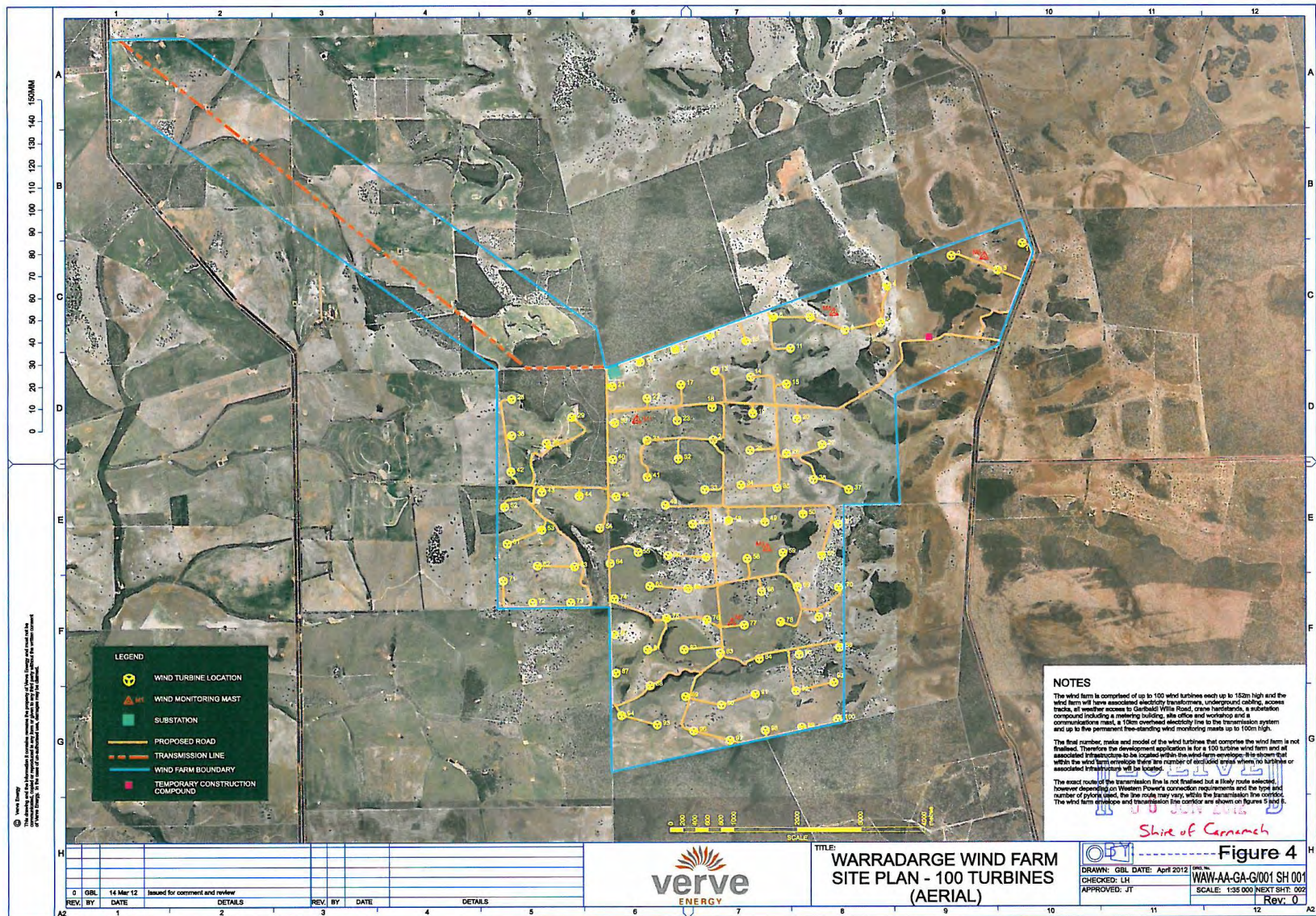
- A completed DAP Form 2 application for the Shire of Coorow (DP/12/00625 A2370465)
- A completed DAP Form 2 application for the Shire of Carnamah (DP/12/00624 A2370626)
- Original Development Application for the Warradarge Wind Farm, submitted by Verve Energy June 2012
- Letters of consent response from relevant landowners

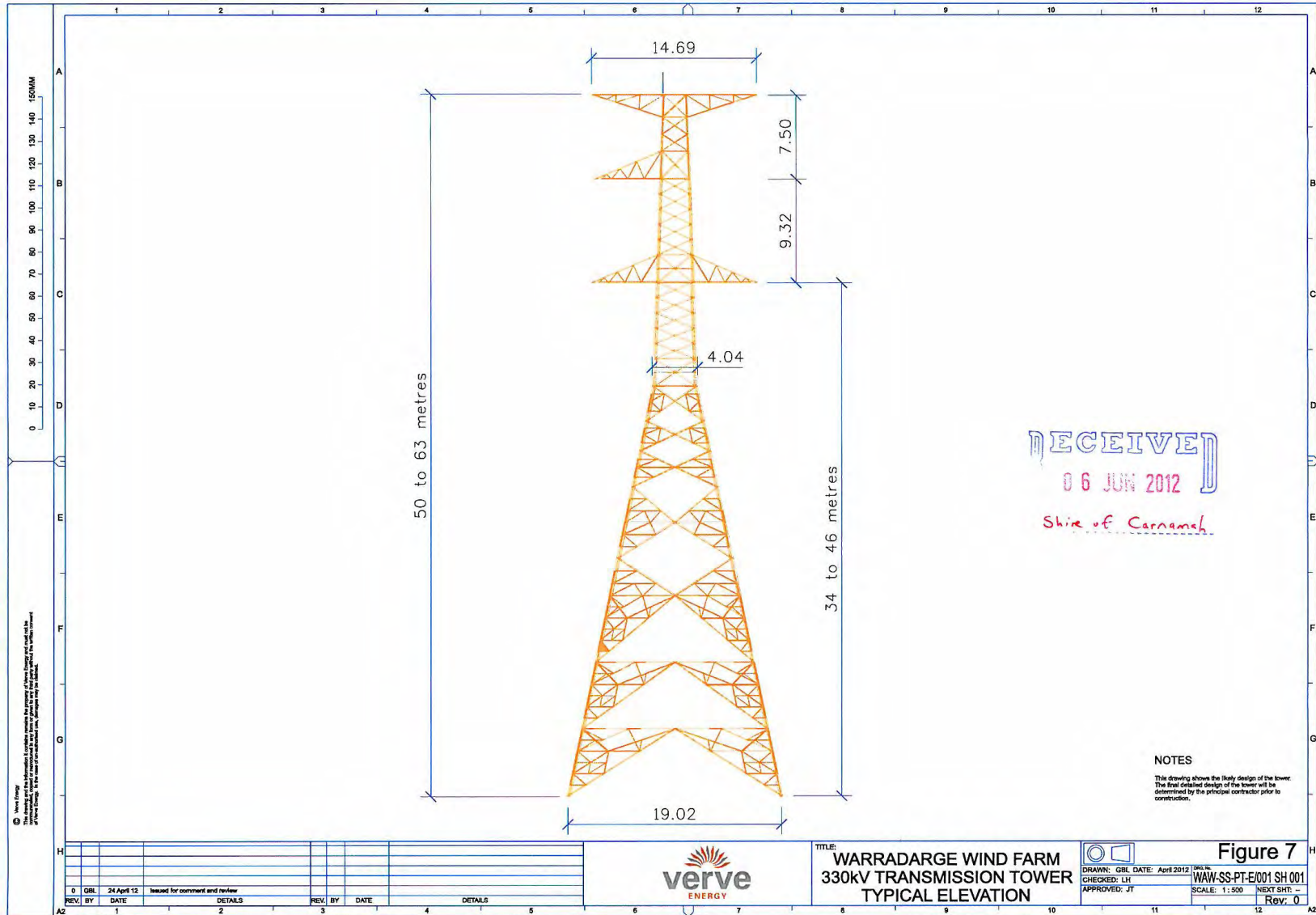
Yours sincerely

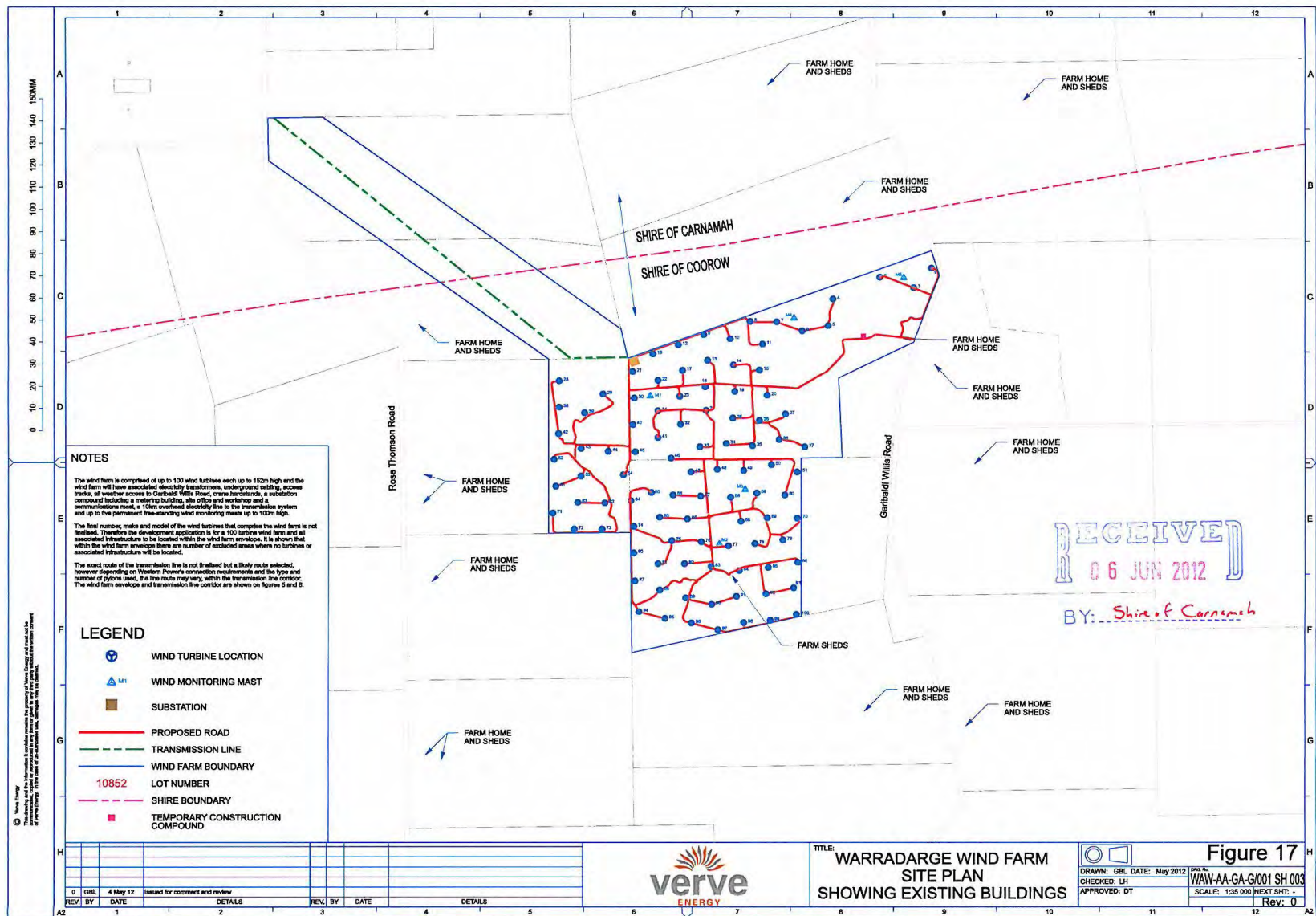
A handwritten signature in black ink, appearing to read "John Lorenti", with a stylized flourish at the end.

JOHN LORENTI
MANAGER RENEWABLES DEVELOPMENT



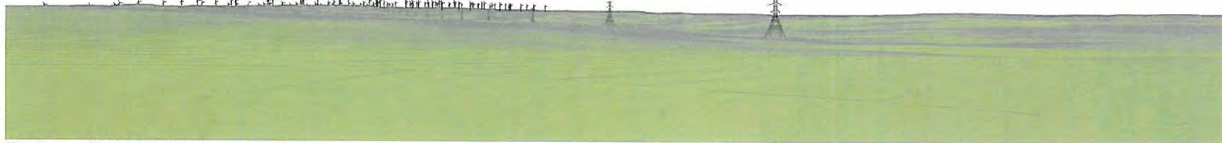








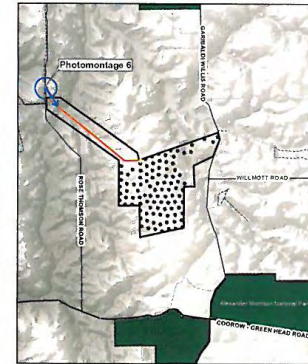
Photo



3D model camera view



Photomontage



Viewpoint Location: 34.4452° E 60.7226° S
 (UTM: WGS 84 Zone 50)
 Elevation of camera: 241.70 m
 Orientation of view: 14.7°
 Horizontal field of view: 32.4°
 Vertical field of view: 55°
 Hub height of turbines: 100m
 Blade length of turbines: 52m
 Approximate distance to nearest turbine: 1050m
 Recommended viewing distance: 429m

VIEW LOCATION

Final Issue

Client: Verne Energy
 Project: Wondagar Wind Farm
 Title: Photomontage
 Location: 06

A2 Drawing No: 61-27826-SK006		Rev: 0
1. Title block amended	N	01/10/12
2. Final issue amended	N	01/10/12
3. Final issue	N	01/10/12
4. Issue for information	N	01/10/12
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100. Issue for information	N	01/10/12



CLIENTS | PEOPLE | PERFORMANCE

Level 6, 100 Lonsdale Street Melbourne VIC 3000 Australia
 T +61 3 9597 8000 F +61 3 9597 8111
 E melbourne@ghd.com.au W www.ghd.com

Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1 Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge				
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment	Recommendation
1 (3/8/2012)	State Heritage Office (PO Box 7479 Cloisters Square PERTH WA 6850)	<i>No objection</i> Proposal does not appear to impact upon any place of state cultural heritage significance.	No additional comment.	Note submission.
2 (6/8/2012)	L Marche (280 Kooyong Road KEWDALE WA 6105) Subject Property: Lot 10854 Garibaldi Willis Road, Warradarge	<p><i>Objection</i> Object to this application and inform your office of the inconsistencies that have been portrayed by Verve Energy to both your office and that of the EPA.</p> <p>The proposed wind farm will adversely affect not only the value but also the only possible use available for my property. My property although located in a rural precinct is not able to be used for farming purposes because the entire 5000 acres comprises of natural vegetation and/or remnant bush land. My property has not been able to be used for agricultural purposes for the last 20 years and unless the current legislation is over turned, it is unlikely that it could be farmed during the course of the next 20 years. The laws in place prohibiting clearing of land, whether it be natural vegetation or regrowth bush, prevents me from clearing my property. Therefore the only conceivable use for my property is that of a "lifestyle" property, attributable to its seclusion, peace, tranquillity, flora and fauna.</p> <p>If the proposed wind farm proceeds the only use available for my property will not only be lost but the value of my property will be devalued for the entire 20-25 year duration of the wind farm. The placement of the wind turbines on the adjacent</p>	<p>The objector's property of Lot 10854 is zoned 'Rural' under the Shire of Coorow Town Planning Scheme No.2 and there are a number of uses listed under the Scheme Zoning Table for this zone that are either (P) permitted, (D) discretion, or (A) special notice. It is not considered that the presumption that the objector's property could only be used for "lifestyle" purposes has been verified through lodgement of development applications for these listed uses. It is noted that Section 5 of the <i>Environmental Protection (Clearing of Native Vegetation) Regulations 2004</i> addresses the issue of prescribed clearing with Regulation 5 Item 1 listing:</p> <p>"Clearing of a site for the lawful construction of a building or other structure on a property, being clearing which does not, together with all other limited clearing on the property in the financial year in which the clearing takes place, exceed 1 ha, if —</p> <p>(a) the clearing is to the extent necessary; and</p> <p>(b) the vegetation is not riparian vegetation."</p>	<p>Note submission and recommend that any development approval for the Warradarge Wind Farm be made subject to the following condition:</p> <p>"The applicant is to prepare, submit and implement a Noise Management Plan to the satisfaction of the Department of Environment and Conservation and the Local Government."</p> <p>Further it is recommended that advice notes be attached with the abovementioned condition requiring that:</p> <p>"Prior to commencement of any site works, the applicant is responsible to ensure that the Noise Management Plan is lodged with the Department of Environment and Conservation and the Local</p>

Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1

Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge

Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment	Recommendation
		<p>property (Lot 10853) will destroy the visual and aesthetic qualities of my property and will also hinder any possibility of living on my property due to the noise from the wind turbines being a nuisance and interfering with the peace and tranquillity of my property.</p> <p>Extremely concerned that the documentation submitted by Verve Energy to the EPA (and to the Shire of Coorow), has misrepresented my property as being "cleared agricultural/rural" land when almost the entire 5,000 acres is natural vegetation/nature reserve. A fact that has been conveyed to Verve Energy on several occasions.</p> <p>Over the years my property has been enjoyed as a "lifestyle/recreational" parkland with extended family and friends frequently camping and caravanning at the shed located on my property, which has been shown as a "non-residence". Verve Energy are aware that the shed is where we stay when we camp at my property but did not mention this is in their application, probably because the shed is right in the middle of their</p>	<p>The applicant was advised of the nature of the objection received and provided with the opportunity to make comment upon the issues raised in Submission 2. The comments of Verve Energy in relation to the specific issues that have been raised are provided in italic font in this comments section.</p> <p><i>"Figures 4 and 6 in the Development Application Report show Lot 10854 is predominantly vegetated. Verve Energy does not believe the Development Application Report shows it is "cleared agricultural/rural" land. Additionally, although Lot 10854 has a good wind resource, in our site selection process as discussed in section 1.8, we sought to select land that minimised any vegetation clearing."</i></p> <p>The Shire of Coorow has no record of a structure upon Lot 10854 being approved or subsequently constructed to a Class 1 (habitable) standard as per the Building Code of Australia. However, it is noted that a dwelling is listed as a permitted use under the Scheme Zoning Table for the 'Rural' zone. On this basis the landowner of Lot 10854 could make application for a habitable</p>	<p>Government for its review. The Noise Management Plan shall set out in detail the management commitments applicable to noise minimisation relevant to all installations, activities and processes, based on sound level measurements of plant, both individually and in combination. The Noise Management Plan shall take proper account of tonal components, amplitude or frequency modulations or impulses, and the Noise Management Plan shall demonstrate that noise emissions will achieve compliance with the requirements of the South Australian guidelines Environmental Protection Authority – Wind Farms Environmental Noise. Once approved, the applicant from time to time as directed by the Local Government is responsible to ensure, that all installations, activities and processes carried out at all times and in all respects are in accordance with the Noise Management Plan."</p>

Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1 Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge				
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment	Recommendation
		<p>noise buffer zone.</p> <p>If the proposed wind farm proceeds any prospect of a future tourism development on my property will be rendered impossible. The visual landscape of my property will be adversely affected by the location of the 100 turbines. I note that from the documentation lodged by Verve Energy my property is the only property upon which between 80 to 100% of the turbines will be seen/viewed at all times.</p>	<p>building to be constructed upon the property and such a building upon completion would be treated as a 'noise sensitive premise' and in the event that emissions from any neighbouring operation exceed regulatory criteria (be they noise, dust, vibration, odour etc.) then it is the responsibility of the emitter to modify their actions to meet the prescribed limits and not the responsibility of the receiver.</p> <p><i>"Verve Energy is aware that the land owners of Lot 10854 do use their existing shed for occasional residential purposes as shown in Figure 17.</i></p> <p><i>We have also assessed this location as a potential house labelled Receiver Point 12 in the Noise Impact Assessment, Annex 4. It is shown that the wind turbines will comply with the limits at this point."</i></p> <p>Whilst it is acknowledged that the Warradarge Wind Farm would be visible from Lot 10854 a statement that this would render any neighbouring tourism development impossible is considered difficult to substantiate.</p> <p><i>"Verve Energy has shown in Figures 5 and 6 of the LVIA report (Annex 2) a Zone of Theoretical Visibility (ZTV) of the potential wind turbine layout. If that layout were adopted, there are a number of surrounding properties from which, theoretically, between 80% and 100% of the turbines could be</i></p>	<p>"The applicant is to implement and maintain reporting mechanisms and monitoring for noise complaints throughout the duration of the operation of the development. In event of a substantiated complaint being received the applicant is required to demonstrate mitigation responses to the requirements of the Department of Environment and Conservation and the Local Government. Such responses will be treated as required modifications to the Noise Management Plan."</p> <p>Recommend that any development approval for the Warradarge Wind Farm be made subject to the following condition:</p> <p>"The applicant is to prepare, submit and implement an Environmental Management Plan to the satisfaction of the Department of Environment and Conservation and the Local Government."</p> <p>Further it is recommended</p>

Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1 Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge				
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			<p><i>visible. It is also noted that this ZTV is theoretical only, and does not take into account existing built form and vegetation which may provide screening.</i></p> <p><i>The Development Application Report states- 4.2.7 A Zone of Theoretical Visibility ("ZTV") for both tip and hub height has been produced for the Proposal and these are shown in Figures 5 and 6 in Annex 2. A ZTV is the area around a designated point in the landscape from which that point is visible. It is calculated using elevation data such as a Digital Elevation Model and does not take account of buildings or vegetation screening. It represents a worst case view of how many turbines or blade tips can be seen at the location.</i></p> <p><i>4.2.8 Figures 5 and 6 in Annex 2 shows the turbines that are visible from the hub (100m) upwards and the tip height (152m). These figures show that beyond 10km from the wind farm the number of turbines visible to the west reduces to zero except on a few elevated areas. In areas to the south and north the turbines are theoretically visible out to 15km, beyond which it they are only seen in isolated areas. To the west the tips of the turbines are theoretically visible to 25km except in lower areas of the landform but it can be seen that the hubs are not as visible beyond 15km, and this is due to the screening effect of the topography.</i></p>	<p>that the following advice note be attached with the abovementioned condition requiring that:</p> <p>"Prior to commencement of any site works, the applicant is responsible to ensure that the Environmental Management Plan is lodged with the Department of Environment and Conservation and the Local Government for its review. The Environmental Management Plan shall address the following issues:</p> <ul style="list-style-type: none"> - fuel storage, handling and spill response; - weed management; - surface, ground and stormwater management; - waste disposal; - flora and fauna; & - dust suppression and stabilisation of any soils disturbed or deposited on site."

Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1

Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge

Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment	Recommendation
		<p>The estimated noise implications for my property indicate that noise attenuation of between 39dB at my boundary fence which adjoins Lot 10853, will also impact across the entire length and breadth of my property, with an estimate of 25dB at the opposite boundary fence. The noise alone is going to adversely affect the use and enjoyment of my property. From information available about existing wind farms it is likely that the noise impact could be far greater once the turbines are in full operation and during various weather conditions, which will put off anyone from wanting to sleep over at my property, let alone stay their during daylight hours. Not to mention possible health concerns being another issue altogether.</p>	<p><i>4.2.9 In should be noted that the ZTV is a tool to assess theoretical visibility only and that vegetation and built structures will influence what is actually visible from various locations. It is for this reason that a number of viewpoints are selected to represent what the actual change of view will be and these are shown as photomontages. The viewpoints are selected in areas that theoretically have a view of at least 80% of the wind turbines."</i></p> <p>It should also be noted that in addition to the development approval process under the <i>Planning and Development Act 2005</i> administered by the Local Government and the Development Assessment Panel, the applicant is also subject to the environmental approval process under the <i>Environmental Protection Act 1986</i> administered by the DEC and the EPA. The applicant must comply with the requirements of the EPA, the <i>Environmental Protection Act 1986</i> and the <i>Environmental Protection (Noise) Regulations 1997</i> both for the construction and operational phases irrespective of any conditions related to noise applied by the Local Government or Development Assessment Panel.</p> <p>The Noise Impact Assessment prepared by Herring Storer Acoustics has logged the existing background noise on-site (over a period of six weeks) and models the proposed noise impact (and low frequency</p>	

Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1 Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge				
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			<p>noise and infrasound projections) and concludes that the Warradarge Wind Farm will meet with the requirements of the Noise Regulations and the 'Wind Farms–Environmental Noise Guidelines–July 2009' (EPA of South Australia) which are the guidelines recognised by the DEC. The modelling has been undertaken using the conservative criteria of the wind turbine design that emits greatest noise (which may not be utilised for this project) and incorporates all wind conditions. The closest residence to the application would under the most noise conducive conditions experience 35dB(a) which is in compliance with the relevant regulations and guidelines for noise sensitive premises. It should be noted that in the event that the modelling is found to be inaccurate (undervalued) upon operation of the wind farm it would be the responsibility of the operator to modify the turbine(s) until compliant with the <i>Environmental Protection (Noise) Regulations 1997</i>.</p> <p>The Noise Assessment does indicate that there are some land areas within the 35dB(A) noise contour (being the minimum background noise criteria) which are owned by non-participants of the wind farm development. These areas are within Lots 10849, 10854, 10877, 10878, 10855 and 11017 and this presents a risk to the applicant in the absence of a statutory buffer, as noise sensitive premises would be permitted to 'encroach' into the 35dB(A) noise contour.</p>	

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			<p>It is considered appropriate given the issues raised by the objector that any approval and operation of the Warradarge Wind Farm should be subject to the applicant preparing and adhering to a Noise Management Plan.</p> <p><i>“The Noise Impact Assessment has been carried out in accordance with Western Australian Planning Bulletin 67 and the Department of Environment and Conservation WA which recommends using the EPA of South Australia “Wind Farms – Environmental noise guidelines – July 2009” as the guidelines for the assessment of wind farms. The Noise Impact Assessment was provided in Annex 4 of the DAR.</i></p> <p><i>The noise limits for new wind farm developments is that the predicted noise level must not exceed the greater of either 35 dB(A) or 5 dB(A) above the background noise at any nearby homes or other noise sensitive receiver premises during night-time hours. The noise limits have been assessed for all nearby lots including Lot 10854 and are predicted to be below these levels at the existing sheds. The wind farm complies with the noise limits at the current sheds which were given the same importance as a house.</i></p> <p><i>The wind farm noise on areas of vegetated land of Lot 10854 closer to the turbines than the sheds could be greater than either 35 dB(A) or 5 dB(A) above the background noise. It is good practice for Wind Farm proponents to enter Good Neighbour Agreements to agree that no new homes or</i></p>	

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		<p>When the previous owners (my parents) lodged an application for permission to clear my property in about 2010, the DEC expressed concern about possible interference with the breeding habitats of the natural wildlife and birds inhabiting my property in particular mention was made of the endangered Carnabys Black Cockatoos. No consideration whatsoever has been given by Verve Energy as to how the wind farm will affect the fauna and bird life on my property. Environmental impact studies for noise, landscape & visual, and flora & fauna, particularly in relation to Lot 10854, have to be undertaken prior to the application for construction of the Warradarge Wind Farm proposal being approved.</p> <p>From the documentation provided by Verve Energy, my property - not being a participant in the wind farm, is the only property that will be greatly affected by the noise, land and visual impacts of the wind farm.</p>	<p><i>other noise sensitive receiver premises will be constructed during the lifetime of the wind farm in these areas. These areas are known as noise buffer areas."</i></p> <p>The submitted development application report includes a visual impact assessment, flora and fauna assessment, noise impact assessment, aviation impact assessment, environmental management plan, and outline of the stakeholder consultation undertaken by the applicant to date.</p> <p><i>"Verve Energy conducted a Noise Impact Assessment, Background Noise Monitoring, Flora, Vegetation and Fauna Assessment and a Landscape and Visual Impact Assessment (LVIA) on the proposed wind farm development site. The noise assessments and LVIA considers the impact on adjacent properties, however, a flora and fauna survey was not conducted on Lot 10854 as Verve Energy does not propose to clear any vegetation on that land.</i></p> <p><i>The Development Application Report states-</i></p> <p><i>4.3.1 Biota Environmental Sciences undertook a Flora, Vegetation and Fauna Assessment of the wind farm envelope and a possible transmission line route. This comprised a desktop review, field survey and flora specimen identification and this report is provided in Annex 3. The field survey was conducting over two trips in the October and November of 2011 and comprised a total of 12 days. The</i></p>	

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			<p><i>land area of the wind farm envelope and area of transmission line corridor is 5,010 hectares, Biota surveyed 3,650 hectares of land which was the entire wind farm envelope and one possible line route within the transmission line corridor.</i></p> <p>4.4.3 <i>Verve Energy engaged specialist consultant Herring Storer Acoustics ("HSA") to undertake Noise Impact Assessment for the Warradarge Wind Farm. A prediction of worst case noise propagation from the proposed wind farm was undertaken and background noise measurements undertaken. The Noise Impact Assessment is in Annex 4. The background noise measurements took place over 6 weeks and the results of these have set the noise limits to be applied to nearby noise sensitive premises such as residential properties, this report is in Annex 5.</i></p> <p>4.2.2 <i>Following the initial wind farm design, GHD have undertaken a landscape and visual impact assessment and this is attached in Annex 2. The assessment covers a 25km radius study area from the Proposal and it investigates the various effects the wind farm has on the landscape and people in the study area at seven different publicly accessible locations.</i></p> <p>4.2.3 <i>To assess the Proposal, the wind farm is designed with the greatest likely footprint and the</i></p>	

Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1 Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge				
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		<p>For the record, neither my mother, nor my father nor myself have agreed to enter into any Noise Neighbour Agreement or any other agreement with Verve Energy, nor have we consented to the Wind Farm being proposed.</p>	<p><i>north-south/east-west extents are shown as spaced across the greatest amount of overall land area within the wind farm envelope, as shown in Figures 5 and 6. This is deemed the worst case design from a visual point of view.</i></p> <p><i>4.2.4 As such, the width of any view of the wind farm is greatest from any viewpoint. Therefore, smaller or fewer number of turbines within the wind farm envelope or 100 turbines located in different locations within the wind farm envelope are also encompassed by the assessment."</i></p> <p><i>"Verve Energy has not stated at any point that a Good Neighbour (noise buffer) Agreement has been signed with the land owner of Lot 10854. However such an agreement has been among the topics discussed at meetings with Mr Eric Marche.</i></p> <p><i>Verve Energy commenced discussions with various land owners on 16 June 2011 regarding the proposed wind farm and the potential for a noise buffer (if applicable).</i></p> <p><i>Verve Energy met Mr Eric Marche in June 2011, November 2011 and in June 2012, with various correspondence and conversations in between. During this time a draft agreement was presented for consideration and a counter proposal received. Verve Energy is open to continuing discussions with the owner of Lot 10854 to come to a mutually</i></p>	

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			<p><i>beneficial agreement if common ground can be found. However, should an agreement not be reached for Lot 10854, Verve Energy will consider either relocating turbines away from the boundary of Lot 10854 or accepting that there is a commercial risk that if a house or noise sensitive premises is constructed on nearby land in the future that the turbines may need to be limited to reduce their noise to comply with noise regulations at these new premises.</i></p> <p><i>The Development Application Report states-</i></p> <p><i>1.9.4 Verve Energy is negotiating wind farm neighbour agreements with the owners of adjacent Lots (Lots 10849, 10854, 10877, & 10878) to ensure the areas of these lots where the wind farm will be generating noise exceeding 35dB(A) or 5dB(A) above background noise, whichever is greater, will not cause any conflict with any possible future noise sensitive premises.</i></p> <p><i>1.9.5 It should be noted that the final design of the wind farm and its capacity will be dependent on these agreements. Should one or more wind farm neighbour agreements not be reached this will not affect the ability to operate a wind farm, only the position and overall number of turbines within the wind farm envelope. This is discussed more fully in Chapter 4."</i></p>	
3a (7/8/2012)	Telstra (Locked Bag	<i>Comment</i> Telstra requires more time to assess this	Telstra was notified by Shire staff via email on 8/8/2012 that the Shire could not grant	Note submission.

Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1 Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge				
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment	Recommendation
	2525 PERTH WA 6001)	proposal. An engineering study needs to be undertaken to assess the impact to our network. As you can appreciate this is not a trivial exercise. As such we will require 6 weeks to complete this task.	any extension to the submission period as the matter was required to be placed before the 15/8/2012 Council meeting and then be sent to the Development Assessment Panel in order to comply with the timeframe established by the <i>Development Assessment Panel Regulations 2011</i> . Shire staff advised Verve Energy of Telstra's concerns so that the applicant might make contact with Telstra to establish whether they may be able to assist them in addressing their concerns prior to the 10/8/2012 submission deadline.	
3b (10/8/2012)	Telstra (Locked Bag 2525 PERTH WA 6001)	<i>Comment</i> I have been in contact with Verve Energy and they have provided me with a comprehensive feasibility report and that has put my mind at ease to some extent. Whilst it does cover our radio sites we have a country exchange located about 2.5 km from the south west corner of the wind farm area. It is not a radio site but I am still concerned about induced noise and more importantly induced EMF from the wind farm. I will have our design team check the impact to our country exchange and also verify the findings of the report. Unfortunately they will not be able complete this investigation by close of business today. As I don't have the time to complete an engineering impact study I do not feel comfortable stating that I have no objections to the development.	The applicant has been provided with a 21 day period in which to make comment upon the application, which is an extension of the minimum 14 day period as per the requirements of the Scheme. The submitted Development Application includes Annexure 6 'Warradarge Wind Farm - Investigation of Possible Impacts on Broadcasting and Radiocommunication Services' prepared by Lawrence Derrick & Associates, Engineering Consultants & RF Frequency Assigners. Section 14 of Annexure 6 states: "The power generated by the wind turbines will be exported to the transmission grid via purpose built substations and high voltage transmission lines using conventional designs meeting standards applying to the State network at large. Substations will be designed and sited to reduce the electric and magnetic fields to acceptable levels at the	Note submission and provide copy of Telstra's submissions to the applicant so that they are made aware of its issues. Recommend that any development approval for the Warradarge Wind Farm be made subject to the following advice note: "The applicant is advised that this planning approval does not negate the requirement for any additional approvals which may be required under separate legislation including but not limited to the Building Code of Australia, <i>Building Act 2012</i> ,

Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1 Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge				
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		It is unfortunate that circumstances have prevented me from having more time to investigate this development proposal.	boundary fence. The internal wind farm reticulation will employ underground cables of up to 33 kV in voltage. These will have no significant EMI emission above ground. The main transmission lines from the wind farm substation to the grid will employ 330 KV overhead lines. All transmission lines will be built to specifications consistent with the HV lines throughout the State network. The height of the lines and the easement width will be in accordance with power authority recommendations which will ensure magnetic and electric fields will be within acceptable limits for human exposure and for electromagnetic interference levels at dwellings in the area and for accessible public access areas. HV power lines and substations are required to meet the Australian Standard AS/NZS 2344: 1997 Amendment 1:2007 limits for EMI which protects broadcasting and radiocommunications reception from unacceptable interference."	<i>Health Act 1911, Health (Treatment of Sewerage and Disposal of Effluent and Liquid Waste) Regulations 1974, Environmental Protection (Clearing of Native Vegetation) Regulations 2004, Environmental Protection (Noise) Regulation 1997, Traffic Act 2000, Aboriginal Heritage Act 1972 and the obtaining of a works licence from the Department of Environment and Conservation if required. It is the applicant's responsibility to obtain any additional approvals required before the development/use lawfully commences."</i>
4 (9/8/2012)	Department of Environment & Conservation (PO Box 72 GERALDTON WA 6531)	<i>Comment</i> The DEC is unable to provide comment at this time. In providing advice DEC would need to refer to the EPA who is the lead agency for this application. DEC would need to take into account the Office of EPA comments and recommendations for this project, and unfortunately they are yet to assess this application.	It should also be noted that in addition to the development approval process under the <i>Planning and Development Act 2005</i> administered by the Local Government and the Development Assessment Panel, the applicant is also subject to the environmental approval process under the <i>Environmental Protection Act 1986</i> administered by the DEC and the EPA. The applicant must comply with the requirements of the EPA, the <i>Environmental Protection Act 1986</i> and the <i>Environmental Protection (Noise) Regulations</i>	As per Submission 3b.

Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1 Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge				
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			1997 both for the construction and operational phases irrespective of any conditions related to noise applied by the Local Government or Development Assessment Panel.	
5 (13/8/2012)	Department of Transport (PO Box 68 GERALDTON WA 6531)	<i>Support</i> The proposal for the Warradarge Wind Farm will have a positive impact on the sustainability of the State should it go ahead. The Department of Transport supports the idea though we will not have any direct involvement in the development.	No additional comment.	Note submission.
6 (13/8/2012)	Main Roads WA (PO Box 165 GERALDTON WA 6531)	<i>Comment</i> MRWA supports the provision of renewable energy developments and is satisfied that principle of the development in this location would be acceptable. Notwithstanding the above, MRWA has some concerns over potential impacts of the proposal on the MRWA network as a result of the type and number of additional vehicle movements generated, particularly in association with the construction and decommissioning stages. It is considered, however, that the production of a Traffic Management Plan including condition surveys would address MRWA concerns regarding: <ul style="list-style-type: none"> - Ability of route and intersection to accommodate volume and nature of traffic. This would be resolved through the identification and subsequent implementation of upgrades as necessary; and - Potential for damage at intersections and repair of any damage associated with development construction/decommissioning, which would be addressed by the 	Shire staff were contacted by MRWA during the submission period to discuss the areas of their concern. Shire and MRWA staff have jointly worked on preparing draft conditions and advice notes that might be applied in the event that the Development Assessment Panel resolved to approve the development application to address MRWA's raised issues.	Note submission and recommend that any development approval for the Warradarge Wind Farm be made subject to the following conditions: "The applicant is to prepare, submit and implement a Traffic Management Plan to the requirements of Main Roads WA and the Local Government." "The applicant is to ensure that the installation of any traffic warning/safety signage in relation to the approved development during the transportation/construction phase shall be to the satisfaction of Main Roads WA and the Local Government."

Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1 Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge				
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment	Recommendation
		<p>Dilapidation/Condition part of the Plan.</p> <p>Furthermore, it is considered that the wording of the conditions set out in the email from Simon Lancaster (dated 6/8/2012) would satisfactorily protect the interests and assets of MRWA, although we would suggest that the wording of condition X is expanded to clarify that all 'costs' would include, inter-alia, those in relation to surveys to establish the conditions together with any costs associated with the design, construction and maintenance (over a specified defect liability period) of identified required upgrades.</p> <p>In addition to the conditions and advice set out within the aforementioned email, we would request that the following advice is also offered to the proponent:</p> <p>Any signs or additional markings on or visible from the Main Road will require the approval of MRWA's Mid West Network Operations Manager, Peter Herbert, who can be contacted on 08 9956 1208</p>		<p>"Repairing of any damage to the road network including the surface is required by reason of use of the road in connection with the development to the satisfaction of Main Roads WA and the Local Government, with all costs met by the applicant."</p> <p>Further it is recommended that the following advice notes be attached with the abovementioned conditions requiring that:</p> <p>"Prior to commencement of any site works, the applicant is responsible to ensure that the Traffic Management Plan is lodged with the Mid West Regional Manager of Main Roads WA and the Shire of Coorow for review. The Traffic Management Plan shall incorporate a Traffic Impact assessment for the transportation activities associated with the development and to ensure that intersections and impacts to the road network are addressed. The Traffic</p>

Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1 Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge				
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment	Recommendation
				<p>Management Plan shall set out in detail the management commitments applicable to traffic relevant to all installations, activities and processes. The Traffic Management Plan shall include if required by Main Roads WA or the Shire of Coorow the identification of any necessary road upgrading, and property access construction and the provision of a dilapidation survey prior to and at the completion of the development with any damage caused to the road network used by transport vehicles accessing the site to be repaired to the requirements of Main Roads WA and the Local Government. Once approved, the applicant from time to time is responsible to ensure, that all installations, activities and processes carried out at all times and in all respects are in accordance with the Traffic Management Plan.”</p> <p>“Main Roads WA advise that permits are required for</p>

Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1 Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge				
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment	Recommendation
				<p>overweight and oversized vehicles associated with the proposed development.”</p> <p>“Main Roads WA advise that should the proponent undertake any works within the road reserve of its network, the proponent must submit an application to Main Roads WA to undertake works within the road reserve. Applications must conform to the Main Roads WA document titled ‘Application Form for Organisations Seeking to Undertake Works within the Road Reserve - High Complexity Works’ (application kits are available from the Main Roads' website). No works are to commence within the road reserve until Main Roads WA has approved the proponent's application seeking to undertake works within the road reserve.”</p>
7 (15/8/2012)	Water Corporation (PO Box 165 GERALDTON WA 6531)	<i>No objection</i> Water Corporation has no facilities in this area and there are no objections to this development proposal.	No additional comment.	Note submission.
8 (15/8/2012)	Department of Agriculture &	<i>No objection</i> DAFWA does not have any objections to the Wind	The submission was received following the meetings of the Shire of Coorow and Shire of	Note submission and provide copy to the

Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1 Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge				
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment	Recommendation
	Food (PO Box 110 GERALDTON WA 6531)	<p>Farm but would like to offer the following comments:</p> <p>Sections 1.1.10 & 1.1.11 (page 1) of the draft Environmental Management Plan discusses issues with weed hygiene, the declared weed Paterson's Curse is raised but not Skeleton Weed. This is another significant weed which has been identified in the vicinity of the Wind Farm site and is considered to be at moderate risk for infestation.</p> <p>Weed management standards need to be maintained in all aspects of the project throughout its life. This is important to ensure minimal biosecurity risk, for the landowner, the adjoining farms and along the transport route.</p> <p>The site in question is dominated by deep sands and gravelly soils and much of the area is subject to very high wind erosion. These issues appear to have been addressed in Sections 1.1.20 to 1.1.24 (pages 2 & 3) of the draft Management Plan under 'Topsoil management and rehabilitation' and 'Dust suppression'.</p>	<p>Carnamah Councils that formulated the respective Shire recommendations in regards to the Warradarge Wind Farm application.</p> <p>However, it is considered that condition (10) and advice note (g) as recommended by the Shire of Coorow Council adequately addresses the comments raised by the Department of Agriculture & Food.</p> <p>Should the Development Assessment Panel form the view that the suggested conditions and advice notes do not adequately address the comments of the Department of Agriculture & Food then the wording for condition (10) and advice note (g) could be expanded to make specific reference to the Department of Agriculture & Food being a responsible authority in addition to the Department of Environment & Conservation, and the Local Government.</p>	<p>applicant. Recommend that any development approval for the Warradarge Wind Farm be made subject to the following condition:</p> <p>"The applicant is to prepare, submit and implement an Environmental Management Plan to the satisfaction of the Department of Environment and Conservation and the Local Government."</p> <p>Further it is recommended that the following advice note be attached with the abovementioned condition requiring that:</p> <p>"Prior to commencement of any site works, the applicant is responsible to ensure that the Environmental Management Plan is lodged with the Department of Environment and Conservation and the Local Government for its review. The Environmental Management Plan shall address the following issues:</p> <ul style="list-style-type: none"> - fuel storage, handling and spill response;

Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1 Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge				
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment	Recommendation
				<ul style="list-style-type: none"> - weed management; - surface, ground and stormwater management; - waste disposal; - flora and fauna; & - dust suppression and stabilisation of any soils disturbed or deposited on site."
9 (15/8/2012)	Department of Water (PO Box 73 GERALDTON WA 6531)	<p><i>Comment</i></p> <p>The subject land is located within the Hill River and Tributaries Catchment surface water area as proclaimed under the <i>Rights in Water Irrigation Act 1914</i>. Any taking or diversion of surface water for purposes other than stock/domestic, and any interference with the bed or banks of a watercourse in this proclaimed area will require a permit from the Department of Water.</p> <p>Several small tributaries of the Hill River System traverse the subject land. It is recommended that the Shire of Coorow required the proponent to ensure that all road crossings over waterways are to be designed and constructed to minimize detrimental impact on the waterways form and function. It is also recommended that the proponent be required as a condition of approval to ensure that works do not encroach into the standard 30m foreshore buffer area on both banks of all waterways.</p> <p>The land is also located within the Arrowsmith groundwater area as proclaimed under the <i>Rights in Water and Irrigation Act 1914</i>. The applicant should be advised to ensure that all landowners</p>	<p>The submission was received following the meetings of the Shire of Coorow and Shire of Carnamah Councils that formulated the respective Shire recommendations in regards to the Warradarge Wind Farm application.</p> <p>However, it is considered that conditions (7) and (10) and advice note (g) as recommended by the Shire of Coorow Council adequately addresses the comments raised by the Department of Water.</p> <p>Should the Development Assessment Panel form the view that the suggested conditions and advice notes do not adequately address the comments of the Department of Water then the wording for conditions (7) and (10) and advice note (g) could be expanded to make specific reference to the Department of Water being a responsible authority in addition to the Department of Environment & Conservation, and the Local Government.</p>	<p>Note submission and provide copy to the applicant. Recommend that any development approval for the Warradarge Wind Farm be made subject to the following condition:</p> <p>"The applicant is to ensure the design, construction (to a minimum compacted gravel standard), drainage and maintenance of the internal roads and vehicle manoeuvring areas required for the approved development shall be to the satisfaction of the Local Government."</p> <p>"The applicant is to prepare, submit and implement an Environmental Management Plan to the satisfaction of the Department of Environment and</p>

Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1 Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge				
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment	Recommendation
		<p>have been consulted regarding potential impacts on private bores.</p> <p>In general the draft Environmental Management Plan provided adequately addresses other water management issues, such as stormwater management and contamination risks.</p>		<p>Conservation and the Local Government.”</p> <p>Further it is recommended that the following advice note be attached with the abovementioned condition requiring that:</p> <p>“Prior to commencement of any site works, the applicant is responsible to ensure that the Environmental Management Plan is lodged with the Department of Environment and Conservation and the Local Government for its review. The Environmental Management Plan shall address the following issues:</p> <ul style="list-style-type: none"> - fuel storage, handling and spill response; - weed management; - surface, ground and stormwater management; - waste disposal; - flora and fauna; & - dust suppression and stabilisation of any soils disturbed or deposited on site.”
10 (21/8/2012)	S Sorgiovanni on behalf of	<i>Objection</i> Express our disappointment with the lack of	On 20 August 2012 the Shire was made aware that one of the landowners within a	Note submission and recommend that any

Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1 Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge				
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment	Recommendation
	B Sorgiovanni (250 Anstey Road FORREST-DALE WA 6112) Subject Property: Lot 1 Garibaldi Willis Road, Warradarge	<p>consultation by the Shire to the affected landowners impacted by the proposed development considering it is probably the largest financial development in the Shire. My parents have not received any correspondence from the Shire regarding this issue and seeking their comment. We were also not advised of the public consultation period by either the Shire or Verve Energy.</p> <p>Hope you appreciate that having received the 18 emails only late yesterday afternoon, we have not had sufficient time to read everything that was sent to us. However, from what we have read, it shows that our father's property is significantly impacted by the proposed development a lot more than what was explained to him or us by Verve.</p>	<p>5km radius of the Warradarge Wind farm site had not been written to by the Shire during the advertising period.</p> <p>The Shire contacted the affected party by phone and subsequently e-mailed to the affected party on 20 August 2012 the details of the application as submitted by Verve Energy (with hard copy following in the mail) and advised in accompanying correspondence that should an electronic or hard copy submission be received prior to close of business 23 August 2012 then it could be included within the responsible authority report to be submitted by the Shire to the Development Assessment Panel.</p> <p>The objection was received on 21 August 2012 and the Shire acknowledged receipt of the submission on 22 August 2012 and confirmed that it would be included within the responsible authority report.</p> <p>In its acknowledgement the Shire noted the respondent's comment over the limited time in which they had to view the forwarded information and the Shire advised that there may also be opportunity to submit further information directly to the DAP, both in the form of written information and a verbal presentation at the meeting of the DAP to be held on 31 August 2012.</p> <p>The Shire advised the respondent that further queries in relation to the opportunity to make a presentation should be directed to the DAP with the Shire providing the necessary phone, email, and mail contact details to be of</p>	<p>development approval for the Warradarge Wind Farm be made subject to the following condition:</p> <p>"The applicant is to prepare, submit and implement a Noise Management Plan to the satisfaction of the Department of Environment and Conservation and the Local Government."</p> <p>Further it is recommended that advice notes be attached with the abovementioned condition requiring that:</p> <p>"prior to commencement of any site works, the applicant is responsible to ensure that the Noise Management Plan is lodged with the Department of Environment and Conservation and the Local Government for its review. The Noise Management Plan shall set out in detail the management commitments applicable to noise minimisation relevant to all installations, activities and processes, based on sound level measurements</p>

Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1 Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge				
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment	Recommendation
			<p>assistance to the respondent.</p> <p>The Shire also advised the respondent that it was its understanding that a person who wishes to make a presentation at the DAP meeting must provide a request in writing to the DAP Secretariat at least 72 hours before the commencement of the meeting.</p> <p>The Shire has offered its apologies to the respondent that they were not advised directly in writing of the proposal by the Shire at the commencement of the advertising period. However, it should be noted that once being made aware of the situation the Shire has made efforts to provide all relevant information to the landowner and enable the landowner opportunity to make comment.</p> <p>It should also be noted that the Warradarge Wind Farm application did not require advertising under either the Shire of Coorow or Shire of Carnamah Town Planning Schemes, and has been advertised arising from a decision of Council at the respective 18 July 2012 Council meetings. Further the submission period for the Wind Farm advertising period was extended from the 14 days prescribed by the Shire of Coorow Town Planning Scheme to 21 days. It should also be noted that the requirements of both the Shire of Coorow and Shire of Carnamah Town Planning Schemes is that advertising shall include one, or more, of the following actions:</p> <ul style="list-style-type: none"> - notice being provided to nearby 	<p>of plant, both individually and in combination. The Noise Management Plan shall take proper account of tonal components, amplitude or frequency modulations or impulses, and the Noise Management Plan shall demonstrate that noise emissions will achieve compliance with the requirements of the South Australian guidelines Environmental Protection Authority – Wind Farms Environmental Noise. Once approved, the applicant from time to time as directed by the Local Government is responsible to ensure that all installations, activities and processes carried out at all times and in all respects are in accordance with the Noise Management Plan.”</p> <p>“The applicant is to implement and maintain reporting mechanisms and monitoring for noise complaints throughout the duration of the operation of the development. In event of a substantiated complaint being received the applicant</p>

Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1 Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge				
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment	Recommendation
			<p>owners/occupiers;</p> <ul style="list-style-type: none"> - notice being published in a newspaper circulating in the Scheme area; - notice being displayed on a sign on-site. <p>Although the application was not required to be advertised, the advertising of the Warradarge Wind Farm application was undertaken in accordance with the advertising requirements of the Schemes by being available for public comment for a period of 21 days through the placement of an advisory sign on-site, and a notice being displayed in the Geraldton Guardian on 20 July 2012.</p> <p>It is also noted that in addition to this the advertising actions included the placement of a notice in the Mid West Times on 26 July 2012, and the Mid West Times also ran an article on the Warradarge Wind Farm development application on 2 August 2012. A copy of the development application was displayed at the Shire of Coorow (Leeman) and Shire of Carnamah (Carnamah) offices and the following parties were written to and provided with a complete copy of the application and invited to make comment:</p> <ul style="list-style-type: none"> - All landowners within 5km of the Warradarge Wind Farm site (with the exception of Mr Sorgiovanni who was found to have been omitted through administrative error and was provided with the application information immediately upon the Shire being made aware of this and provided with opportunity to make 	<p>is required to demonstrate mitigation responses to the requirements of the Department of Environment and Conservation and the Local Government. Such responses will be treated as required modifications to the Noise Management Plan.”</p> <p>Recommend that any development approval for the Warradarge Wind Farm be made subject to the following condition:</p> <p>“The applicant is to prepare, submit and implement an Environmental Management Plan to the satisfaction of the Department of Environment and Conservation and the Local Government.”</p> <p>Further it is recommended that the following advice note be attached with the abovementioned condition requiring that:</p> <p>“Prior to commencement of any site works, the applicant is responsible to ensure that the</p>

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Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment	Recommendation
		<p>The proposed wind farm development will impact my father's property by:-</p> <ul style="list-style-type: none"> - Restricting and almost eliminating any future development of the property. We have had 2 companies over the last few years interested in the property. One was for setting up chalets 	<p>submission);</p> <ul style="list-style-type: none"> - Alinta Gas; - Civil Aviation Safety Authority; - Department of Agriculture & Food; - Department of Environment and Conservation; - Department of Indigenous Affairs; - Department of Mines and Petroleum; - Department of Planning; - Department of Regional Development & Lands; - Department of State Development; - Department of Transport; - Department of Water; - Fire & Emergency Services Authority; - Main Roads WA; - Mid West Development Commission; - State Heritage Office; - Telstra; - Water Corporation; - Western Power. <p>These actions are in addition to the public consultation undertaken by the applicant as outlined in Section 2.3 of their submitted development application report, including direct contact; production of newsletters, mail-outs and e-mails; newspaper notices; surveys; and public information sessions.</p> <p>The respondent's property is zoned 'Rural' under the Shire of Coorow Town Planning Scheme No.2 and the following land uses are listed under the Scheme Zoning Table for this zone as either (P) permitted, (D) discretion, or (A) special notice:</p>	<p>Environmental Management Plan is lodged with the Department of Environment and Conservation and the Local Government for its review. The Environmental Management Plan shall address the following issues:</p> <ul style="list-style-type: none"> - fuel storage, handling and spill response; - weed management; - surface, ground and stormwater management; - waste disposal; - flora and fauna; & - dust suppression and stabilisation of any soils disturbed or deposited on site."

Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1

Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge

Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment	Recommendation
		<p>for ecotourism for wild flowers and farm stays and the other was for a cattle feed lot. Both proposals would have required construction of accommodation to house guests or workers. Neither of these interested parties would look this option now if a buffer/easement is on the property to the magnitude that Verve is intending.</p> <ul style="list-style-type: none"> - Significantly impacting any future sale of the property and commercial value to potential buyers. - Ruining the aesthetics of the area and creating an unsightly visual impact. - Destroying the peace and tranquility of the local area during the construction <p>I have decided to provide our comment via email as my father would like his opposition to the proposal tabled at the upcoming DAP meeting and forwarded to the Councillors and any upcoming development approval committee that is to assess this proposal.</p>	<p>(P) Uses: Animal Establishment Aquaculture Dwelling-Single Rural Pursuit Stables</p> <p>(D) Uses: Aged Persons Hostel Caravan Park Caretaker's Dwelling Carpark Dwelling-Grouped Home Occupation Industry Rural Public Utility Zoological Gardens</p> <p>(A) Uses: Agriculture Intensive Consulting Room Dog Kennels Educational Establishment Funeral Parlour Hospital Hotel Industry Cottage Industry Extractive Industry Hazardous Industry Light Industry Service Milk Depot Motel Motor Vehicle Repair Office</p>	

Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1 Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge				
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment	Recommendation
			<p>Place of Worship Reception Centre Recreation Private Restaurant Service Station Shop Transport Depot Veterinary Centre</p> <p>The above list does not include land uses that may not be listed within the Zoning Table but may be considered by Council under Section 4.4.2 of the Coorow Scheme.</p> <p>The approval of the Wind Farm application does not preclude the lodgement and potential approval (if in accordance with the requirements of the Scheme) of development applications upon surrounding properties.</p> <p>It should be noted that the landowner of Lot 1 could make application for a habitable building (e.g. accommodation to house guests or workers for a cattle feed lot) upon their property and such a building upon completion would be treated as a 'noise sensitive premise' and in the event that emissions from any neighbouring operation exceed regulatory criteria (be they noise, dust, vibration, odour etc.) then it is the responsibility of the emitter to modify their actions to meet the prescribed limits and not the responsibility of the receiver.</p> <p>The Noise Impact Assessment prepared by Herring Storer Acoustics has logged the</p>	

Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1 Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge				
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment	Recommendation
			<p>existing background noise on-site (over a period of six weeks) and models the proposed noise impact (and low frequency noise and infrasound projections) and concludes that the Warradarge Wind Farm will meet with the requirements of the Noise Regulations and the 'Wind Farms–Environmental Noise Guidelines–July 2009' (EPA of South Australia) which are the guidelines recognised by the DEC. The modelling has been undertaken using the conservative criteria of the wind turbine design that emits greatest noise (which may not be utilised for this project) and incorporates all wind conditions. The closest residence to the proposed wind farm would, under the most noise conducive conditions, experience 35dB(a) which is in compliance with the relevant regulations and guidelines for noise sensitive premises. It should be noted that in the event that the modelling is found to be inaccurate (undervalued) upon operation of the wind farm it would be the responsibility of the operator to modify the turbine(s) until compliant with the <i>Environmental Protection (Noise) Regulations 1997</i>.</p> <p>The Noise Assessment does indicate that there are some land areas within the 35dB(A) noise contour (being the minimum background noise criteria) which are owned by non-participants of the wind farm development. This includes the north-western portion of Lot 1 and this presents a risk to the Wind Farm applicant in the absence of a</p>	

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		<p>The only correspondence my father has received in the past 6 months is a very onerous and binding deed of agreement with an unacceptable offer considering the significant impact the proposed development has on my father's property and any future or potential development of Lot 1. The area Verve have indicated on the documents previously sent to my father have not been as clear as the documents that were sent to my brother and I only yesterday. So the quality of their consultation is questionable as it appears Verve are only showing the affected land owners what they want to show to suit the approval of the proposal.</p> <p>A letter that accompanied the deed of agreement</p>	<p>statutory buffer, as noise sensitive premises would be permitted to 'encroach' into the 35dB(A) noise contour.</p> <p>It is considered appropriate given the issues raised by the objector that any approval of the Warradarge Wind Farm, both for the construction and operational phases of the project, should be subject to the applicant preparing and adhering to a Noise Management Plan.</p> <p>The Landscape and Visual Impact Assessment prepared by GHD does demonstrate that 80-100 turbines would be visible from Lot 1, however an assertion that that this would restrict and almost eliminate any neighbouring development is considered difficult to substantiate.</p> <p>The applicant was advised of the nature of the objection received and provided with the opportunity to make comment upon the issues raised in Submission 10. The comments of Verve Energy in relation to the specific issues that have been raised are provided in italic font in this comments section.</p> <p><i>"Community consultation and engagement is a critical component of all of our project developments. Verve Energy has actively engaged with all of the surrounding landowners of the proposed Warradarge Wind Farm and presented our plans to the local communities of Eneabba and</i></p>	

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Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment	Recommendation
		<p>sent by Verve, was not very clear in clarifying whether the area that impacts my father's property is to be a 'development buffer' or an 'easement' as both terms were used to describe the area and each having an significant effect on any future development of my father's property. The area of my father's farm impacted is almost the entire property, and from the documents sent yesterday, no other property is affected by this proposal like my father's property is affected.</p> <p>Therefore, I request that you record our total DISAPPROVAL of the proposed Warradarge Wind Farm by Verve Energy. We will be seeking legal advice over the next couple of weeks and request that <u>no approval</u> be given to Verve until all of the affected land owners have been properly consulted and informed of the actual impact of this proposal.</p> <p>We look forward your future consultation regarding this proposed development.</p>	<p>Warradarge.</p> <p><i>Verve Energy initially met with the owners of Lot 1, Mr Bruno Sorgiovanni and Mrs Carmella Sorgiovanni in November 2011 informing them of the proposed Warradarge Wind Farm. They advised at the time their property was up for sale, to which Verve Energy explained that we were not in a position to purchase land.</i></p> <p><i>Since then, Verve Energy has spoken to their other son Mr Ross Sorgiovanni on several occasions and kept him informed of the wind farm development and our intention to enter into a Neighbour Agreement. An agreement was sent to Mr Bruno Sorgiovanni via Mr R. Sorgiovanni mid February 2012 for consideration.</i></p> <p><i>Newsletter updates advising of the upcoming March Public Information Sessions were sent to the owner's residence in Forrestdale in February and March 2012. Mr R. Sorgiovanni spoke to me to ask what was at the Public Information Sessions and I advised that I could send through the presentation and offered to meet with any of the owners to share our information we collected from our environmental studies. Following the Public Information Sessions, Verve Energy sent through to Mr R. Sorgiovanni a copy of the presentation that was on display as well as offered to meet to further discuss the project if required.</i></p>	

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			<p>We spoke to Mr R. Sorgiovanni last week to advise on the project status and we believed that we were waiting to hear from Mr B. Sorgiovanni's legal advisor about our proposed Neighbour Agreement we issued earlier in the year.</p> <p>The Noise Impact Assessment for the Proposal has been carried out in accordance with Western Australian Planning Bulletin 67 and the Department of Environment and Conservation WA which recommends using the EPA of South Australia "Wind Farms – Environmental noise guidelines – July 2009" as the guidelines for the assessment of wind farms. The Noise Impact Assessment was provided in Annex 4 of the Development Application Report (DAR).</p> <p>The noise limits for new wind farm developments is that the predicted noise level must not exceed the greater of either 35 dB(A) or 5 dB(A) above the background noise at any nearby homes or other noise sensitive receiver premises during night-time hours. The noise limits have been assessed for all nearby lots including Lot 1 and are predicted to be below these levels.</p> <p>The wind farm noise on areas of land on Lot 1 could be greater than either 35 dB(A) or 5 dB(A) above the background noise. It is good practice for Wind Farm proponents to enter Neighbour Agreements to agree that no new homes or other noise sensitive receiver premises will be constructed during the</p>	

Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1 Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge				
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			<p><i>lifetime of the wind farm in these areas. These areas are known as noise buffer areas. In the Neighbour Agreement, it was illustrated that the noise buffer area which corresponds to the extent of predicted noise above 35dB(A), would encompass around a quarter of Lot 1 and not encompass the existing farm house or buildings.</i></p> <p><i>It is our hope that we are still able to achieve a suitable agreement, however, the project has been developed in such a way that we can minimise the impact on Lot 1 if such an agreement cannot be reached. Verve Energy can do this be either:</i></p> <ol style="list-style-type: none"> <i>1 Relocating the turbines to non optimal locations such that under all scenarios Verve Energy will never exceed the noise limits imposed by the Environmental Protection Authority (EPA) on nearby land. For Lot 1 this would mean moving the turbines away from the eastern boundary towards the centre of the wind farm; or</i> <i>2 Accepting the commercial risk that if Verve Energy proceeds with the optimal locations for the wind turbines within the project area and if a new house or other noise sensitive property is built near the wind farm, the wind turbines may need to have their output turned down at night to meet the statutory noise limits imposed by the EPA.</i> 	

Shire of Coorow Town Planning Scheme No.2 & Shire of Carnamah Town Planning Scheme No.1 Proposed Wind Farm & Transmission Line – Lots 10850 & 10853 Garibaldi Willis Road & Lots 10847, 10848 & 10851 Rose Thomson Road, Warradarge				
Submission No. & Date Rec'd	Author of Submission	Nature of Submission	Comment	Recommendation
			<p><i>Throughout the DAR and public consultation process we have stressed that the wind farm design is flexible and we have presented a worst case scenario in terms of turbine spacing, visual impact and noise. If a Neighbour Agreement cannot be reached with Mr B. Sorgiovanni for Lot 1 Verve Energy will need to consider its options which may include relocating wind turbines away from the north eastern boundary of the wind farm.</i></p> <p><i>Verve Energy welcomes the opportunity to discuss this letter with the Council if required, and reiterate our intention to continue to positively engage with the owner of Lot 1 to reach a mutually beneficial agreement."</i></p>	

SUBMISSION 1

From: Lauren Taylor [<mailto:Lauren.Taylor@stateheritage.wa.gov.au>]
Sent: Friday, 3 August 2012 11:25 AM
To: Leonie Quantock
Subject: Attn: David Hadden - Proposed Warradarge Wind Farm

Hi David

Thank you for your referral for the abovementioned proposal, received 23 July 2012.

I wish to advise that we have no comment in relation to the proposal, as it does not appear to impact upon any place of State cultural heritage significance.

Kind regards,

Lauren Taylor
Planning Officer
State Heritage Office
Tel: +61 8 6552 4152
Fax: +61 8 6552 4001
Email: Lauren.Taylor@stateheritage.wa.gov.au
Web: www.stateheritage.wa.gov.au



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SUBMISSION 2

Ms L Marche
280 Kooyong Road
KEWDALE WA 6105

6 August 2012

**By fax and mail – fax number 9952 1173
and by email - admin@coorow.wa.gov.au**

The Chief Executive Officer and all Council Members
Shire of Coorow
Main Street
PO Box 42
COOROW WA 6515

Dear Sir,

**RE: PROPOSED WIND FARM – VERVE ENERGY
IMPACT ON LOT 10854 GARIBALDI WILLIS ROAD, WARRADARGE**

I am writing to inform you that I am now the registered proprietor of Lot 10854 Garibaldi Willis Road, Coorow ("my property"). That property was transferred to me, from my mother Nardia Marche, in June 2012, and I am her Enduring Power of Attorney also.

I refer to the Minutes of Meeting of Council on 18 July 2012, and in particular *Item 10.2.1 Proposed Wind Farm – Lots 10850 & 10853 Garibaldi Willis Road & Lots 1048 & 10851 Rose Thomas Road, Warradarge*, and the Application lodged by Verve Energy to establish this wind farm on the property adjacent to my property. I am writing to both object to this application being granted and to also inform your office of the inconsistencies that have been portrayed by Verve Energy to both your office and that of the EPA.

I am writing to you to inform you and the Council at the next meeting scheduled for 15 August 2012 that I not only object to the application lodged by Verve Energy for the proposed Wind Farm being established at Warradarge but also set out details of my reasons, which should be conveyed to the Council at that meeting, in accordance with the advertising and notice requirements of the relevant legislation.

The proposed wind farm will adversely affect not only the value but also the only possible use available to me for my property. As you will no doubt be aware, my property although located in a rural precinct is not able to be used for farming

purposes because the entire 5000 acres comprises of natural vegetation and/or remnant bush land. My property has not been able to be used for agricultural purposes for the last twenty years and unless the current legislation is over turned, it is unlikely that it could be farmed during the course of the next twenty years. That is the laws in place prohibiting clearing of land, whether it be natural vegetation or regrowth bush, prevents me from clearing my property. Therefore the only conceivable use for my property is that of a "lifestyle" property, attributable to its seclusion, peace, tranquillity, flora and fauna.

However, if the proposed wind farm proceeds the only use available to me for my property will not only be lost but the value of my property will be devalued for the entire duration of the wind farm, some 20 to 25 years. The placement of the wind turbines on the adjacent property (Lot 10853) will destroy the visual and aesthetic qualities of my property and will also hinder any possibility of living on my property due to the noise from the wind turbines being a nuisance and interfering with the peace and tranquillity of my property.

I am extremely concerned that the documentation submitted by Verve Energy to the Environmental Protection Authority (and to the Shire of Coorow), has misrepresented my property as being "cleared agricultural/rural" land when almost the entire 5000 acres is natural vegetation/nature reserve. A fact that has been conveyed to Verve Energy on several occasions

Over the years my property has been enjoyed as a "lifestyle/recreational" parkland with extended family and friends frequently camping and caravanning at the shed located on my property, which has been shown as a "non-residence". Verve Energy are aware that the shed is where we stay when we camp at my property but did not mention this in their application, probably because the shed is right in the middle of their noise buffer zone.

Further, if the proposed wind farm proceeds any prospect of an economically future tourism development on my property will be rendered impossible. The visual landscape of my property will be adversely affected by the location of the 100 turbines. I note that from the documentation lodged by Verve Energy my property is the only property upon which between 80 to 100% of the turbines will be seen/viewed at all times.

The estimated noise implications for my property (as shown in the documentation lodged with the application) indicate that noise attenuation of between 39 dB at my boundary fence which adjoins Lot 10853, will also impact across the entire length and breadth of my property, with an estimate of 25dB at the opposite boundary fence. The noise alone is going to adversely affect the use and enjoyment of my

property. From information available about existing wind farms it is likely that the noise impact could be far greater once the turbines are in full operation and during various weather conditions, which will put off anyone from wanting to sleep over at my property, let alone stay there during day light hours. Not to mention possible health concerns being another issue altogether.

When the previous owners (my parents) lodged an application for permission to clear my property in about 2010 with the Department of Environment and Conservation, the DEC expressed concern about possible interference with the breeding habitats of the natural wildlife and birds inhabiting my property in particular mention was made of the endangered Carnaby's Black Cockatoos. No consideration whatsoever has been given by Verve Energy as to how the wind farm will affect the fauna and bird life on my property. Environmental impact studies for noise, landscape & visual, and flora & fauna, particularly in relation to Lot 10854, (that is, my property) have to be undertaken prior to the application for construction of the Warradarge Wind Farm Proposal being approved.

From the documentation provided by Verve Energy, my property – not being a participant in the wind farm, is the only property that will be greatly affected by the noise, land and visual impacts of the wind farm.

For the record, neither my mother, nor my father nor myself have agreed to enter into any Noise Neighbour Agreement or any other agreement with Verve Energy, nor have we consented to the Wind Farm being proposed.

A copy of this letter has been faxed and emailed to your office and the original has been posted to ensure that the letter arrives by the closing date (which I note is 10 August 2012), and in time for the Council Meeting on 15 August 2012.

I look forward to hearing from you once council have considered the contents of this letter.

Yours faithfully,



.....
Liana Marche

APPLICANT RESPONSE TO SUBMISSION 2



Our Ref: DMS#3477122
Enquiries: James Townsend
Telephone: (08) 9424 1889 / 0417 644 218
Email: james.townsend@verveenergy.com.au

10 August 2012

Mr Darren Friend
Chief Executive Officer
Shire of Coorow
PO Box 42
Coorow WA 6515

Dear Sir,

RE: DEVELOPMENT APPLICATION – PROPOSED WARRADARGE WIND FARM

Thank you for the opportunity to provide further information to the Council following the correspondence your office received from Ms Liana Marche, owner of Lot 10854, who is adjacent and to the south of Verve Energy's proposed Warradarge Wind Farm.

There are a number of points raised in Ms Marche's letter on which we would like to provide some clarification to the Council. These points have been collated into a table and attached to this letter with our clarifying comments. It should be noted that the points raised by Ms Marche are detailed in the Development Application Report (DAR) that was submitted by Verve Energy for this project and this table points to the location of this information in the DAR.

Verve Energy is a leading renewable energy developer in Western Australia having developed commercial wind farm projects in the State since 1987 when it built Australia's first wind farm at Salmon Beach near Esperance. Verve Energy is accountable for achieving industry best practice in the identification, selection and development of wind farm projects that balance the social, environmental and commercial drivers of a project and is highly regarded for its success. The proposed Warradarge Wind Farm project is no exception. Verve Energy has selected the project site using best practice techniques to identify a site with:

- Cleared and grazed pastures such that remnant vegetation disturbance can be minimised;
- A suitable wind resource;
- The potential for the wind farm to be sized such that economies of scale can be realised;
- Cost effective electrical connection access to the 330kV transmission network;

- Suitable landownership and usage patterns including sufficient distance from permanent habitable premises;
- A high level of social acceptance for a prospective wind farm; and
- Ease of construction.

Community consultation and engagement is a critical component of all of our project developments. Verve Energy has actively engaged with all of the surrounding landowners of the proposed Warradarge Wind Farm and presented our plans to the local communities of Eneabba and Warradarge. Verve Energy has spoken and met with Ms Marche's father (Mr Eric Marche) on several occasions and kept him informed of the wind farm development and our intention to enter into a Good Neighbour Agreement. It is our hope that we are still able to achieve a suitable agreement, however, the project has been developed in such a way that we can minimise the impact on the Marche property (Lot 10854) if such an agreement cannot be reached.

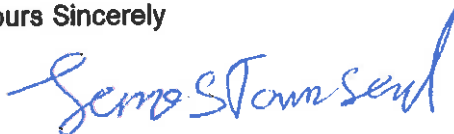
Verve Energy intends to negotiate Good Neighbour Agreements with all relevant neighbours of the wind farm. Should a Good Neighbour Agreement not be reached with Ms Marche for Lot 10854, or any other landowner for that matter, Verve Energy will consider:

1. Relocating the turbines to non optimal locations such that under all scenarios Verve Energy will never exceed the noise limits imposed by the Environmental Protection Authority (EPA) on the adjoining land. For Lot 10854 this would mean moving the turbines away from southern boundary towards the centre of the wind farm; or
2. Accepting the commercial risk that if Verve Energy proceeds with the optimal locations for the wind turbines within the project area and if a new house or other noise sensitive property is built near the wind farm, the wind turbines may need to have their output turned down at night to meet the statutory noise limits imposed by the EPA.

Throughout the DAR and public consultation process we have stressed that the wind farm design is flexible and we have presented a worst case scenario in terms of turbine spacing, visual impact and noise. If a Good Neighbour Agreement cannot be reached with Ms Marche for Lot 10854 Verve Energy will need to consider its options which may include relocating wind turbines away from the Northern boundary of her property.

Verve Energy welcomes the opportunity to discuss this letter and its attachment with the Council if required, and reiterate our intention to continue to positively engage with the owner of Lot 10854 to reach a mutually beneficial agreement,

Yours Sincerely



JAMES TOWNSEND
SENIOR PROJECT DEVELOPER

Concern raised by Ms L Marche	Verve Energy response with reference to relevant section(s) in Development Application Report
<p>I am extremely concerned that the documentation submitted by Verve Energy to the Environmental Protection Authority (and to the Shire of Coorow), has misrepresented my property as being "cleared agricultural/rural" land when almost the entire 5000 acres is natural vegetation/nature reserve. A fact that has been conveyed to Verve Energy on several occasions</p>	<p>Figures 4 and 6 in the Development Application Report show Lot 10854 is predominantly vegetated. Verve Energy does not believe the Development Application Report shows it is "cleared agricultural/rural" land. Additionally, although Lot 10854 has a good wind resource, in our site selection process as discussed in section 1.8, we sought to select land that minimised any vegetation clearing.</p>
<p>Over the years my property has been enjoyed as a "lifestyle/recreational" parkland with extended family and friends frequently camping and caravanning at the shed located on my property, which has been shown as a "non-residence". Verve Energy are aware that the shed is where we stay when we camp at my property but did not mention this is in their application, probably because the shed is right in the middle of their noise buffer zone.</p>	<p>Verve Energy is aware that the land owners of Lot 10854 do use their existing shed for occasional residential purposes as shown in Figure 17.</p> <p>We have also assessed this location as a potential house labelled Receiver Point 12 in the Noise Impact Assessment, Annex 4. It is shown that the wind turbines will comply with the limits at this point.</p>
<p>Further, if the proposed wind farm proceeds any prospect of an economically future tourism development on my property will be rendered impossible. The visual landscape of my property will be adversely affected by the location of the 100 turbines. I note that from the documentation lodged by Verve Energy my property is the only property upon which between 80 to 100% of the turbines will be seen/viewed at all times.</p>	<p>Verve Energy has shown in Figures 5 and 6 of the LVIA report (Annex 2) a Zone of Theoretical Visibility (ZTV) of the potential wind turbine layout. If that layout were adopted, there are a number of surrounding properties from which, theoretically, between 80% and 100% of the turbines could be visible. It is also noted that this ZTV is theoretical only, and does not take into account existing built form and vegetation which may provide screening.</p> <p>The Development Application Report states-</p> <p><i>4.2.7 A Zone of Theoretical Visibility ("ZTV") for both tip and hub height has been produced for the Proposal and these are shown in Figures 5 and 6 in Annex 2. A ZTV is the area around a designated point in the landscape from which that point is visible. It is calculated using elevation data such as a Digital Elevation Model and does not take account of buildings or vegetation</i></p>

	<p>screening. It represents a worst case view of how many turbines or blade tips can be seen at the location.</p> <p>4.2.8 Figures 5 and 6 in Annex 2 shows the turbines that are visible from the hub (100m) upwards and the tip height (152m). These figures show that beyond 10km from the wind farm the number of turbines visible to the west reduces to zero except on a few elevated areas. In areas to the south and north the turbines are theoretically visible out to 15km, beyond which it they are only seen in isolated areas. To the west the tips of the turbines are theoretically visible to 25km except in lower areas of the landform but it can be seen that the hubs are not as visible beyond 15km, and this is due to the screening effect of the topography.</p> <p>4.2.9 It should be noted that the ZTV is a tool to assess theoretical visibility only and that vegetation and built structures will influence what is actually visible from various locations. It is for this reason that a number of viewpoints are selected to represent what the actual change of view will be and these are shown as photomontages. The viewpoints are selected in areas that theoretically have a view of at least 80% of the wind turbines.</p>
<p>The estimated noise implications for my property (as shown in the documentation lodged with the application) indicate that noise attenuation of between 39 dB at my boundary fence which adjoins Lot 10853, will also impact across the entire length and breadth of my property, with an estimate of 25dB at the opposite boundary fence. The noise alone is going to adversely affect the use and enjoyment of my property. From information available about existing wind farms it is likely that the noise impact could be far greater once the turbines are in full operation and during various weather conditions, which will put off anyone from wanting to sleep over at my property, let alone stay their during day light hours. Not to mention possible health concerns being another issue altogether.</p>	<p>The Noise Impact Assessment has been carried out in accordance with Western Australian Planning Bulletin 67 and the Department of Environment and Conservation WA which recommends using the EPA of South Australia "Wind Farms – Environmental noise guidelines – July 2009" as the guidelines for the assessment of wind farms. The Noise Impact Assessment was provided in Annex 4 of the DAR.</p> <p>The noise limits for new wind farm developments is that the predicted noise level must not exceed the greater of either 35 dB(A) or 5 dB(A) above the background noise at any nearby homes or other noise sensitive receiver premises during night-time hours. The noise limits have been assessed for all nearby lots including Lot 10854 and are predicted to be below these levels at</p>

	<p>the existing sheds. The wind farm complies with the noise limits at the current sheds which were given the same importance as a house.</p> <p>The wind farm noise on areas of vegetated land of Lot 10854 closer to the turbines than the sheds could be greater than either 35 dB(A) or 5 dB(A) above the background noise. It is good practice for Wind Farm proponents to enter Good Neighbour Agreements to agree that no new homes or other noise sensitive receiver premises will be constructed during the lifetime of the wind farm in these areas. These areas are known as noise buffer areas.</p>
<p>Environmental impact studies for noise, landscape & visual, and flora & fauna, particularly in relation to Lot 10854, (that is, my property) have to be undertaken prior to the application for construction of the Warradarge Wind Farm Proposal being approved.</p>	<p>Verve Energy conducted a Noise Impact Assessment, Background Noise Monitoring, Flora, Vegetation and Fauna Assessment and a Landscape and Visual Impact Assessment (LVIA) on the proposed wind farm development site. The noise assessments and LVIA considers the impact on adjacent properties, however, a flora and fauna survey was not conducted on Lot 10854 as Verve Energy does not propose to clear any vegetation on that land. The Development Application Report states-</p> <p><i>4.3.1 Biota Environmental Sciences undertook a Flora, Vegetation and Fauna Assessment of the wind farm envelope and a possible transmission line route. This comprised a desktop review, field survey and flora specimen identification and this report is provided in Annex 3. The field survey was conducting over two trips in the October and November of 2011 and comprised a total of 12 days. The land area of the wind farm envelope and area of transmission line corridor is 5,010 hectares, Biota surveyed 3,650 hectares of land which was the entire wind farm envelope and one possible line route within the transmission line corridor.</i></p> <p><i>4.4.3 Verve Energy engaged specialist consultant Herring Storer Acoustics ("HSA") to undertake Noise Impact Assessment for the Warradarge Wind Farm. A prediction of worst case noise propagation from the proposed wind</i></p>

Verve Energy response to letter from L Marche (Lot 10854) dated 6 August 2012 re proposed Warradarge Wind Farm

	<p><i>farm was undertaken and background noise measurements undertaken. The Noise Impact Assessment is in Annex 4. The background noise measurements took place over 6 weeks and the results of these have set the noise limits to be applied to nearby noise sensitive premises such as residential properties, this report is in Annex 5.</i></p> <p><i>4.2.2 Following the initial wind farm design, GHD have undertaken a landscape and visual impact assessment and this is attached in Annex 2. The assessment covers a 25km radius study area from the Proposal and it investigates the various effects the wind farm has on the landscape and people in the study area at seven different publicly accessible locations.</i></p> <p><i>4.2.3 To assess the Proposal, the wind farm is designed with the greatest likely footprint and the north-south/east-west extents are shown as spaced across the greatest amount of overall land area within the wind farm envelope, as shown in Figures 5 and 6. This is deemed the worst case design from a visual point of view.</i></p> <p><i>4.2.4 As such, the width of any view of the wind farm is greatest from any viewpoint. Therefore, smaller or fewer number of turbines within the wind farm envelope or 100 turbines located in different locations within the wind farm envelope are also encompassed by the assessment.</i></p>
<p>For the record, neither my mother, nor my father nor myself have agreed to enter into any Noise Neighbour Agreement or any other agreement with Verve Energy, nor have we consented to the Wind Farm being proposed.</p>	<p>Verve Energy has not stated at any point that a Good Neighbour (noise buffer) Agreement has been signed with the land owner of Lot 10854. However such an agreement has been among the topics discussed at meetings with Mr Eric Marche</p> <p>Verve Energy commenced discussions with various land owners on 16 June 2011 regarding the proposed wind farm and the potential for a noise buffer (if applicable).</p> <p>Verve Energy met Mr Eric Marche in June 2011, November 2011 and in June</p>

2012, with various correspondence and conversations in between. During this time a draft agreement was presented for consideration and a counter proposal received. Verve Energy is open to continuing discussions with the owner of Lot 10854 to come to a mutually beneficial agreement if common ground can be found. However, should an agreement not be reached for Lot 10854, Verve Energy will consider either relocating turbines away from the boundary of Lot 10854 or accepting that there is a commercial risk that if a house or noise sensitive premises is constructed on nearby land in the future that the turbines may need to be limited to reduce their noise to comply with noise regulations at these new premises.

The Development Application Report states-

1.9.4 Verve Energy is negotiating wind farm neighbour agreements with the owners of adjacent Lots (Lots 10849, 10854, 10877, & 10878) to ensure the areas of these lots where the wind farm will be generating noise exceeding 35dB(A) or 5dB(A) above background noise, whichever is greater, will not cause any conflict with any possible future noise sensitive premises.

1.9.5 It should be noted that the final design of the wind farm and its capacity will be dependent on these agreements. Should one or more wind farm neighbour agreements not be reached this will not affect the ability to operate a wind farm, only the position and overall number of turbines within the wind farm envelope. This is discussed more fully in Chapter 4.

SUBMISSION 3A



DEVELOPMENT APPLICATION SUBMISSION FORM

**PROPOSED WARRADARGE WIND FARM & TRANSMISSION LINE
LOTS 10850 & 10853 GARIBALDI WILLIS ROAD & LOTS 10847, 10848 &
10851 ROSE THOMSON ROAD, WARRADARGE**

Name: DAVID JONAS

Postal Address: LOCKED BAG 2525 PERTH WA 6001

Phone Number: (08) 6224 6268

SUBMISSION: ☐ Support ☐ Object ☐ Indifferent

Please give in full your comments and any arguments supporting your comments
(if insufficient space, please attach additional sheets) -

*** TELSTRA REQUIRES MORE TIME TO ASSESS THIS PROPOSAL ***

AN ENGINEERING STUDY NEEDS TO BE UNDERTAKEN TO
ASSESS THE IMPACT TO OUR NETWORK. AS YOU CAN
APPRECIATE THIS IS NOT A TRIVIAL EXERCISE. AS SUCH
WE WILL REQUIRE 6WKS TO COMPLETE THIS TASK.
THANK YOU FOR YOUR UNDERSTANDING.

PLEASE FEEL FREE TO CONTACT ME IF YOU WISH
TO DISCUSS THIS FURTHER. THANKS.

REMARKS,
Signature: [Signature] Date: 6/8/2012

Please return to either: Chief Executive Officer
Shire of Coorow
PO Box 238
LEEMAN WA 6514

Chief Executive Officer
Shire of Carnamah
PO Box 80
CARNAMAH WA 6517

NOTE: The local government in determining the application will take into account the submissions received but is not obliged to support those views.

Submissions Close: 4pm Friday 10 August 2012

SUBMISSION 3B

From: Jonas, David R [mailto:David.Jonas@team.telstra.com]
Sent: Friday, 10 August 2012 3:21 PM
To: Simon Lancaster
Cc: MRS@coorow.wa.gov.au; Kathryn Jackson
Subject: RE: Warradarge Wind Farm - Shire of Coorow

Simon,

I have been in contact with Verve Energy and they have provided me with a comprehensive feasibility report and that has put my mind at ease to some extent. Whilst it does cover our radio sites we have a country exchange located about 2.5 km from the south west corner of the wind farm area. It is not a radio site but I am still concerned about induced noise and more importantly induced EMF from the wind farm.

I will have our design team check the impact to our country exchange and also verify the findings of the report. Unfortunately they will not be able complete this investigation by CoB today.

As I don't have the time to complete a engineering impact study I do not feel comfortable stating that I have no objections to the development.

It is unfortunate that circumstances have prevented me from having more time to investigate this development proposal.

Regards,



David Jonas Area Planning Manager WA

Area Planning WA | Fixed & Data Access Engineering | Telstra Operations
P 08 6224 6268 | M 0438 934 894 | E david.jonas@team.telstra.com | W www.telstra.com

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SUBMISSION 4



Government of Western Australia
Department of Environment and Conservation

Your ref. A1492/A1493 DH/GM
Our ref. 32709
Enquiries Liz Rushforth
Telephone: 08 9652 1911
Fax. 08 9652 1922
Email: elizabeth.rushforth@dec.wa.gov.au

Mr Dave Hadden
Manager Regulatory Services
Shire of Coorow
PO Box 42
COOROW WA 6515

Dear Mr Hadden

APPLICATION NO A1492/A1493 DH/GM – PROPOSED WARRADARGE WIND FARM

Thank you for your letter of 19 July 2012 regarding the above application.

The Department of Environment and Conservation (DEC) is unable to provide comment at this time. In providing advice DEC would need to refer to the Office of Environmental Protection Authority (EPA) who is the lead environmental agency for this application. DEC would need to take into account the Office of EPA comments and recommendations for this project, and unfortunately they are yet to assess this application.

Yours sincerely

Nigel Sercombe
REGIONAL MANAGER
Midwest Region

9 August 2012

SUBMISSION 5



DEVELOPMENT APPLICATION SUBMISSION FORM

**PROPOSED WARRADARGE WIND FARM & TRANSMISSION LINE
LOTS 10850 & 10853 GARIBALDI WILLIS ROAD & LOTS 10847, 10848 &
10851 ROSE THOMSON ROAD, WARRADARGE**

Name: DEPT OF TRANSPORT

Postal Address: PO BOX 68 GERALDTON WA 6531

Phone Number: (08) 99560110

SUBMISSION: ☒ Support ☐ Object ☐ Indifferent

Please give in full your comments and any arguments supporting your comments
(if insufficient space, please attach additional sheets) -

The proposal for the Warradarge Wind Farm will have a positive impact on the sustainability of the State should it go ahead. The Dept of Transport supports the idea even though we will not have any direct involvement in the development.

Signature: V McCrory Date: 13.8.12

Please return to either: Chief Executive Officer
Shire of Coorow
PO Box 238
LEEMAN WA 6514

Chief Executive Officer
Shire of Carnamah
PO Box 80
CARNAMAH WA 6517

NOTE: The local government in determining the application will take into account the submissions received but is not obliged to support those views.

Submissions Close: 4pm Friday 10 August 2012

SUBMISSION 6

Enquiries: Naomi Mynott on 08 9956 1205
Our Ref: 06/1393
Your Ref: A1492/A1493 DH/GM

9 August 2012

Chief Executive Officer
Shire of Coorow
PO Box 238
LEEMAN WA 6514

ATTENTION: MR D HADDEN, MANAGER REGULATORY SERVICES

Dear Sir

PROPOSED WARRADARGE WIND FARM & TRANSMISSION LINE

Thank you for consulting Main Roads Western Australia (MRWA) on the proposed development of a wind farm at Warradarge. We have had the opportunity to review the submitted details comprising the Development Application Report (dated June 2012) and supporting plans and reports and have the following comments to make.

MRWA supports the provision of renewable energy developments and is satisfied that principle of the development in this location would be acceptable.

Notwithstanding the above, MRWA has some concerns over potential impacts of the proposal on the Main Roads network as a result of the type and number of additional vehicle movements generated, particularly in association with the construction and decommissioning stages. It is considered, however, that the production of a Traffic Management Plan including condition surveys would address MRWA concerns regarding:

- Ability of route and intersection to accommodate volume and nature of traffic. This would be resolved through the identification and subsequent implementation of upgrades as necessary; and
- Potential for damage at intersections and repair of any damage associated with development construction/decommissioning, which would be addressed by the Dilapidation/Condition part of the Plan.

Furthermore, it is considered that the wording of the conditions set out in the email from Simon Lancaster (dated 6 August 2012) would satisfactorily protect the interests and assets of MRWA, although we would suggest that the wording of condition X is expanded to clarify that all 'costs' would include, inter-alia, those in relation to surveys to establish the conditions together with any costs associated with the design, construction and maintenance (over a specified defect liability period) of identified required upgrades.

In addition to the conditions and advice set out within the aforementioned email, we would request that the following advice is also offered to the proponent:

- Any signs or additional markings on or visible from the Main Road will require the approval of MRWA's Mid West Network Operations Manager, Peter Herbert, who can be contacted on 08 9956 1208

If you require any further information please contact Naomi Mynott on 08 9956 1205.

Yours faithfully

Bernie Miller
REGIONAL MANAGER MID WEST REGION

SUBMISSION 7

watercorporation.com.au

Mid West Region

45 Cathedral Avenue
Geraldton WA 6530

PO Box 43
Geraldton WA 6531

Faults, Emergencies and Security 13 13 75

Account Enquiries 13 13 85

Building and Subdivision 13 13 95

ADM0519 ICR125547

Your Ref: A1492/A1493 DH/GM
Our Ref: GN1 2002 00033 V01 DOC 7393402
Enquiries: Phil Gale
Direct Tel: 08 9923 4942
Fax: 08 9923 4966

16 AUG 2012



13 August 2012

Shire Of Coorow
PO BOX 42
COOROW WA 6515

Attention: Dave Hadden

**SHIRE OF COOROW
LOTS 10850, 10853, 10848 & 10851 GARIBALDI WILLIS & ROSE THOMSON RDS
WARRADARGE - WARRADARGE WIND FARM**

I refer to your letter of 19 July 2012 regarding the above proposed Wind Farm in Warradarge.

The Water Corporation has no facilities in this area and there are no objections to this development proposal.

Should you have any queries, please do not hesitate to contact the Enquiries Officer.

A handwritten signature in black ink that reads "Phil Gale".

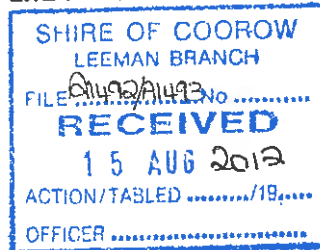
PHIL GALE
LAND SERVICING CONSULTANT
DEVELOPMENT SERVICES



Government of Western Australia
Department of Agriculture and Food



Chief Executive Officer
Shire of Coorow
PO Box 238
LEEMAN WA 6514



Your Ref: A1492/A1493 DH/GM
Our Ref: GE100173V1
Enquiries: A. Stuart-Street
Date: 9 August 2012

Dear Sir

Re: PROPOSED WARRADARGE WIND FARM

Thank you for the opportunity to comment on the Proposed Warradarge Wind Farm. The Department of Agriculture and Food (DAFWA) does not have any objection to the Wind Farm, but would like to offer the following comments:

Page one of the Draft Environmental Management Plan (sections 1.1.10 and 1.1.11) discusses issues with Weed hygiene. The declared weed Paterson's Curse is raised in the report, but no mention is made of Skeleton Weed. This is another significant declared weed which has been identified in the vicinity of the wind farm site (both to the east and west of the proposed wind farm location), if not actually on the site. The site is considered to be at moderate risk for infestation.

Weed management standards need to be maintained in all aspects of the project throughout its life. This is important to ensure a minimal biosecurity risk for the land owner, the adjoining farms and along the transport route. See the attached link to DAFWA's website for further information about Biosecurity guidelines.
http://www.agric.wa.gov.au/PC_93003.html?s=700803442.

The site in question is dominated by deep sands and gravelly soils and much of the area is subject to a very high risk of wind erosion. These issues appear to have been addressed in the Draft Environmental Management Plan under Topsoil management and rehabilitation; and Dust suppression; in sections 1.1.20 to 1.1.24.

I trust these comments inform the Council's decision on this matter. If you need specific advice on biosecurity issues please contact Dave Lisle on (08) 9956 8569. If you have queries regarding other comments, please contact Angela Stuart-Street on (08) 9956 8547.

Yours sincerely,

Pam l'Anson
Acting Regional Director
Northern Agricultural Region

ADM0519

ICR125558



Government of Western Australia
Department of Water



Your Ref: A1002101100
Addressing all our water needs

Our Ref: RF6388

Enquiries: Ms Kerry Wray

(08) 9965 7400

Manager Regulatory Services
Shire of Coorow
PO Box 42
COOROW WA 6515

Attn: Manager Regulatory Services

Dear Dave

PROPOSED WARRADARGE WIND FARM

Thank you for the referral of the above proposal dated 19 July 2012. The Department of Water (DoW) has assessed the proposal and provides the following advice and recommendations.

The subject land is located within the Hill River and Tributaries Catchment surface water area as proclaimed under the Rights in Water and Irrigation Act (1914). Any taking or diversion of surface water for purposes other than stock/domestic, and any interference with the bed or banks of a watercourse in this proclaimed area will require a permit from the DoW.

Several small tributaries of the Hill River system traverse the subject land. It is recommended that the Shire of Coorow require the proponent to ensure that all road crossings over waterways are to be designed and constructed to minimise detrimental impact on the waterways form and function. It is also recommended that the proponent be required as a condition of approval to ensure that works do not encroach into the standard 30m foreshore buffer area on both banks of all waterways.

The land is also located within the Arrowsmith groundwater area as proclaimed under the Rights in Water and Irrigation Act (1914). The applicant should be advised to ensure that all landowners have been consulted regarding potential impacts to private bores.

In general, the Draft Environmental Management Plan provided adequately addresses other water management issues, such as stormwater management and contamination risks. If you wish to discuss this issue further please contact the Mid West Gascoyne Region office on (08) 9965 7400.

Yours sincerely

Katherine Tutt
Program Manager
Mid West Gascoyne

August 15, 2012

SUBMISSION 10

From: Sam Sorgiovanni [mailto:Sam.Sorgiovanni@Kwinana.wa.gov.au]
Sent: Tuesday, 21 August 2012 4:13 PM
To: Simon Lancaster; MRS@coorow.wa.gov.au
Cc: 'rosss@stockerpreston.com.au'
Subject: Proposed Warradarge Wind Farm
Importance: High

Dear Mr. Lancaster and Mr. Hadden

I am responding on behalf of my father Mr. Bruno Sorgiovanni, Owner of Lot 1 Garrabaldi-Willis Road Warradarge, in relation to the proposed Warradarge wind farm.

Firstly we wish to express our disappointment with the lack of consultation by the shire to the affected land owners impacted by the proposed development considering it is probably the largest financial development in the Shire. My parents have not received any correspondence from the shire regarding this issue and seeking their comment. We were also not advised of the public consultation period by either the Shire of Coorow or Verve energy.

Also I hope you appreciate that having received the 18 emails only late yesterday afternoon, we have not had sufficient time to read everything that was sent to us. However, from what we have read, it shows that our fathers property is significantly impacted by the proposed development a lot more than what was explained to him or us by Verve.

The proposed wind farm development will impact my fathers property by:-

1. Restricting and almost eliminating any future development of the property. As discussed with Mr. Hadden yesterday, we have had 2 companies over the last few years interested in the property. One was for setting up chalets for eco tourism for wild flowers and farm stays and the other was for a cattle feed lot. Both proposals would have required construction of accommodation to house guests or workers. Neither of these interested parties would look this option now if a buffer/easement is on the property to the magnitude that Verve is intending.
2. Significantly impacting any future sale of the property and commercial value to potential buyers.
3. Ruining the aesthetics of the area and creating an unsightly visual impact.
4. Destroying the peace and tranquility of the local area during the construction

I have decided to provide our comment via email as my father would like his opposition to the proposal tabled at the upcoming DAP meeting and forwarded to the councilors and any upcoming development approval committee that is to assess this proposal.

The only correspondence my father has received in the past 6 months is a very onerous and binding deed of agreement with an unacceptable offer considering the significant impact the proposed development has on my fathers property and any future or potential development of Lot 1. The area Verve have indicated on the documents previously sent to my father have not been as clear as the documents that were sent to my brother and I only yesterday. So the quality of their consultation is questionable as it appears Verve are only showing the affected land owners what they want to show to suit the approval of the proposal.

A letter that accompanied the deed of Agreement sent by Verve, was not very clear in clarifying whether the area that impacts my fathers property is to be a 'development buffer' or an 'easement' as both terms were used to describe the area and each having an significant effect on any future development of my fathers property. The area of my fathers farm impacted is almost the entire

property, and from the documents sent yesterday, no other property is affected by this proposal like my fathers property is affected.

Therefore, I request that you record our Total DISAPPROVAL of the proposed Warradarge wind farm by Verve energy. We will be seeking legal advice over the next couple of weeks and request that no approval be given to Verve until all of the affected land owners have been properly consulted and informed of the actual impact of this proposal.

I request that any future correspondence regarding my fathers property be addressed to:-

Mr. Bruno Sorgiovanni
250 Anstey Road
Forrestdale WA 6112

We look forward your future consultation regarding this proposed development.

Yours Sincerely

Sam Sorgiovanni

APPLICANT RESPONSE TO SUBMISSION 10



Our Ref: DMS#3480956
Enquiries: James Townsend
Telephone: (08) 9424 1889 / 0417 644 216
Email: james.townsend@verveenergy.com.au

23 August 2012

Mr Darren Friend
Chief Executive Officer
Shire of Coorow
PO Box 42
Coorow WA 6515

Dear Sir,

RE: DEVELOPMENT APPLICATION – PROPOSED WARRADARGE WIND FARM

Thank you for the opportunity to provide further information to the Council following the correspondence your office received from Mr Sam Sorgiovanni on behalf of the owner (his father, Mr Bruno Sorgiovanni) of Lot 1, to the east of Verve Energy's proposed Warradarge Wind Farm.

There are some points raised in Mr S. Sorgiovanni's letter on which we would like to provide some clarification to the Council.

Previous Consultation

Community consultation and engagement is a critical component of all of our project developments. Verve Energy has actively engaged with all of the surrounding landowners of the proposed Warradarge Wind Farm and presented our plans to the local communities of Eneabba and Warradarge.

Verve Energy initially met with the owners of Lot 1, Mr Bruno Sorgiovanni and Mrs Carmella Sorgiovanni in November 2011 informing them of the proposed Warradarge Wind Farm. They advised at the time their property was up for sale, to which Verve Energy explained that we were not in a position to purchase land.

Since then, Verve Energy has spoken to their other son Mr Ross Sorgiovanni on several occasions and kept him informed of the wind farm development and our intention to enter into a Neighbour Agreement. An agreement was sent to Mr Bruno Sorgiovanni via Mr R. Sorgiovanni mid February 2012 for consideration.

Newsletter updates advising of the upcoming March Public Information Sessions were sent to the owner's residence in Forrestdale in February and March 2012. Mr R. Sorgiovanni spoke to me to ask what was at the Public Information Sessions and I advised that I could send through the presentation and offered to meet with any of the owners to share our information we collected from our environmental studies. Following the Public Information Sessions, Verve Energy sent through to Mr R. Sorgiovanni a copy of the presentation that was on display as well as offered to meet to further discuss the project if required.

We spoke to Mr R. Sorgiovanni last week to advise on the project status and we believed that we were waiting to hear from Mr B. Sorgiovanni's legal advisor about our proposed Neighbour Agreement we issued earlier in the year.

Neighbour Agreement

The Noise Impact Assessment for the Proposal has been carried out in accordance with Western Australian Planning Bulletin 67 and the Department of Environment and Conservation WA which recommends using the EPA of South Australia "Wind Farms – Environmental noise guidelines – July 2009" as the guidelines for the assessment of wind farms. The Noise Impact Assessment was provided in Annex 4 of the Development Application Report (DAR).

The noise limits for new wind farm developments is that the predicted noise level must not exceed the greater of either 35 dB(A) or 5 dB(A) above the background noise at any nearby homes or other noise sensitive receiver premises during night-time hours. The noise limits have been assessed for all nearby lots including Lot 1 and are predicted to be below these levels.

The wind farm noise on areas of land on Lot 1 could be greater than either 35 dB(A) or 5 dB(A) above the background noise. It is good practice for Wind Farm proponents to enter Neighbour Agreements to agree that no new homes or other noise sensitive receiver premises will be constructed during the lifetime of the wind farm in these areas. These areas are known as noise buffer areas. In the Neighbour Agreement, it was illustrated that the noise buffer area which corresponds to the extent of predicted noise above 35dB(A), would encompass around a quarter of Lot 1 and not encompass the existing farm house or buildings.

It is our hope that we are still able to achieve a suitable agreement, however, the project has been developed in such a way that we can minimise the impact on Lot 1 if such an agreement cannot be reached. Verve Energy can do this be either:

1. Relocating the turbines to non optimal locations such that under all scenarios Verve Energy will never exceed the noise limits imposed by the Environmental Protection Authority (EPA) on nearby land. For Lot 1 this would mean moving the turbines away from the eastern boundary towards the centre of the wind farm; or
2. Accepting the commercial risk that if Verve Energy proceeds with the optimal locations for the wind turbines within the project area and if a new house or other noise sensitive property is built near the wind farm, the wind turbines may need to have their output turned down at night to meet the statutory noise limits imposed by the EPA.

Throughout the DAR and public consultation process we have stressed that the wind farm design is flexible and we have presented a worst case scenario in terms of turbine spacing, visual impact and noise. If a Neighbour Agreement cannot be reached with Mr B. Sorgiovanni for Lot 1 Verve Energy will need to consider its options which may include relocating wind turbines away from the north eastern boundary of the wind farm.

Verve Energy welcomes the opportunity to discuss this letter with the Council if required, and reiterate our intention to continue to positively engage with the owner of Lot 1 to reach a mutually beneficial agreement,

Yours Sincerely



JAMES TOWNSEND
SENIOR PROJECT DEVELOPER



WARRADARGE WIND FARM

DEVELOPMENT APPLICATION REPORT

JUNE 2012



Verve Energy is WA's leading electricity producer.

PREFACE

This Development Application Report and Annexes has been prepared to assist decision makers in assessing the Warradarge Wind Farm for development approval.

CONTENTS

Preface.....	1
Contents	1
Executive Summary.....	3
1 Introduction	5
1.1 Project Background.....	5
1.2 Proposal Overview.....	6
1.3 Wind farm envelope and transmission line corridor.....	7
1.4 The Proponent	8
1.5 Proponents Experience.....	8
1.6 Development Application Report	10
1.7 Planning Context and Justification	11
1.8 Site Selection	12
1.9 Land Tenure	13
1.10 Geology.....	14
1.11 Water.....	14
1.12 Wind Power Technology	15
2 Stakeholder Consultation	17
2.1 Introduction	17
2.2 Consultation with authorities, statutory regulators and organisations.....	17
2.3 Public consultation with land owners and local community.....	19
3 Project Description.....	22
3.1 Proposal Overview.....	22
3.2 Proposal Dimensions	22
3.3 Wind turbine.....	24
3.4 Underground cabling.....	25
3.5 Substation Compound	26
3.6 Wind monitoring mast.....	27
3.7 Transmission Line	27
3.8 Access tracks and crane hardstands.....	27
3.9 Foundation.....	29
3.10 Wind Farm Staged Construction	30
3.11 Construction Timetable	30
3.12 Construction compound.....	31
3.13 Construction Materials and Water supply	31
3.14 Concrete Batching	32
3.15 Labour resources and services	33
3.16 Supplier Database	33
3.17 Safety, Health and Environmental (OSHE) Management	33
3.18 Transport Requirements	34

3.19	Environmental Management	36
3.20	Operation period	37
3.21	Decommissioning	38
4	Environmental Impact Assessment.....	39
4.1	Introduction	39
4.2	Landscape and Visual Impact Assessment (“LVIA”)	39
4.3	Flora and Fauna	49
4.4	Noise	52
4.5	Broadcasting and radiocommunication	55
4.6	Aviation	55
4.7	Cultural Heritage.....	56
4.8	Socioeconomic.....	56
4.9	Shadow Flicker and Blade Glint	57
5	Mitigation and Conclusions	58
5.1	Mitigation and Conclusions	58

EXECUTIVE SUMMARY

Verve Energy is the leading electricity generation company in Western Australia operating a portfolio of fossil fuelled and renewable energy power stations. Verve Energy (and its predecessors) has been active in renewable energy development since 1987, with the installation of Australia's first wind farm at Salmon Beach in Esperance. Since this time Verve Energy has developed wind farms in Albany, Hopetoun, Bremer Bay, Rottnest Island, Denham, Kalbarri, Coral Bay, Exmouth and is currently constructing a new facility near Geraldton.

This report details a proposal to install up to 100 wind turbines at a site 15 km south-east of Eneabba in a development to be known as the Warradarge Wind Farm. This wind farm would be developed, owned and operated by Verve Energy together with a joint venture partner and represents a capital investment of approximately \$600 million. The wind farm has a design life of 20 years.

This Proposal is the culmination of several years work by Verve Energy driven by the need to generate electricity more cleanly and sustainably. Wind turbines do not cause pollution, do not contribute to man made climate change and the wind resource is virtually inexhaustible. The chosen site is an excellent one for wind farming having a good wind resource, available land and a community comfortable with the technology.

Verve Energy has used independent planning consultants to assess the Warradarge Wind Farm against Local, Regional, State and Federal planning policies and it has been shown to generally comply with these policies and this Planning Compliance Report is provided as Annex 8.

Following the independent assessments discussed in Chapter 4 the design of the wind farm has been undertaken in conjunction with Verve Energy's Warradarge Wind Farm consultant team. The Mid-West Joint Development Assessment Panel's approval of the wind farm and associated infrastructure is now sought. The wind farm has been designed to balance the benefits of generating renewable energy against the anticipated minimal environmental impacts of the development.

The 100 turbine wind farm would produce on average every year, up to 875 million Kilowatt-hours (kWh) of electricity which is equivalent to the average annual electricity needs of 140,000 West Australian homes. The wind farm would also prevent at least 700,000 tonnes of CO₂ from entering the atmosphere annually.

The final number, make and model of the wind turbines that will comprise the wind farm is not yet finalised and therefore development approval is sought for a 100 turbine wind farm and all associated infrastructure to be located within the wind farm envelope. To minimise the environmental impact of the development there are number of excluded areas where no turbines or associated infrastructure will be located. The Proposal footprint within the wind farm envelope is on cleared land and does not require further clearing of vegetated areas. Important vegetated areas that contain Threatened Ecological Communities and Priority Species have been intentionally avoided.

The exact route of the 10km transmission line is not yet finalised but a likely route corridor has been selected based on Western Power's connection requirements. Up to 0.7 hectares of vegetation may require clearing for the transmission line and this will be subject to a clearing permit through the Department of Environment and Conservation. The likely transmission line route has been surveyed and contains no Threatened Ecological Communities and the Priority 4 species has been intentionally avoided.

The design of the wind farm has taken into account the location of nearby residential premises to ensure that the operational noise from the wind farm is predicted to meet the noise limits for wind farm developments at these locations. The noise limits at relevant receivers is 35 dB(A) or the background noise (LA90,10 minute) plus 5 dB(A), whichever is the greater.

The wind farm location and design complies with the Visual Landscape Planning Manual of Western Australia. The wind farm has been shown to be in a compact area acceptable from a landscape and visual perspective provided that the wind farm is limited to 100 turbines up to 152m high within the wind farm envelope. The majority of impacts have been mitigated through the wind turbine and wind farm design.

The location of the wind farm has been assessed to determine whether any impacts are likely on air safety, radiocommunications and broadcasting and the results of these surveys are that no impacts are expected.

The proposed Warradarge Wind Farm will be a significant project for the Shires of Coorow and Carnamah and for Verve Energy. The Warradarge Wind Farm feasibility study to date has found that a wind farm can be built at the proposed site that meets the technical, social and environmental constraints imposed on it. The majority of the impacts associated with the wind farm have been mitigated through site selection and design.

Verve Energy has undertaken extensive consultation about Warradarge Wind Farm and has received wide spread support from the local community to build the project. No objections were lodged in discussions with surrounding landowners.

Final approval for this project will be sought from Verve Energy's Board of Directors and the Minister for Energy once final statutory approvals have been granted and funding arrangements resolved. If all approvals are received the first stage of the wind farm would take approximately two years to construct and turbines are aimed to be installed and generating in 2015.

The Warradarge Wind Farm is a forward thinking step which represents a clean and sustainable future.

1 INTRODUCTION

1.1 Project Background

- 1.1.1 Verve Energy (the “**Proponent**”) is seeking development approval to construct the Warradarge Wind Farm (the “**Proposal**”) on farmland between Rose Thompson Road and Garibaldi Willis Road in the Shire of Coorow and the Shire of Carnamah. At its closest point, the wind farm is 15km north east of Warradarge, 15 km south east of Eneabba and 40 km south west of Carnamah. A location plan is shown in Figure 1.



Site Location of Warradarge Wind Farm

- 1.1.2 The 100 turbine wind farm would produce on average up to 875 million Kilowatt-hours¹ (kWh) of electricity each year which is equivalent to the average annual electricity needs of 140,000 West Australian homes². The wind farm would also avoid at least 700,000 tonnes of CO₂ from entering the atmosphere annually³.
- 1.1.3 The wind farm is the culmination of many years of work by Verve Energy and its predecessors, driven by the need to generate electricity more cleanly and sustainably. Verve Energy is seeking to build wind farms because the wind resource is virtually inexhaustible and these wind farms are part of the solution to ensuring a sustainable future. Additionally wind turbines do not cause air pollution and are part of the response to reducing fossil fuel usage for electricity generation, minimising the emissions causing climate change.

¹ This figure is based on the predicted electricity production from one hundred 2.5MW turbines situated in the wind regime at the Warradarge Wind Farm site.

² This figure was based on the average electricity demand of Western Australian homes of 6,219 kWh; this figure from Synergy is for the 2010/11 financial year period, residential customers on a standard A1 tariff, with a minimum of 12 months' billing history and no Photovoltaic solar panels.

³ This figure was based on an emission factor of 0.8 kg CO₂/kWh from the National Greenhouse and Energy Reporting (Measurement) Determination 2008 (Schedule 1)

- 1.1.4 The search for suitable wind farm sites in WA has been ongoing since the early 1990s with prospecting wind monitoring masts being installed at various locations. The proponent has undertaken wind monitoring on the current Warradarge Wind Farm site from 2010 until present and demonstrated that the site has a wind resource sufficient for the economical development of a wind farm.
- 1.1.5 Spare electrical transmission capacity for connection of a wind farm is available on the Eneabba to Three Springs 330 kilovolts (kV) transmission line which is under construction, and Verve Energy has a grid connection application currently being processed by Western Power.
- 1.1.6 Verve Energy has secured agreement with the landowners who will host the wind turbines and has consulted with neighbours, local authorities and approval agencies. Should Development Approval be granted the final decision to build this project will be sought from Verve Energy's Board of Directors and the Minister of Energy, subject to all statutory approvals being granted and funding arrangements being agreed.
- 1.1.7 This Development Application Report has been drafted to support the development application for the footprint of the Proposal within the Shire of Coorow and the footprint of the Proposal within the Shire of Carnamah.
- 1.1.8 The Proponent will need to finalise a number of key agreements including: grid connection, turbine supply, construction contractor, finance, the electricity buyer (power offtaker) prior to the project proceeding. It is predicted that more time than two years could be required from the granting of development approval to construction proceeding. It is therefore requested that a condition to the development approval allows that the wind farm construction is substantially commenced within 5 years of the date of Development Approval.

1.2 Proposal Overview

- 1.2.1 The Warradarge Wind Farm will have an overall electrical capacity of up to 250 Megawatts ("**MW**") and will contain up to 100 wind turbines ("**WTGs**"). It is likely that the wind farm will be commissioned in three stages with at least a 2 year gap between the commissioning of each of the three stages.
- 1.2.2 The wind turbine make and model that will comprise each stage of the wind farm is not yet known, and this will only be selected following a tendering procedure for each stage of the development once Development Approval is obtained. Different wind turbine makes and models vary in height, rotor diameter, noise emission output and electrical capacity, therefore the Proponent is seeking Development Approval to encompass all the potential wind turbine configurations of a 100 turbine wind farm within the wind farm envelope.
- 1.2.3 This Development Application Report has been undertaken using the greatest impact (worst case) specifications for all assessments. The wind turbines proposed under this scenario are three-bladed, horizontal axis wind turbines, up to a maximum of 152m in height to the tip. Therefore this assessment of 100 x 152m high wind turbines also encompasses smaller and lesser turbines that may be built. A likely turbine elevation is shown in Figure 2.
- 1.2.4 The wind farm is comprised of up to 100 wind turbines each up to 152m high and the wind farm will have associated electricity transformers, underground cabling, access tracks, all

weather access to Garibaldi Willis Road, crane hardstands, a substation compound including a metering building, site office and workshop and a communication mast, a 10km overhead electricity transmission line to the 330kV transmission system with up to 22 transmission towers that are up to 63m in height; and up to five permanent free-standing wind monitoring masts up to 100m high. The 100 turbine layout is shown in Figures 3 and 4.

- 1.2.5 During the construction and commissioning period there will be a number of temporary works including a construction compound, equipment lay-down and storage areas, site offices, ablutions, communication masts and equipment.
- 1.2.6 Within the Shire of Coorow are the 152m high wind turbines and associated electricity transformers, underground cabling, access tracks, all weather access to Garibaldi Willis Road, crane hardstands, a substation compound including a metering building, site office and workshop and communication mast, five permanent free-standing wind monitoring masts up to 100m high and a portion (approximately 4.5km) of the overhead electricity transmission line.
- 1.2.7 Within the Shire of Carnamah the Proposal contains a portion (approximately 5.5km) of the overhead electricity transmission line to the existing Western Power 330kV transmission system.

1.3 Wind farm envelope and transmission line corridor

- 1.3.1 The final number, make and model of the wind turbines that will comprise the wind farm is not yet finalised. Therefore the development application is for a 100 turbine wind farm and all associated infrastructure to be located within the wind farm envelope, as shown in Figure 5 and Figure 6. Within the wind farm envelope are a number of excluded areas where no turbines or associated infrastructure will be located. These vegetated areas have been intentionally avoided to minimise the environmental disturbance of the Proposal.
- 1.3.2 The exact route of the transmission line is not finalised but a likely route through the transmission line corridor has been selected. Depending on Western Power's final connection requirements and the type and number of towers used, the line route may vary within the transmission line corridor as shown in Figure 5 and Figure 6.
- 1.3.3 To assess the worst case impact of the Proposal, the wind farm is presented for assessment with the greatest likely footprint and the north-south/east-west extents are spaced across the greatest amount of overall land area within the wind farm envelope.
- 1.3.4 As such the width of any view of the wind farm is greatest from any viewpoint. Therefore if the final development results in smaller or fewer numbers of turbines within the wind farm envelope or the anticipated 100 wind turbines are located in different locations within the wind farm envelope this is also encompassed by the assessment.
- 1.3.5 The turbines assessed are the noisiest likely wind turbine to be installed and therefore if a quieter turbine was installed the noise impact would be lesser and therefore quieter turbines are also encompassed by this assessment.

1.4 The Proponent

- 1.4.1 The Proponent of the Warradarge Wind Farm is Verve Energy (ABN 58 673 830 106). Verve Energy is responsible for the development, financing and operation of the Warradarge Wind Farm. The Project Manager is responsible for all day-to-day activities of the project and should be the point of contact for the Shire. Contact details are as follows:
- 1.4.2 Mr James Townsend
Warradarge Wind Farm Project Manager
Sustainable Development
Verve Energy
Level 11, Australia Place
15-17 William Street
Perth WA 6000
Ph: (08) 9424 1889
Mob: 0417 644 216
Email: james.townsend@verveenergy.com.au
- 1.4.3 The project Superintendent has overall responsibility for the project. Contact details are as follows:
- 1.4.4 Mr Daniel Thompson
Manager Sustainable Development
Verve Energy
Level 11, Australia Place
15-17 William Street
Perth WA 6000
Ph: (08) 9424 1851
Mob: 0428 928 894
Email: daniel.thompson@verveenergy.com.au
- 1.4.5 Verve Energy is in the process of forming a joint venture entity for the financing of this project. The joint venture party/s will provide equity, and the residual will be debt financed and the joint venture entity will ultimately own the project. It is likely that the joint venture entity will appoint a third party to undertake the detailed engineering, procurement, construction and commissioning of this project once the final project approvals have been secured. Furthermore it is possible that Verve Energy may be responsible for the Operation and Maintenance of this facility, with support contracts from the wind turbine supplier.
- 1.4.6 Verve Energy will ensure that any commitments made by itself, and any conditions of development approval by the Shire of Coorow and the Shire of Carnamah will be met during the project through contractual agreements.

1.5 Proponents Experience

- 1.5.1 Verve Energy has a great deal of experience in building and operating wind farms, and we are currently constructing Australia's largest solar farm. Table 1 provides an overview of our portfolio and a map showing all Verve Energy generation facilities is provided overleaf.



Verve Energy's other electricity generation projects

Table 1- Verve Energy Renewable Energy Portfolio

Project	Renewable Capacity	Status
Ten Mile Lagoon Wind Farm	2.025MW (9 x 225kW Vestas V27 WTG's)	Operational since 1993
Denham Wind-Diesel System	990kW (1 x 330kW Enercon E33 & 3 x 220kW Enercon E30 WTG's)	Operational since 1997
Albany Wind Farm	21.6MW (12 x 1.8MW Enercon E66 WTG's)	Operational since 2001
Nine Mile Beach Wind Farm	3.6MW (6 x 600kW Enercon E40 WTG's)	Operational since 2003
Hopetoun Wind-Diesel System	1.2MW (2 x 600kW Enercon E40 WTG's)	Operational since 2004
Bremer Bay Wind-Diesel System	600kW (1 x 600kW Enercon E40 WTG)	Operational since 2005
Coral Bay Wind-Diesel System	600kW (3 x 200kW Vergnet GEV-MP WTG's)	Operational since 2007
Kalbarri Wind Farm	1.6MW (2 x 800kW Enercon E48 WTG's)	Operational since 2008
Grasmere Wind Farm	13.8MW (6 x 2.3MW Enercon E70 WTG's)	Operational since 2011
Mumbida Wind Farm	55MW (22 x 2.5MW GE 2.5-100 WTG's)	Under construction
Greenough River Solar Farm	10MW (150,000 x 80W First Solar Panels)	Under construction

1.6 Development Application Report

1.6.1 The purpose of this Development Application Report is to provide information about the environmental effects of the Proposal that has been collected by the Proponent and independent consultants. This can inform stakeholders of the proposed development details and any potential effects resulting from the project.

1.6.2 The Development Application Report comprises the following Chapters:

- Chapter 1 Introduction
- Chapter 2 Stakeholder Consultation
- Chapter 3 Project Description
- Chapter 4 Environmental Impact Assessment
- Chapter 5 Mitigation and Conclusions

1.6.3 The independent reports and their authors are detailed below, and they are provided as Annexes to this Development Application Report. The consultants were selected on the basis that they all have previous experience in working on wind farm projects, both internationally, interstate and in Western Australia. The Annexes to this Development Application Report and their authors are:

- Annex 1 – Planning and Context Statement - URBIS
- Annex 2 – Landscape and Visual Impact Assessment - GHD
- Annex 3 – Flora, Vegetation and Fauna Assessment - Biota Environmental Sciences
- Annex 4 – Noise Impact Assessment- Herring Storer Acoustics
- Annex 5 – Background Noise Monitoring - Herring Storer Acoustics
- Annex 6 – Investigation of Possible Impacts on Broadcasting and Radiocommunication Services - Lawrence Derrick & Associates
- Annex 7 – Aviation Impact Statement Assessment - AECOM
- Annex 8 – Planning Compliance Report - URBIS
- Annex 9 – Verve Health and Safety Policy - Verve Energy
- Annex 10 – Verve Environmental Policy - Verve Energy
- Annex 11 – Draft Environmental Management Plan - Verve Energy
- Annex 12 – Stakeholder Consultation - Verve Energy

1.7 Planning Context and Justification

- 1.7.1 The Proponent has commissioned URBIS to provide a planning context and justification statement and this is available in Annex 1. URBIS have also undertaken a Planning Compliance Report of all the information contained within this Development Application Report and the independent third party reports to ensure that all topics are suitably assessed. This independent report, provided in Annex 8, demonstrates that the Proposal complies with all relevant Federal, State, Regional and Local planning policies and meets all the requirements to be assessed for development approval.
- 1.7.2 Although the planning context and proposal justification are covered in detail in Annex 1 it is worth mentioning the principal regulatory driver behind the wind farm development is the Mandatory Renewable Energy Target (“MRET”) Scheme and the principal planning guidance relevant in Western Australia (Planning Bulletin No.67).
- 1.7.3 The MRET is a market based scheme designed to encourage investment in renewable energy generation capacity, contributing to development of an Australian renewable energy industry and to cut greenhouse gas emissions from electricity generation. The MRET commenced on 1 April 2001 by means of the *Renewable Energy (Electricity) Act 2000* (the “Act”).
- 1.7.4 The key objectives of the Act are to:
- Encourage the additional generation of electricity from renewable sources;
 - Reduce emissions of greenhouse gases in the electricity sector; and
 - Ensure that renewable energy sources are ecologically sustainable.
- 1.7.5 The MRET operates by placing a responsibility on wholesale electricity purchasers to source specific proportions of total electricity sales from renewable energy sources according to a fixed timeframe, with the scheme running until at least 2020. The Western Australian

Government has been active in supporting the national target and in attracting renewable energy investors to provide the renewable energy certificates necessary to satisfy Western Australia's liability from within the State.

1.7.6 Planning Bulletin No.67 ("**PB67**") was prepared to provide local government, other relevant approval authorities and wind farm developers with a guide to the planning framework for the balanced assessment of land-based wind farm developments throughout Western Australia. PB67 identifies key planning issues relevant to wind farm developments, and provides guidance in the design and siting of wind farms, as well as assisting local governments in their assessment process. The key objectives of PB67 are as follows:

- Facilitate the development of wind farms in an efficient, cost-effective and environmentally responsible manner that meets community needs, while taking into account the needs of developers, and State and national imperatives;
- Promote community understanding of the issues involved in the design and installation of wind farm infrastructure and provide opportunities for community input into decision-making;
- Promote a consistent approach in the preparation, assessment and determination of applications for planning approval for wind farm developments; and
- Minimise disturbance to the environment (including landscape) and loss of public amenity in the establishment, operation, maintenance and decommissioning of wind farms.

1.8 Site Selection

1.8.1 The primary issues in identifying possible wind farm sites are wind resource, electricity transmission access and minimising technical, environmental and social impacts.

1.8.2 A state wide wind resource assessment has been undertaken by Verve Energy and areas of higher wind speeds have been investigated for wind farm suitability.

1.8.3 Western Australia has an excellent wind resource; however, there are limited locations for commercial wind farm development. The main constraints are that many of the windy areas are inaccessible due to their proximity to areas of recognised natural heritage value, such as National Parks, RAMSAR wetlands or sensitive nature reserves.

1.8.4 Agricultural land is preferred because vegetation clearing is kept to a minimal which reduces the development's environmental impact whilst providing an additional income stream to local landowners.

1.8.5 Proximity to the high voltage electricity transmission network of the South West Interconnected System ("**SWIS**") is very important. If a wind farm is too far from the network then long above-ground high voltage transmission lines are required. These lines can be prohibitively expensive and can involve substantial land and environmental disturbance.

1.8.6 A wind farm does not supply what is called 'firm capacity'. This simply means that a wind farm cannot be turned on at any time to get maximum electricity output, as it depends on the wind conditions at the time. While the wind cannot be controlled, a site can be chosen

where the wind blows sufficiently to provide economic wind power. It is expected that the wind farm would be generating electricity around 90% of the time.

- 1.8.7 Social acceptability is an increasingly important issue for wind farm developments. Wind farms need to be appropriately sited, and the community engaged in their development.
- 1.8.8 Consideration of alternative locations in the mid west was conducted during the pre-feasibility stage of the project. There is substantial cleared and grazed agricultural land throughout the mid west and there are also various areas of high wind speeds, but some of these are in vegetated areas. There is however limited areas where sufficient wind speeds exist, there is cleared agricultural land and suitable opportunities for grid connection can be found. In the areas that met all of these criteria the Proponent investigated the appetite for landowners to host wind turbines on their property and the suitability of the land areas to accommodate a wind farm whilst minimising negative environmental and social impacts.
- 1.8.9 The site identified for the Proposal is the most attractive site identified through these investigations once the initial site design was conducted.
- 1.8.10 The Best Practice Guidelines, prepared by Auswind (now Clean Energy Council) in December 2006 advises sites must satisfy 5 technical criteria for successful development. These are:
- Good potential wind resource.
 - Potential for reasonable size of generation facility.
 - Cost effective electrical connection access.
 - Suitable landownership and usage patterns.
 - Ease of construction.
- 1.8.11 The proposed location of the Warradarge Wind Farm has all of the positive features needed for a wind farm. It is in a windy location, in cleared agricultural land, close to the high voltage electricity transmission grid and has a broadly supportive community.
- 1.8.12 Verve Energy has a good understanding of the issues that need to be addressed to construct and operate the Proposal. With long term experience of operating wind turbines at other sites, Verve Energy has the confidence to pursue a new wind farm development at this site.

1.9 Land Tenure

- 1.9.1 The Proposal is located on Lots 10847, 10848, 10850, 10851 and 10853 and the site boundary forms an area of up to 5,010 hectares, as shown in Figure 18.
- 1.9.2 The Proposal has a land take of 82.5 hectares with the majority of the land take being on cleared agricultural land and only 0.7 hectares of vegetated land being developed. The wind farm envelope encompasses Lots 10850, 10851 and 10853 and the transmission line corridor is across Lots 10847, 10848, and 10851.

Table 2 - Lots that contain the Proposal

Lot Number	Owner
10847	Judeen Nominees Pty Ltd
10848	Judeen Nominees Pty Ltd
10850	Judeen Nominees Pty Ltd
10851	Judeen Nominees Pty Ltd
10853	Gary Marshall Chivers

- 1.9.3 Verve Energy has negotiated secure tenure through Option agreements to lease the above lots for the purposes of the Proposal. These leases contain a noise buffer clause that allows for noise to exceed the greater of either 35dB(A) or 5dB(A) above background noise, in areas of land away from noise sensitive premises, such as in-situ houses. This ensures that no future noise sensitive premises will be constructed throughout the life of the wind farm in areas of the Lots where the wind farm may exceed the allowable noise limits.
- 1.9.4 Verve Energy is negotiating wind farm neighbour agreements with the owners of adjacent Lots (Lots 10849, 10854, 10877, & 10878) to ensure the areas of these lots where the wind farm will be generating noise exceeding 35dB(A) or 5dB(A) above background noise, whichever is greater, will not cause any conflict with any possible future noise sensitive premises.
- 1.9.5 It should be noted that the final design of the wind farm and its capacity will be dependent on these agreements. Should one or more wind farm neighbour agreements not be reached this will not affect the ability to operate a wind farm, only the position and overall number of turbines within the wind farm envelope. This is discussed more fully in Chapter 4.

1.10 Geology

- 1.10.1 The site is characterised by gentle undulating plains with areas of vegetated table-top topography. The Geological Survey of Western Australia indicates that the study area is characterised by quartz sand with patches of laterite (ferruginous laterite) and sandstone/siltstone/shale. A geotechnical study will be completed to inform the exact ground conditions of each wind turbine location. Erosion of soils is a risk and will be managed through the Environmental Management Plan (Annex 11).

1.11 Water

- 1.11.1 No major surface water bodies are present in the study area or immediate vicinity except for several small creeks/drainage channels. The Proposal is within the Arrowsmith groundwater area and the Tathra subarea.



Photographic example of agricultural land at the site, with patches of uncleared vegetation occupying higher areas around the agricultural land.

1.12 Wind Power Technology

- 1.12.1 Wind power involves the conversion of wind energy into electricity by using wind turbines. A wind turbine usually consists of three blades mounted on a horizontal axis. The blades are attached to the spinner, and the rotor is the combination of the spinner and blades. The rotor attaches to the nacelle which contains the gearbox (if used), generator, yaw and other of parts that control and monitor the wind turbine. The nacelle is mounted on top of a tall tower, to take advantage the strong winds higher up from the ground. A wind turbine captures wind energy by facing the wind. The wind makes the rotor spin, and the movement of the spinning blades (kinetic energy) give power to the generator which creates electricity.
- 1.12.2 Wind turbines are usually connected in strings of turbines connected in parallel to the substation, where the electrical voltage is increased from around 22 kV or 33kV to the grid connection voltage, in Warradarge Wind Farm's case, this is 330kV.
- 1.12.3 The power available from the wind is a function of the cube of the wind speed. Therefore if the wind blows at twice the speed, its energy content will increase eight-fold.
- 1.12.4 A collection of wind turbines is known as a wind farm, and the design of the wind farm is arranged so that one wind turbine is generally at least 3 rotor diameters from another wind turbine. This minimises the energy losses between the wind turbines by them using

the same wind stream and additionally reduces turbulence between wind turbines. Although siting for energy is important, environmental factors such as available land area, vegetation, noise emissions and visibility need to be accommodated in a wind farm design, sometimes at the expense of obtaining the maximum energy from an individual turbine.

- 1.12.5 The costs of establishing a wind farm substation is fixed up to a certain scale and therefore constructing more turbines to attach to a substation is generally more economically viable.



Photograph of wind turbine at the Albany Wind Farm, the turbines installed at Warradarge Wind Farm will be of generally similar appearance.

2 STAKEHOLDER CONSULTATION

2.1 Introduction

- 2.1.1 Consultation with local residents and authorities is an important part of the development process. For each major project that the Proponent undertakes, a stakeholder management plan is implemented. This plan covers internal and external stakeholder consultation, communication activities, media management and issues management. Consultation with a number of external stakeholders has been undertaken and these are discussed below.

2.2 Consultation with authorities, statutory regulators and organisations

- 2.2.1 Consultation with various authorities, statutory regulators, aviation and telecommunication organisations, and services stakeholders commenced in November 2011. Communication with these stakeholders occurred either via telephone, face-to-face meetings, letters, newsletter mail outs or emails providing them with information about the Proposal. Annex 12 provides a detailed list of whom and when stakeholders were contacted, their responses and any further actions required by the Proponent. The stakeholders consulted were:

Airservices Australia
Australian Broadcasting Corporation
Broadcast Australia
Bureau of Meteorology
Civil Air Service Australia (“CASA”)
DBNGP (WA) Nominees Pty Ltd
Department of Environment and Conservation
Department of Indigenous Affairs – Aboriginal Heritage Inquiry System
Department of Land
Department of Mines and Petroleum – TENGRAPH Online
Department of Planning
Department of Water
Dunstan Holdings
Electricity Networks Corporation (“Western Power”)
Empire Oil
Eneabba Airport
Environmental Protection Authority (“EPA”)
Fire and Emergency Services Authority of Western Australia (“FESA”)
Geraldton Telecasters Pty Ltd
Green Head Community Association
Iluka Resources Limited
Leeman Airport
Leeman Progress Association
Main Roads WA

Mid West Development Commission
Midwest Aerial Ag Pty Ltd
Northern Agricultural Catchments Council (“ NACC ”)
Department of Sustainability, Environment, Water, Population and Communities National Environment Significance Database
Nixon Communications Pty Ltd
Optus Mobile Pty Ltd
Repacholi Aviation Pty Ltd
Royal Australian Air Force (“ RAAF ”)
Royal Flying Doctor Service (“ RFDS ”)
SBS Corporation
Shire of Carnamah
Shire of Coorow
Shire of Morowa
Singtel Optus Pty Ltd
St Johns Ambulance Australia WA
Telstra Corporation Limited
Tourism Western Australia
WA Air Services Guide
Water Corporation
Western Australia Police Service
WIN Television WA Pty Ltd

- 2.2.2 Upon advice from Airservices Australia, the Proponent completed an “Aviation Impact Statement” (Annex 7). The impact of the Proposal was found to be minimal on existing airspace aviation within the vicinity, and findings of the report were passed onto Airservices Australia and Civil Aviation Safety Authority for information. The Proponent has committed to advise Airservices Australia of the final turbine positions and heights of the structures prior to construction. Refer to Section 4.6 for further discussion.
- 2.2.3 The Proponent contacted a number of operators of point-to-point and point-to-multipoint radio systems and broadcasting services to advise them of the Proposal. A site layout with information on the proposed turbine locations was provided for further assessment. Of the twenty operators contacted, five confirmed that there was no impact on services, the remaining did not respond. Refer to Section 4.5 for further discussion.
- 2.2.4 As suggested by the WA Environmental Protection Authority (“EPA”), the Proponent is in the process of submitting an Environmental Referral for the wind farm that includes the impact of constructing an overhead 330kV transmission line to connect the wind farm to Western Power’s network, so that it may be assessed as one project.
- 2.2.5 The Department of Water were consulted to confirm if there would be sufficient water in the existing aquifers available for construction. Refer to Section 3.13 for further discussion.
- 2.2.6 A search of existing mining tenements was conducted via the Department of Mines and Petroleum’s online system. The only existing tenement belonged to Empire Oil. They were subsequently contacted and confirmed that they did not have any concerns with the Proposal.

- 2.2.7 The Proposal was also presented at the Shire of Coorow and Shire of Carnamah Council meetings, both held on 15 February 2012. The Warradarge Wind Farm Project Overview newsletter was left with Councillors and public attendees for information.
- 2.2.8 In general, there were no significant concerns raised by the authorities, statutory regulators, organisations and departments that were consulted. The correspondence detailed in Annex 12 is not provided in full but can be provided on request if required.

2.3 Public consultation with land owners and local community

- 2.3.1 Public consultation with neighbouring residents and landowners commenced in mid 2011. Consultation occurred either via telephone, face-to-face meetings, letters, newsletter mail outs or emails. By the end of the planning consultation period, the Proponent contacted all land owners up to 20km from the development site and across the Shires of Coorow and Carnamah. The Proponent started with residents closest to the Proposal and worked out from that point over time.
- 2.3.2 The Proponent initially contacted adjacent and surrounding land owners to the development area to request a meeting to explain the project. Of the five land owners (Lots 10854, 10846, 10836, 10835, 10849) contacted on 2 June 2011, three did not respond to the written meeting requests.
- 2.3.3 On 16 and 17 June 2011, the Proponent met with land owners of Lots 10854, 10831/10832, 10846, 10855. They were interested to learn what the project was about, and did not have any objection with the Proposal. A newsletter "Stakeholder Update Number 1 – June 2011" (Annex 12) was left with these land owners for information.
- 2.3.4 In November 2011 the Proponent contacted the land owners of Lots 1, 10854, 10870, 10849, 10869, 10846, 10878 to discuss the project and the potential for a noise buffer if required at a later date. Meetings with these landowners were held in November 2011 and February 2012. These land owners did not have any objection to the development. Noise buffer agreement discussions are still in progress with some of these landowners and this is discussed further in Chapter 4.
- 2.3.5 On the 16 January 2012 the stakeholder newsletter and Verve Energy's Capability Statement (Annex 12) were sent out to land owners further from the Proposal that were not previously contacted to ensure that they were aware of the project, together with an invitation to meet Verve Energy representatives at a time convenient to them. (Lots 31/6661, 10245/10246, 10842, 10843, 10878/10886, 10857, 10488/10487, 10868/10871, 10879, 10885, 10887, 10890, 10891, 10884, 10883, 10383, 10804).
- 2.3.6 On 23 February 2012, an updated newsletter "Warradarge Wind Farm Project Overview" (Annex 12) and "Verve Energy Sustainable Energy Projects" capability statement (Annex 12) was sent to all land owners within 20km of the site, and all households within the Eneabba townsite. The newsletter contained details of the wind farm and information about the public information sessions held in Eneabba and Warradarge on 27 and 28 March 2012. A further letter to remind stakeholders of the information sessions was sent to all these stakeholders a week before they were held.
- 2.3.7 Two public information sessions were held by the Proponent. The first one was on Tuesday, 27 March 2012 at the Eneabba Recreation Centre from 3pm to 7pm. The second

session was on Wednesday, 28 March 2012 at the Warradarge Volunteer Bush Fire Brigade meeting room from 3pm to 7pm.

- 2.3.8 Advertisements for the public information sessions were placed in the Geraldton Guardian newspaper (9 and 23 March 2012, Early General News section), Eneabba News (15 March 2012, full page), Magpie Squawk (14 and 15 March 2012, front page), On The Mat (14 and 21 March 2012, full page) and Snag Island News (12 March 2102). A3 advert posters were also placed at both Shire offices and at the Warradarge Volunteer Bush Fire Brigade venue.
- 2.3.9 The information sessions provided the local community the opportunity to drop in and find out more about the project and to speak to the Proponent's representatives in person. A total of eighteen visitors attended the public information sessions; seven from the first session at Eneabba and eleven from the second session in Warradarge.
- 2.3.10 Key information displayed included: a site location plan and wind farm layout map; proposed wind farm design envelope; A2 sized colour photomontages (Locations 1 – 7) of the proposed wind farm; Zone of Theoretical Visibility ("ZTV") map, noise contour map; vegetation map; community funding description; supplier expression of interest register and feedback forms.
- 2.3.11 There were also various information banners on the Warradarge wind farm, wind farming and renewable energy in general. A projector was set up with a presentation on the wind farm with photos of other wind farms constructed by the Proponent. General information about wind power was also available. Refer to photos taken from the Eneabba exhibition (Annex 12).



Photograph of exhibition displays at the Eneabba Recreation Centre

- 2.3.12 As well as speaking to members of the Verve Energy team, feedback forms provide an important way to obtain candid views from the community about the proposal. Of the eighteen people who attended, fifteen feedback forms were completed. A copy of the feedback form is provided in Annex 12.
- 2.3.13 All respondents (100%) were in favour of increasing the use of renewable energy in WA.
- 2.3.14 Fourteen or 93% stated that they support the proposed Warradarge wind farm; however, one or 6% stated that they were unsure/indifferent, and no one was against the Proposal,
- 2.3.15 Five of the respondents lived between 2 – 15km away from the proposed development site; six of the respondents lived between 15 – 30km away and four lived greater than 30km away.
- 2.3.16 The few respondents who raised issues were concerned about the use of local labour and services during construction, operational noise and would like to see the expansion of the wind farm in the future. Of the few concerns raised, the Proponent has addressed these by conducting an extensive Noise Impact Assessment (Annex 4) and created a supplier database to help allow local services to become involved in the construction of the wind farm. The majority saw the benefits of the wind farm providing clean and sustainable energy, and an opportunity for the community to benefit.
- 2.3.17 A supplier expression of interest register was available at the session for anyone who was interested in offering goods or services throughout the construction phase(s) of the project, should the project go ahead. The Proponent will pass on the details to the Principal Contractor for consideration. Two visitors from the public sessions registered their businesses and there are currently five suppliers registered.
- 2.3.18 In general, there is overwhelming support from the local community for the proposed Warradarge Wind Farm.
- 2.3.19 The Proponent commits to continue to keep the community informed of project progress and updates as they occur.

3 PROJECT DESCRIPTION

3.1 Proposal Overview

- 3.1.1 The wind turbine make and model that will comprise each stage of the wind farm is not yet known, and this will only be selected following a tendering procedure for each stage of the project once Development Approval is obtained. Different wind turbine makes and models vary in height, rotor diameter, noise emission output and electrical capacity, therefore the Proponent is seeking Development Approval to encompass all potential wind turbine configurations of a 100 turbine wind farm within the wind farm envelope shown in Figures 5 and 6.
- 3.1.2 The wind farm is comprised of up to 100 wind turbines each up to 152m high and the wind farm will have associated electricity transformers, underground cabling, access tracks, all weather access to Garibaldi Willis Road, crane hardstands, a substation compound including a metering building, site office and workshop and a communication mast, a 10km overhead electricity transmission line to the 330kV transmission system with up to 22 transmission towers that are up to 63m in height; and up to five permanent free-standing wind monitoring masts up to 100m high. The 100 turbine layout is shown in Figures 3 and 4.
- 3.1.3 During the construction and commissioning period there will be a number of temporary works including a construction compound, equipment lay-down and storage areas, site offices, ablutions, communication masts and equipment.
- 3.1.4 Within the Shire of Coorow are the 152m high wind turbines and associated electricity transformers, underground cabling, access tracks, all weather access to Garibaldi Willis Road, crane hardstands, a substation compound including a metering building, site office and workshop and communication mast, five permanent free-standing wind monitoring masts up to 100m high and a portion (approximately 4.5km) of the overhead electricity transmission line.
- 3.1.5 The final route of the transmission line is not finalised however this will remain within the transmission line corridor shown in Figures 5 and 6.
- 3.1.6 Within the Shire of Carnamah the Proposal contains a portion (approximately 5.5km) of the overhead electricity transmission line to the existing Western Power transmission system. The final position of the transmission line is not finalised, however this will remain within the transmission line corridor, shown in Figures 5 and 6.

3.2 Proposal Dimensions

- 3.2.1 The Proposal is located on Lots 10847, 10848, 10850, 10851 and 10853 and the site boundary forms an area of up to 5,010 hectares, as shown in Figure 3 and Figure 4. The site boundary across the affected Lots is shown in Figure 18.
- 3.2.2 The Proposal has a land take of 82.5 Hectares with the majority of the land take being on cleared agricultural land (Table 3-Land take of Proposal) and up to 0.7 Hectares of vegetated land being developed.

3.2.3 The Proposal comprises:

- 100 wind turbines, with a tip height of up to 152 m and associated electricity transformers. The turbines are located within Lots 10850, 10851 and 10853 within a wind farm envelope area of 3,800 Hectares of agricultural and vegetated land.
- Five permanent wind monitoring masts.
- Substation compound to step up voltage from wind farm 22,000 / 33,000 Volts to 330,000 Volts. Within the compound is a metering building, site office and workshop and 50m high communication mast.
- A 10km transmission line connecting the onsite substation to the Eneabba to Karara 330kV transmission line. This is composed of up to 22 towers, 50m to 63m in height, with a space between towers of around 500m-600m. This line is to be routed within the transmission line corridor across Lots 10851, 10848 and 10847 to the grid connection point.
- Adjacent to each wind turbine and wind monitoring mast there is likely to be hardstand of 25m by 40m to enable construction and decommissioning, these dimensions may change slightly for different turbine types.
- Approximately 85,000 metres of new all weather gravel roads including upgrades to existing tracks on site.
- Underground Cabling between turbines and substation.
- A Construction compound containing site offices, ablutions and storage facilities.
- Site entrance off Garabaldi Willis Road onto the site.

Table 3-Land take of Proposal

Total length of wind farm site tracks (m)	75,000	Sum of all tracks assuming (including existing farm tracks)
Transmission line length (m)	10,000	
Total length of transmission line track (m)	10,000	
Number of transmission towers	22	Lattice Steel structure 50m- 63m high 500m-600m spans
Area Calculations		
Area of transmission track (m ²)	40,000	Based on 4m overall width
Area of intersections (m ²)	8,000	
Total area of site tracks (m ²)	525,000	Based on 7m overall width
Total area of crane hard standings (m ²)	105,000	Based on 25 x 40m hardstands and for 100 turbines and five masts also.
Total area of turbine footprint disturbance (m ²)	40,000	Based on 20 x 20m turbine footprint
Five wind monitoring mast area (m ²)	4,500	Based of 900 m ² per mast
Total area of the substation (m ²)	62,500	Generic compound = 250m by 250m
Transmission tower footprint area (m ²)	30,000	Width by length of each cleared hardstand area for tower 30m x 50m
Area of construction compound (m ²)	10,000	Area of construction compound assuming 100 x 100m
Total area of disturbed land (m ²)	825,000	

3.3 Wind turbine

- 3.3.1 The wind turbine that will ultimately form part of this project will be determined through a tendering procedure following Development Approval. The overall height to the tip will not exceed 152 metres above ground level. Table 4-Likely wind turbine dimensions outlines some of the candidate turbines that are being considered and will meet the tip height requirements. As the development time for the Proposal spans a number of years, it is possible that other turbine makes and models not currently available to the Proponent may become available that fall within the 152m tip height requirement and may be considered for this project. A drawing showing the likely elevation of a wind turbine is shown on Figure 2.

Table 4-Likely wind turbine dimensions

Turbine Make and Model with electrical capacity in MW and rotor diameter	Standard Tower Height	Rotor radius	Tip height
Vestas 3MW – 112m	94m	56m	150m
GE 2.75MW – 103 m	98.5m	51.5m	150m
Repower 3.2MW 104 m	100m	52m	152m
Siemens 3MW 113m	84m	56.5m	140.5m
Enercon 3MW 101 m	99m	50.5m	150m

- 3.3.2 Turbines begin generating automatically at a wind speed of around 3 metres per second (11 km/h) and have a shut down wind speed of around 25 metres per second (90 km/h).
- 3.3.3 When the turbines are rotating they are generating electricity. The electricity is generated at a low voltage in the nacelle and is stepped up to a medium voltage of 22kV or 33kV from the turbine transformer to transport the electricity to the substation. Some turbines have a medium voltage transformer enclosure located alongside the base of each turbine or within the turbine tower base or nacelle.
- 3.3.4 The colour and finish of the wind turbine rotor blades, nacelles and towers is usually a pale grey colour with a semi-matt finish and is typical of many wind turbine finishes.
- 3.3.5 Each turbine is equipped with a control system and the wind turbine and wind farm operates automatically and is monitored remotely using a Supervisory Control and Data Acquisition (“**SCADA**”) system. The turbines can also be controlled by a wind turbine maintenance crew onsite or remotely when required.

3.4 Underground cabling

- 3.4.1 The wind turbines will be connected to an on site electricity substation by a three phase underground cable and each cable is likely to connect a group of four or five turbines to the substation. There is also a communication cable connecting each turbine to the substation so that each turbine can be monitored remotely using the SCADA system. All medium voltage cables on the site will be buried at least 0.75m deep underground, below agricultural ploughing depth, and will be marked with cable markers and a buried marker tape. A cable trench typical of that proposed is shown in Figure 11. It should be noted however that the route of the cables will be determined to minimise cable length and may not necessarily be adjacent to existing or new tracks.

Photographs showing typical cable installation stages-marking route, excavation, cable laying and cables covered fill and marker tape.



3.5 Substation Compound

- 3.5.1 The substation compound is proposed to be located in the north west corner of Lot 10850. At the Substation the medium voltage (22kV/33kV) underground powerlines from the turbine groups would enter the substation and then be stepped up to the transmission voltage of 330kV. Exiting the substation would be the overhead transmission lines exporting the power to the newly built 10km transmission line.
- 3.5.2 Within the substation compound there will be the step-up transformers, circuit breakers and switchgear, additionally there will also be a metering building. Associated with the compound would be the first 330kV transmission tower connecting the substation to the transmission line.
- 3.5.3 There will also be a site office with toilet facilities and workshop, a lay-down area for maintenance equipment, parking spaces and a 50m communication mast as shown in Figure 20.
- 3.5.4 There will not be a need for permanent 24 hour a day staff to be onsite. The onsite buildings will be visited periodically by maintenance personnel in the course of maintaining the wind farm. It is not expected that any other permanent buildings will be required on the site. A drawing showing the generic arrangement of the substation is shown on Figure

13. The plans and elevations of the meter room and site office are shown in Figure 15 and Figure 16. The final detailed design of the substation compound will be determined by the principal contractor and will be no more than 250m by 250m.

3.6 Wind monitoring mast

3.6.1 The wind speed the wind turbines receive will need to be independently monitored throughout the life of the wind farm and for this reason wind monitoring masts up to hub height (up to 100m depending on turbine model) are needed. As the wind farm will have up to 100 turbines, five masts will be required as part of the performance testing of the wind farm. The likely location of the masts are shown in Figure 3 and Figure 4, and a drawing showing the likely elevation of a mast is shown in Figure 8. The final detailed design of the mast will be determined by the principal contractor prior to construction and will be no more than 100m high.

3.7 Transmission Line

- 3.7.1 A 10 km transmission line is proposed connecting the substation to the recently constructed Eneabba to Karara line. The likely route of this line is shown in Figure 3 and Figure 4, however the exact nature and location of the connection is not yet established and the best location for each of the transmission poles may be dependent on in-situ ground conditions. A transmission line corridor shown in Figures 5 and 6 is proposed to provide flexibility in the final routing of the transmission line. A drawing showing the likely elevation of a tower is shown in Figure 7.
- 3.7.2 The Eneabba to Karara line currently crosses Lot 10847 and our line would either connect directly into this line at the connection point or at the onsite substation. There are tentative plans from Western Power to construct a new Eneabba substation on a piece of land they acquired adjacent to Lot 10847. If we are required to connect into this substation this transmission line corridor route would still be utilised.
- 3.7.3 The line is composed of up to 22 transmission towers, up to 63m to height, with a distance between towers of around 500m-600m. The first tower is likely to be adjacent to the substation within Lot 10850. The rest of the towers will be routed through 10851, 10847 and 10848 to the grid connection point. The final detailed design of the towers and routing of the transmission will be determined by the principal contractor and Proponent prior to construction.

3.8 Access tracks and crane hardstands

- 3.8.1 Access tracks from the site entrance to each of the turbine locations are proposed to access the various turbine locations and would in total would be up to approximately 75 km in length with a running width of approximately 6m, with a 0.5m shoulder on either side. A 10km track under or adjacent to the transmission line is also required, with a width of 4m. On corners and junctions, widening may occur to accommodate long loads.
- 3.8.2 The access tracks would be constructed of lateritic gravel to give a road thickness of approximately 300mm. A likely access track design is shown in Figure 11.

3.8.3 Crane hardstands of approximately 25m x 40m are adjacent to each turbine, to allow a working surface to construct the turbine and support the crane. The crane hardstands will be constructed of lateritic gravel to give a thickness of approximately 300mm. The arrangement of the crane hardstands is shown in Figure 10. The final detailed design of the hardstand arrangement will be determined by the principal contractor prior to construction.

3.8.4 Similar sized crane hardstands are also required for each of the wind monitoring masts. Each transmission line tower would be constructed on a cleared hardstand area of approximately 50m x 30m, totalling 1500m² for each tower.

Photographs showing typical access track construction- top soil striping, compaction, base gravel pouring and graded gravel compaction.



Photographs showing typical hardstands gravel compaction and final hardstand



3.9 Foundation

3.9.1 The size of the foundation for each turbine is dependent on ground conditions and detailed geotechnical studies that are conducted in advance of construction. The wind turbine foundation is up to 20m in diameter and is about 3m deep, as shown in Figure 9. A 20m diameter foundation requires approximately 630m³ of concrete which is around 1,510 tonnes. The final detailed design of the foundation will be determined by the principal contractor prior to construction, following geotechnical assessment.

Typical Foundation Construction, showing excavated hole, concrete blinding with cable conduits, foundation rebar and foundation tower ring, concrete pouring, compaction of soil above foundation and completed foundation ready to receive turbine tower.



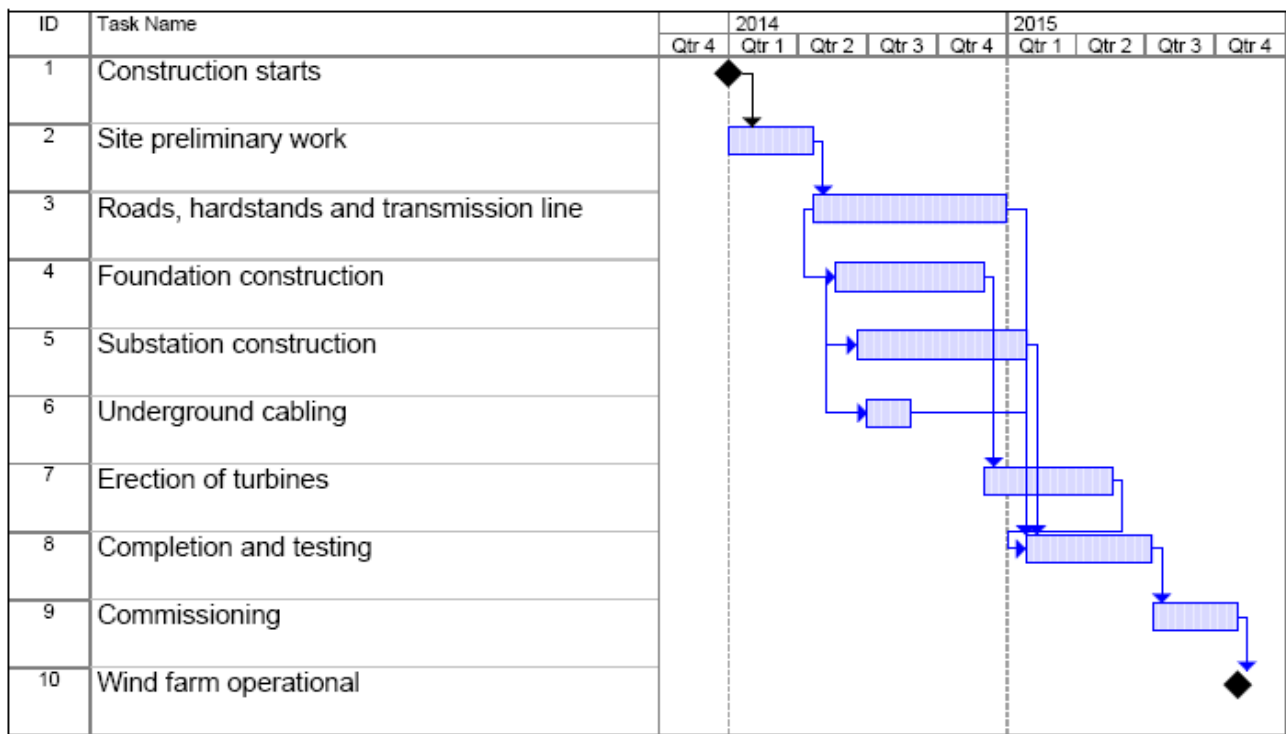
3.10 Wind Farm Staged Construction

- 3.10.1 The wind farm construction is likely to be staged to allow wind farm generation capacity to come onto the transmission system in an incremental way. The wind farm will likely be built a third at a time with each stage having a capacity of around 80-90 MW. This staged process will be driven by commercial decisions and expected capacity on the SWIS and the ultimate size of each stage will be driven by the commerciality of the project as it develops.
- 3.10.2 If all approvals are secured, construction of the first stage is anticipated to commence in January 2014 and take up to 24 months to complete at which point the first stage will be supplying electricity into the SWIS. During the construction of the first stage, Verve Energy will make a decision on the development of the second stage, which if approved may be started immediately and take around 18 months to complete. Similarly, during the construction of stage two, Verve Energy will make a decision on development of stage three and if approved will probably take 18 months to construct bringing the wind farm to its full potential.
- 3.10.3 The first stage will take longer to construct as the site entrance, construction compound, substation and grid transmission line will need to be constructed. Stages 2 and 3 will take advantage of this substantial infrastructure which will shorten the construction time. As such, the development approval will have substantially commenced for all stages at the same time at it is commenced for Stage 1.
- 3.10.4 It is expected that Stage 1 will supply electricity around January 2016, Stage 2 around January 2018 and Stage 3 around January 2020. It is possible that only one stage gets completed due to commercial decisions and the expected capacity on the SWIS or that anything up to the full capacity of the wind farm is built as the first and only stage.

3.11 Construction Timetable

- 3.11.1 The final construction programme will be finalised once the contractor is appointed, however broadly each stage of the construction project could be by built as shown in Table 5.

Table 5- Possible construction timetable for Stage 1



3.12 Construction compound

- 3.12.1 A temporary construction compound of up to 10,000m² (indicative dimensions of 100m x 100m) will be located in the north east of the site, next to an access track. The compound areas would be constructed in a similar manner to the access tracks and would provide office facilities for workers on site. An indicative compound is shown in Figure 12. The final detailed design of the compound will be determined by the principal contractor and will be no more than 100m by 100m in dimension.
- 3.12.2 The compound will be fenced and likely to include temporary type structures to be used for site offices, crib room, toilet and shower blocks, changing rooms and a workshop. There would also be storage areas for tools, small plant and parts, a refuelling area, a receiving area for incoming vehicles, a laydown area and parking for around 10 construction vehicles.
- 3.12.3 There will also be portable toilets located at various places around the wind farm construction site for site workers as required during the construction period. Disposal of the waste will be offsite at suitable facilities.

3.13 Construction Materials and Water supply

- 3.13.1 The wind farm is likely to be constructed using a principal contractor to Engineer Procure and Construct ("EPC") the wind farm. The wind turbines and most of the associated infrastructure will be imported from an overseas manufacturer due to the limited availability of this equipment within Australia. It is also very likely that the 330/22kV

power transformers and all the main 330kV outdoor and 22kV indoor switchgear for the substation will also be imported.

- 3.13.2 Ancillary equipment such as site buildings, power lines and structures, control equipment, cabling and bulk earthwork materials such as sand, aggregate and cement will be sourced from within Australia, and locally, where feasible and competitive.
- 3.13.3 Materials for roads, concrete works, minor structures and associated infrastructures will generally be sourced from the local area.
- 3.13.4 Gravel is proposed to be excavated on site in various places using borrow pits and will be extracted where appropriate. No clearing of vegetation is proposed to obtain gravel. The borrow pits will be reinstated at the completion of construction using other excavated material from elsewhere on the site or by resculping the land.
- 3.13.5 A large amount of water will be required throughout the construction phase for concrete mixing, road construction and dust suppression. Water required for concrete will be around 165,000 kilolitres and water for road construction and dust suppression will be approximately 1,850,000 kilolitres. The water sources for the project are yet to be determined, but are likely to be from bores within or near to the site and will be sourced in accordance with approvals from the Department of Water.
- 3.13.6 It is likely that the principal contractor will seek an abstraction licence for water onsite or in nearby aquifers. The Department of Water has advised that the Proposal is within the Arrowsmith Groundwater area, and the Tathra subarea. Within this subarea the aquifers as shown in Table 6 demonstrate that there is a sufficient spare water allocation to construct the wind farm using the Parmelia aquifer. This water data was supplied by the Department of Water on 21 December 2011 following consultation as detailed in Annex 12.

Table 6-Water availability in the Tathra subarea

Aquifer in Tathra subarea	Allocation Limit (kL/year)	% Allocated	% Allocated committed & requested	Balance available for future licensing (kL/yr)
Cattamarra Coal Measures	50,000	0	0	50,000
Eneabba	100,000	0	0	100,000
Lesueur Sandstone	100,000	0	0	100,000
Parmelia	29,950,000	61.04	62.04	11,369,500
Yarragadee	700,000	0	0	700,000

3.14 Concrete Batching

- 3.14.1 Approximately 82,500 m³ of concrete is required for wind turbine foundations, transmission tower footings wind monitoring mast foundations and substation works. There may be an on-site concrete batching plant established for the duration of the works. This will minimise the transportation requirements and maximise construction efficiency.

3.15 Labour resources and services

- 3.15.1 It is estimated that there will be an average of 50 employees on-site during the construction. The maximum labour on site is expected to peak at between 80 and 100.
- 3.15.2 Site construction will generally be limited to the hours between 6am and 7pm Monday to Saturday and 9am to 7pm Sundays and Public Holidays. Work may take place out of these hours to finish work that needs completion once started (e.g. foundation concrete pouring, turbine lifting).
- 3.15.3 No onsite accommodation or camp is proposed as part of this Proposal. Where possible, non specialist resources and supporting services will be sourced from the local area. This is consistent with Verve Energy's approach on past projects.

3.16 Supplier Database

- 3.16.1 Verve Energy has set up a supplier database for the local businesses who think they may be able to assist during the wind farm construction. This database will be supplied to the principal contractor who will build the wind farm, so they are aware of local businesses that are available to supply services.

3.17 Safety, Health and Environmental (OSHE) Management

- 3.17.1 Verve Energy aims to promote high levels of participation in the responsible management of safety, health and environmental management, to meet, and where appropriate, exceed legal and industry safety, health and environmental standards.
- 3.17.2 Amongst the wide array of State and Commonwealth legislation that impacts on safety and health, the Western Australian *Occupational Safety and Health Act 1984* ("the OSH Act") and the Western Australian *Electricity Act 1945* are the principal pieces of legislation which impose statutory obligations on Verve Energy, its directors, managers and employees.
- 3.17.3 The OSH Act regulates safety and health by imposing general duties on employers and others. Breaches of these duties can result in significant penalties including fines to individuals and Verve Energy. Individuals can be imprisoned for two years in cases of gross negligence causing serious harm or death. This includes managers and directors who have personal liability under the OSH Act.
- 3.17.4 Verve Energy has an established safety and health management system that is appropriately supported by managers and employees responsible for managing the day-to-day safety and health issues. Implementation of the system throughout the business is audited annually, demonstrating that significant safety and health issues are being managed to a satisfactory level or higher.
- 3.17.5 The driving force for achieving Verve Energy's safety and health vision is the Safety and Health Policy contained in Annex 9. The policy contains key objectives that support effective risk management, and injury and harm prevention strategies.
- 3.17.6 A systematic approach to safety and health management is used to ensure Verve Energy's duty-of-care obligations are met. The administration of the Safety and Health Management System assists in meeting legal requirements, and leads to sustained improvement in safety and health performance. The system structure of processes, documents and

programs is consistent with AS/NZS 4804:2001 Occupational Health and Safety Management Systems. Details of the Verve Energy Safety and Health Management System are summarised below.

3.17.7 The Verve Energy Safety and Health Management System is designed to ensure that all management and operational practices;

- Comply with statutory and other requirements;
- Conform to Company policy; and
- Continually realise improvements in safety and health performance.

3.17.8 Verve Energy's Safety and Health expectations are detailed in twelve mandatory Standards listed below. These Safety and Health Standards define the minimum acceptable requirements for safety and health management, and also ensure that management practices are aligned with Verve Energy's policies and commitments.

- Standard 1 - Leadership & Accountability
- Standard 2 - Statutory & Other Obligations Management
- Standard 3 - Safety and Health Planning
- Standard 4 - Safety and Health Communication and Consultation
- Standard 5 - Occupational Health Management
- Standard 6 - Risk Management
- Standard 7 - Safe Systems of Work
- Standard 8 - Audit and Review
- Standard 9 - Emergency Management
- Standard 10 - People, Training & Behaviours
- Standard 11 - Learning from Incidents
- Standard 12 - Working with Contractors, Suppliers and Partners

3.17.9 An Occupational Health, Safety and Environment ("OHSE") Plan will be established for the construction stage of the project.

3.17.10 Our Environmental Policy encourages Verve Energy to strive for environmental excellence as the cornerstone of sustainability. Verve Energy's Environmental Policy can be found in Annex 10.

3.18 Transport Requirements

3.18.1 Access to the site by general construction vehicles will be via the public road network. For special construction traffic i.e. for the delivery of wind turbine tower sections, transformers, blades and nacelles a route will be formalised during the detailed design process. Special construction traffic will consist of mainly oversized vehicles which could have loads up to 56m long. Oversized loads may require a Main Roads WA ("MRWA") Oversized Vehicle Permit as well as vehicle escorts. Some may require police escorts.

- 3.18.2 The likely turbine delivery route is shown in Figure 14 and will likely be from the port of Geraldton, via the Brand Highway turning east at Warradarge onto the Coorow-Green Head Road, and then turning north along the Garibaldi-Willis Road to the site entrance.
- 3.18.3 A Traffic Management Plan will be produced prior to construction. The plan will review the existing public road network to the proposed site, and the type and number of vehicles during the construction period and operational phase including any statutory and permit requirements for access on local road networks. The Traffic Management Plan will identify any road intersection upgrades thought necessary to accommodate oversized vehicles, additional traffic or site access requirements whether temporary or ongoing, and produce a timetable for implementation of works identified to be undertaken. Part of the Plan will include a condition survey (Dilapidation Report) of the public roads utilised during the transport of oversized loads.



Delivery of wind turbine blade at Mumbida Wind Farm.

- 3.18.4 As previously discussed, the use of a concrete batching plant will be considered, which will help to reduce the amount of wind farm generated traffic on the local road network. Concrete constituents, cement, aggregates, sand and steel reinforcement will still need to be trucked to site.
- 3.18.5 The total estimated traffic generated by the construction of the foundations and the delivery and erection of the towers and generators is detailed in Table 7 below. This will vary accordingly if the wind farm is constructed in stages, however the total transport movements is likely to be the same.

Table 7 Estimated total number of traffic movements during the construction period

Component	Total Loads (100 turbines)	Duration (weeks)	Vehicle Type
Foundation Construction			
Aggregate and Sand	3300	48	Truck and Dog
Cement	440	48	Semi Trailer
Reinforcing Steel	300	40	Semi Trailer
Water and other deliveries	300	48	Rigid and semi
Agitator Trucks	600	48	Rigid Track
Plant (road making, crane	100	40	Semi Trailer
Personnel and visitors	12000	56	Cars and utilities
Towers, Turbine and electrical component delivery			
Tower Sections	400	36	Extended OD Vehicle
Blades	300	32	Extended OD Vehicle
Nose cones	100	32	Semi Trailer
Nacelles	100	32	Semi Trailer
Containers	100	32	Semi Trailer
Electrical components	100	100	Semi Trailer
Cranes and other major plant	100	46	Semi trailer
Other Traffic			
Sundry	2000	100	Car/utility
Water (Dust Suppression)	200	140	Rigid Tanker

3.18.6 Traffic to and from the site once the wind farm is operational will be minimal, mostly of service vehicle movements in order to fulfil maintenance requirements. This is likely to be one vehicle a day. During the operational phase, whilst not planned, it is possible that major items such as the turbine blades, gearboxes, etc, may need to be replaced. Accordingly the access roads and intersections will need to be maintained in a condition which will support over-dimensional vehicles.

3.19 Environmental Management

3.19.1 As part of the Occupational Safety Health and Environment (“OSHE”) management plan, environmental management measures will be put in place through an Environmental Management Plan. It will provide a framework to ensure that the environmental disturbance at the site is minimised during the construction phase of the project. All personnel involved with site works over this period will follow the instructions of the plan, including those from Verve Energy, and its sub-contractors. The document defines the critical environmental issues, how they will be managed and whose responsibility it is to ensure that this occurs.

3.19.2 The Environmental Management Plan will cover the following areas, which are detailed further in Annex 11:

- General site management (including waste disposal)
- Construction noise management
- Weed hygiene
- Flora and fauna
- Ground water
- Topsoil management and rehabilitation
- Dust suppression
- Community relations and visitor safety
- Aboriginal and Archaeological heritage
- Fire management



Photograph of signage- It can be one way of keeping people informed about construction issue on the Proposal site.

3.20 Operation period

3.20.1 Each stage of the wind farm is deemed to be operating from the date of final commissioning and each stage will be operational for up to 25 years. The turbines, cables,

transformers, substation, tracks, transmission lines and hardstands will be maintained throughout the wind farm's life.

3.21 Decommissioning

- 3.21.1 Once the operational period is completed for each stage (1, 2 or 3), that stage of the wind farm will be decommissioned. This will involve the deconstruction and removal of the turbine, recycling the tower and relevant parts of the blades.
- 3.21.2 The turbines may be refurbished and replacement towers nacelle and blades installed, and this would be dependent on land agreements with Lot owners and the market for the electricity.
- 3.21.3 Should there be no life extension or refurbishment, the wind turbines will be dismantled and removed and the wind turbine foundations will be buried below plough depth by resculpting the land. The tracks and hardstands will be left in position as will the substation, underground cables and transmission line as these assets may be used for other purposes in the future. The decommissioning period for each stage is likely to be completed within two years.

4 ENVIRONMENTAL IMPACT ASSESSMENT

4.1 Introduction

4.1.1 Various potential impacts have been assessed using either in house expertise or independent consultants. The independent consultant reports are annexed to this Development Application Report. The results of the third party consultants are highlighted in this Chapter. This is followed by a discussion of the impacts of the Warradarge Wind Farm on the surroundings. The third party consultants were selected on the basis that they have previous experience in working of wind farm projects internationally, interstate and in Western Australia.

4.2 Landscape and Visual Impact Assessment (“LVIA”)

4.2.1 In designing the wind farm, the Proponent has taken into consideration the Visual Landscape Planning Manual. This manual has been developed to help public and private sector planners to address visual landscape matters in the planning process. The manual explains the fundamental planning tools of visual landscape evaluation and visual impact assessment and provides guidelines for siting and design in relation to a range of landscape types and land uses. Part 3 – Guidelines for Location, Siting and Design of the manual identifies the principles and guidelines specifically aimed at wind farm developments at the state, regional and local level. Table 8 provides a summary of these key principles and guidelines and provides an assessment of the proposal.

4.2.2 Following the initial wind farm design, GHD have undertaken a landscape and visual impact assessment and this is attached in Annex 2. The assessment covers a 25km radius study area from the Proposal and it investigates the various effects the wind farm has on the landscape and people in the study area at seven different publicly accessible locations.

4.2.3 To assess the Proposal, the wind farm is designed with the greatest likely footprint and the north-south/east-west extents are shown as spaced across the greatest amount of overall land area within the wind farm envelope, as shown in Figures 5 and 6. This is deemed the worst case design from a visual point of view.

4.2.4 As such, the width of any view of the wind farm is greatest from any viewpoint. Therefore, smaller or fewer number of turbines within the wind farm envelope or 100 turbines located in different locations within the wind farm envelope are also encompassed by the assessment.

4.2.5 As there are a variety of land uses and typologies in close proximity to the Proposal, the study area has been divided into Landscape Character Units (“LCUs”) to identify those areas that share common landscape features and visual characteristics.

4.2.6 The LCUs recognised for this assessment are:

- LCU 1 – Lower Western Edge and Plateau of the Gingin Scarp
- LCU 2 – Higher Valleys of the Western Gingin Plateau
- LCU 3 – Natural Areas

- 4.2.7 A Zone of Theoretical Visibility (“ZTV”) for both tip and hub height has been produced for the Proposal and these are shown in Figures 5 and 6 in Annex 2. A ZTV is the area around a designated point in the landscape from which that point is visible. It is calculated using elevation data such as a Digital Elevation Model and does not take account of buildings or vegetation screening. It represents a worst case view of how many turbines or blade tips can be seen at the location.
- 4.2.8 Figures 5 and 6 in Annex 2 shows the turbines that are visible from the hub (100m) upwards and the tip height (152m). These figures show that beyond 10km from the wind farm the number of turbines visible to the west reduces to zero except on a few elevated areas. In areas to the south and north the turbines are theoretically visible out to 15km, beyond which it they are only seen in isolated areas. To the west the tips of the turbines are theoretically visible to 25km except in lower areas of the landform but it can be seen that the hubs are not as visible beyond 15km, and this is due to the screening effect of the topography.
- 4.2.9 It should be noted that the ZTV is a tool to assess theoretical visibility only and that vegetation and built structures will influence what is actually visible from various locations. It is for this reason that a number of viewpoints are selected to represent what the actual change of view will be and these are shown as photomontages. The viewpoints are selected in areas that theoretically have a view of at least 80% of the wind turbines.
- 4.2.10 The viewing locations assessed in Annex 2 are:
- View location 1 – Eneabba
 - View location 2 – Tootbardi Road
 - View location 3 – Chatfield Road
 - View location 4 – Garibaldi Willis Road
 - View location 5 – Tathra National Park
 - View location 6 – Rose Thomson Road
 - View location 7 – Warradarge
- 4.2.11 For each of these above locations, photomontages demonstrating what the wind farm will look like are provided in Annex 2 - Appendix B.
- 4.2.12 It can be seen that from the edge of the nearest town Eneabba, the wind farm is distant and screened by low level vegetation and not visible.
- 4.2.13 From Viewpoint 2 on an elevated part of Tootbardi Road the wind farm is distant and is visible.
- 4.2.14 From Viewpoint 3 on part of Chatfield Road the wind farm is distant and is visible, although any roadside vegetation will screen the wind farm.
- 4.2.15 From Viewpoint 4 on an elevated part of the Garibaldi Willis Road, the nearest turbine is less than 4km away and the wind farm is visible except when screened by vegetation.
- 4.2.16 From Viewpoint 5 on an elevated part of the Coorow to Carnamah Road junction with the Garibaldi Willis Road adjacent to the Tathra National Park it can be seen that the turbines are not visible as they are screened by vegetation.

- 4.2.17 From Viewpoint 6 on the Rose Thomson Road where the wind farm transmission line meets the existing transmission line, the transmission towers can be seen however the wind farm is generally screened by nearby vegetation.
- 4.2.18 From Warradarge, its position in a valley means that only the tips of some of the turbines are visible, however these are not seen due to the screening of vegetation and buildings.
- 4.2.19 It is shown that the visibility from roads, towns, and dwellings will be influenced by existing nearby vegetation and other structures. In many places vegetation screening will limit views from road users and dwellings. The acceptability of the wind farm to people living or working nearby will be a factor of their location, the scale of the wind farm and their opinion of the wind farm and its location.
- 4.2.20 As detailed in Chapter 2 the Proponent has met every landowner within 5 km of the Proposal and has determined that none of the landowners have an objection to the project. Verve Energy has met or spoken to most of the residents within 10km and carried out extensive public consultation across the whole area.
- 4.2.21 The Proponent has sent a newsletter containing details of the wind farm and information about the public information sessions to all land owners within 20km of the site, and all households within the Eneabba townsite. Two public information sessions were held by the Proponent, the first one was at the Eneabba Recreation Centre and the second session was at the Warradarge Volunteer Bush Fire Brigade meeting room. From the questionnaires received there has been no objection to the wind farm. In fact there seems to be interest that the turbines will be a new and interesting feature in the area.
- 4.2.22 The conclusions of the GHD report (Table 15 in Annex 2) summarises the significance of the impact of the operational wind farm on receptors (people) at the seven viewpoints. It concluded that a high significance of impact occurs at Viewpoint 5, and for Viewpoints 3 and 4 moderate impacts of significance occur, the rest are negligible or minor. The high significance of impact is a function of how close Viewpoint 4 is to the turbines, which is less than four kilometres.
- 4.2.23 Generally, the proposed wind farm will have a large impact upon landscape character primarily within 5 km of the site, including the site itself. From 5 km to 10 km and 10 km to 25 km in distance from the site, and beyond, due to the reducing visibility of the wind turbines, intervening vegetation and variation in topography the wind farm has a reduced impact on the landscape character.
- 4.2.24 From the public consultations that have been undertaken and the responses received there is generally not seen to be many people concerned with the change in landscape that the wind farm will bring. Whilst the presence of a wind farm would bring about change, this would not necessarily be a negative change in terms of the quality of the landscape or visual environment or to the people living and working there. From the public consultation undertaken to date it seems that the addition of a wind farm maybe a positive change.
- 4.2.25 It is therefore determined on balance that the wind farm is an acceptable addition to the landscape and that a wind farm of up to 100 turbines is suitable in this location.
- 4.2.26 The cumulative impact is considered to be negligible between the Warradarge Wind Farm and the Badgingarra Wind Farm as the potential for intervisibility between the wind farms would be extremely restricted by the local topography. There is no overlap of potential visibility between the Emu Downs Wind Farm and the Warradarge Wind Farm.

4.2.27 In designing the wind farm, the Proponent has taken into consideration the key principles from the Visual Landscape Planning Manual for Western Australia and Table 8 provides a summary of the guidelines and provides an assessment of the Proposal.

Table 8 - Assessment of how the Proposal complies with the Landscape Planning Manual for Western Australia key principles and guidelines

SUMMARY OF VISUAL LANDSCAPE PLANNING MANUAL PRINCIPLE/GUIDELINE	DISCUSSION OF HOW PROPOSAL REFLECTS THIS PRINCIPLE/GUIDELINE	COMPLIANCE
State Level		
Use existing renewable energy policies, guidelines and incentives that avoid limiting potential wind farm sites to a few locations only. Adhere to such guidelines and policies that consider visual landscape character.	The Proposal has been assessed against state guidelines and policies that consider visual landscape character (refer to Annex 2 "Landscape and Visual Impact Assessment" (LVIA) of Development Application Report).	✓
Regional Level		
Encourage wind farm development in rural locations with compatible land uses and flat terrain.	The wind farm development is on existing private and predominantly cleared agricultural farmland. The total development envelope encompasses 5,010 hectares, with a land take of only 82.5 hectares (refer to section 1.9 and 3.2 of Development Application Report). Once constructed, the Landowner will be able to continue farming around the turbines and associated infrastructure with minimal impact.	✓
Locating wind farm development in flatter landscapes to reduce visibility.	The area is gently undulating and site elevation ranges from 236m to 351m AHD (refer to Figure 2 of LVIA). The site is located on higher ground to take advantage of the wind resource. The photomontages show that the visual impact is not significant at a majority of the identified viewpoints.	✓
Encourage wind farms to be greater than 15km from major vantage points.	The LVIA (Annex 2) covers a 25km radius study area from the Proposal. Seven representative vantage points were identified and assessed. Distance of viewing locations to the nearest turbines range between 3.8km to 22.1km. There are 3 viewing locations less than 15km to the wind farm. However no identified major viewpoints within 15km.	✓
Consider cumulative impacts of	The cumulative impact is considered negligible between the proposed Warradarge wind farm and the proposed	✓

SUMMARY OF VISUAL LANDSCAPE PLANNING MANUAL PRINCIPLE/GUIDELINE	DISCUSSION OF HOW PROPOSAL REFLECTS THIS PRINCIPLE/GUIDELINE	COMPLIANCE
other wind farms in the locality.	Badgingarra wind farm. The potential for inter-visibility between the wind farms would be extremely restricted by the local topography. There is no cumulative impact between the proposed Warradarge wind farm and the existing Emu Downs wind farm (refer to Figure 7 of Annex 2).	
Remoteness to the main power grid should be avoided to reduce the amount of additional infrastructure required.	The distance from the wind farm substation (along the proposed transmission line corridor) to the main power grid is only 10km (refer to sections 1.3).	✓
Location of wind farm to achieve a balance between using high wind resources and minimising visual impacts in regionally significant landscapes. If high wind resources exist in regionally significant landscapes, then alternative sites should be considered for suitability.	The wind farm development is on existing private and predominantly cleared agricultural farmland. This combined with a good wind resource, close to the transmission network makes it an ideal site (refer to section 1.8 and Figure 4 in Annex 2).	✓
Avoid location of wind farms where sensitive skylines may be visually disrupted.	The wind farm development is on existing private and predominantly cleared agricultural farmland. At its closest point the wind farm is 15km north east of Warradarge, 15km south east of Eneabba and 40km south west of Carnamah. The Zone of Theoretical Visibility illustrates the impact on sensitive skylines in the locality is minimal (refer to Figure 5 in Annex 2).	✓
Utilise existing infrastructure where possible.	<p>The main 330kV overhead transmission line is currently being constructed, and the intention is to utilise this infrastructure.</p> <p>There are also two existing meteorological masts on site in which the Proponent is currently using for wind measurement and data analysis. Depending on the final turbine selection, these may possibly be used as permanent performance masts (refer to section 3.2 and 3.6).</p>	✓
Local Level		
Visibility from key viewpoints minimised.	The LVIA covers a 25km radius study area from the Proposal. Seven representative viewpoints were identified and assessed. Distance of viewpoints to the nearest	✓

SUMMARY OF VISUAL LANDSCAPE PLANNING MANUAL PRINCIPLE/GUIDELINE	DISCUSSION OF HOW PROPOSAL REFLECTS THIS PRINCIPLE/GUIDELINE	COMPLIANCE
	turbines range between 3.8km to 22.1km. The photomontages show that the visual impact is not significant at a majority of the identified viewpoints.	
Height of overall wind farm in relation to height of turbines and topographic elevation balanced to reduce visibility.	The turbines will be the tallest structures in the wind farm with a tip height of up to 152m above ground level. The LVIA was undertaken and photomontages have been produced based on this overall tip height; with the Zone of Theoretical Influence based on a hub height of 100m. The wind farm, although visible has been shown to be in a compact area acceptable from a landscape and visual perspective.	✓
Layout to consider existing visual landscape character.	The wind turbines are located in one landscape type: the Lower Western Edge and Plateau of the Gingin Scarp	✓
Avoid cluttering turbines along major corridors.	The turbines shown in the site plan have been positioned to avoid clearing vegetation, and have been designed with a separation of 5 rotor diameters apart to reduce visual cluttering.	✓
Any extensions to the power grid to consider visual impact. Preference given to underground power lines.	The 10km overhead 330kV powerline connecting the wind farm substation to the grid network was selected to minimise vegetation disturbance. Due to the connection at transmission level at 330kV, it is not possible to install this circuit underground. A visual assessment has been conducted and produced at the viewpoint (refer to Photomontage Location 06 of Annex 2).	✓
Access roads constructed with minimal clearing of vegetation and should follow natural contours to minimise overall visibility.	The site plan shows that the access roads have been designed to minimise vegetation disturbance and generally follow the existing land form (refer to Figure 3).	✓
Access roads should avoid straight alignment and be responsive to land form.	The site plan shows that the access roads have been designed to minimise vegetation disturbance and generally follow the existing land form (refer to Figure 3).	✓
Reduce visual impact of additional infrastructure (eg. transmission lines)	The 10km overhead 330kV powerline connecting the wind farm substation to the grid network was selected to minimise vegetation disturbance. A visual assessment has been produced at the viewpoint (refer to Photomontage Location 06 of LVIA). All other associated permanent infrastructure within the	✓

SUMMARY OF VISUAL LANDSCAPE PLANNING MANUAL PRINCIPLE/GUIDELINE	DISCUSSION OF HOW PROPOSAL REFLECTS THIS PRINCIPLE/GUIDELINE	COMPLIANCE
	substation compound such as the outdoor switchgear, transformers, busbars, buildings, lighting and lightning masts, site office and amenities etc. will cause very little visual impact due to the distance from nearby residential locations.	
Additional infrastructure for tourism facilities should be developed to cater for predicted number of visitors.	There are existing wind farm tourism facilities in the wider area and tourism facilities are not planned as part of this wind farm development. However Verve Energy is open to discuss this should the Shire or local community wish to have these.	✓
Site turbines against a skyline background, as opposed to a landform background, where possible.	Photomontages of the wind farm show the turbines against a skyline background. These representative viewing locations were chosen provide inform the level of visual modification and visual sensitivity (refer to Annex 2).	✓
Avoid turbines cutting across different landscape types and elements.	The wind turbines are located in one landscape type: the Lower Western Edge and Plateau of the Gingin Scarp	✓
Site Level		
Wind Farm Structure		
Individual turbines and structure appropriately coloured to minimise impact.	The colour and finish of the wind turbine rotor blades, nacelles and towers is likely to be a pale grey colour with a semi-matt finish to minimise visual impact.	✓
Number and size of turbines subject to visual absorption capabilities and local community preference.	The local community have been informed of the size of the wind farm and regular updates through newsletters, meetings, phone calls, and public information sessions held at Eneabba and Warradarge. Wind farm site plans and photomontages (amongst other pertinent project information) were made available for public view and discussion no objection has been raised in relation to the scale of development (refer to Chapter 2)	✓
Prevent blade glint and flicker, through use of non-reflective materials.	Turbines blades will be finished with a matt grey treatment to avoid blade glint. Also, as a result of a shadow flicker analysis, shadow flicker will not occur at the site residential locations (refer to section 4.9).	✓
Avoid mixing tower and turbine types in a development site –	The Proponent will seek to maintain a consistent look of	✓

SUMMARY OF VISUAL LANDSCAPE PLANNING MANUAL PRINCIPLE/GUIDELINE	DISCUSSION OF HOW PROPOSAL REFLECTS THIS PRINCIPLE/GUIDELINE	COMPLIANCE
uniformity in design.	the wind farm between the various project stages.	
Individual turbines should be sited off the tops of ridgelines, vantage focal points and prominent locations.	Whilst the site of the proposed wind farm located on higher ground (elevation ranges from 236m to 351m AHD), the figures and photomontages shown in the LVIA show that the visual impacts are not significant at a majority of the viewpoints.	✓
Wind turbine pad construction should avoid creation of fill slopes, and constructed by cut. Fill requires removal from the site.	Further micro-siting, minimising clearing and detailed design will determine the final positions of the turbines. Where possible, turbine foundations will be constructed by cut.	✓
Size of cleared areas at the base of turbines minimised to reduce impact.	Turbine foundations will be up to 20m diameter. There will also be a hardstand of up to 25m x 40m adjacent to each turbine for craneage. Cleared areas of the base of the turbine are designed to minimise areas used.	✓
Avoid advertising or logos on the turbines.	No advertising will be shown on the turbine. As part of the manufacturing process, it is expected that a small discrete logo of the turbine manufacturer will feature somewhere on each turbine.	✓
Ensure lighting is non-obtrusive.	Whilst the final design of the wind farm is yet to be completed, it is expected that there may be some outdoor lighting masts in the substation compound, as well as external lighting on buildings. These will be motion activated and due to the distance of the substation, these lighting installations will be difficult to see from the nearby residential locations. Installation of lighting on turbine nacelles is not proposed for this wind farm.	✓
Vegetation, Earthworks and Access		
Minimise clearing and damage to vegetation during construction where possible.	Impacts on vegetation and flora on the site will be managed and minimised through the implementation of weed hygiene, clearing controls, topsoil management, rehabilitation and fire management. The Proponent will implement a detailed Environmental Management Plan that will address these issues. A sample draft EMP has been included in Annex 11 for information.	✓

SUMMARY OF VISUAL LANDSCAPE PLANNING MANUAL PRINCIPLE/GUIDELINE	DISCUSSION OF HOW PROPOSAL REFLECTS THIS PRINCIPLE/GUIDELINE	COMPLIANCE
Vegetation edges should reflect the existing local patterns.	The wind turbines will be constructed in currently cleared agricultural pasture therefore there will be no disturbance to vegetation.	✓
Access roads should have minimal visibility and width.	Access roads will be constructed to be a minimum height above the natural ground level. The sole purpose of raising the road surface is to provide surface drainage.	✓
Avoid high colour contrast of access road materials.	Roads will be constructed of locally available gravel which is similar in hue to the natural surface of the pastoral land. Therefore colour contrast will not be harsh.	✓
Access roads should traverse as low as possible on slopes and follow contours.	Where possible the roads will follow existing farm fence lines which are currently used for farm machinery transit. The land is generally quite gently undulating so the roads will have very low grades that are less than 6%.	✓
Reduce visual impact of earthworks by minimising cut and fill.	Cut and fill will be minimal due to the gently undulating terrain.	✓
Ensure fill is not pushed up onto sloping areas.	The negligible quantity of fill will be retained as sub-base under road and crane hardstand gravel surfaces.	✓
Avoid movement of soil from one area to another.	Gravel road construction material will be obtained from borrow pits within the lots allocated for the wind farm. At the completion of earthworks the borrow pits will be rehabilitated to the standard of the surrounding pasture.	✓
Edges of earthworks should be of gentle slope and reflect surrounding land form.	Minor edges will be graded at a maximum slope of 1 in 4.	✓
Allow for the removal of soil from the turbine pad sites.	Soil from turbine foundation excavation will be used to rehabilitate the gravel borrow pits or offered to the land owner for use as fill.	✓
Allow for stockpiling of topsoil for areas that will require rehabilitation as well as the promotion of local materials	Top soil will be stockpiled for use in rehabilitation	✓
Buildings and other Structures		
Minimise visual impact of ancillary	The location of the buildings and structures such as the	✓

SUMMARY OF VISUAL LANDSCAPE PLANNING MANUAL PRINCIPLE/GUIDELINE	DISCUSSION OF HOW PROPOSAL REFLECTS THIS PRINCIPLE/GUIDELINE	COMPLIANCE
buildings, structures, signage and lookouts by using site-sensitive design.	substation compound is on cleared agricultural land and screened by vegetation to the north and west. This is located off the top any promontories within the landform.	
Colour of ancillary structures should not be of high contrast and surface finishes should be non-reflective.	The surfaces are designed to be non-reflective.	✓
Heights of buildings should be minimised, placed beneath ridgelines.	The buildings are located off the top any promontories within the landform.	✓
Roof forms should avoid prominent landform ridges.	The buildings are located off the top any promontories within the landform.	✓
Power Connection		
Promote use of underground cabling, but ensure minimal impact on highly vegetated areas during construction.	Underground medium voltage cabling will be used to connect the turbines to back to the wind farm substation. Open trenching will be the main cable installation method; however, underground directional drilling will be employed to avoid vegetation exclusion zones.	✓
Where overhead cabling is used, minimise impact by designing powerlines to follow natural land contours.	No overhead cabling is anticipated.	✓
Overhead powerlines should avoid traversing highly vegetated areas and sited below ridgelines.	The 10km long corridor for the overhead powerline connecting the wind farm substation to the grid network was selected to minimise vegetation disturbance (refer to section 3.7.).	✓
Rehabilitation		
Vegetation removed or cut during construction should be retained and reused on rehabilitation areas.	The wind farm will be constructed in currently cleared agricultural pasture therefore there will be no disturbance to vegetation. Any vegetation removed for the transmission line will be considered to be used to rehabilitate, if approved by the DEC.	✓
All temporary access roads and tracks to be fully rehabilitated.	All temporary access roads and tracks will be fully rehabilitated with consideration to Landowner requirements at the end of the project life.	✓

SUMMARY OF VISUAL LANDSCAPE PLANNING MANUAL PRINCIPLE/GUIDELINE	DISCUSSION OF HOW PROPOSAL REFLECTS THIS PRINCIPLE/GUIDELINE	COMPLIANCE
Edges of newly established access roads to be revegetated to minimise impact.	Road widths will be kept to a minimum with little or no shoulder and across agricultural land. Since these edges will blend with the level of the natural surface, there will be little impact.	✓
Construction depot and other temporary structures to be removed and areas rehabilitated.	All temporary buildings, structures and amenities required to facilitate construction of the wind farm will be removed and areas rehabilitated by the establishment of topsoil suitable for continuing agricultural activities.	✓
Create screening by selective planting.	A requirement for screening has not been identified at this stage, nor was it raised during the public consultation process with the community. This will be reviewed as appropriate should it be requested by nearby residents.	✓
Implement a reinstatement programme for planting and other associated landscape works to ensure impacts are minimised.	During and after construction, any areas that have been disturbed that are not required for ongoing maintenance will be rehabilitated by the re-establishment of topsoil adequate for continuing agricultural activities. The Proponent shall implement a detailed Environmental Management Plan that will address these issues. A sample draft EMP has been included in Annex 11 for information.	✓

4.3 Flora and Fauna

- 4.3.1 Biota Environmental Sciences undertook a Flora, Vegetation and Fauna Assessment of the wind farm envelope and a possible transmission line route. This comprised a desktop review, field survey and flora specimen identification and this report is provided in Annex 3. The field survey was conducting over two trips in the October and November of 2011 and comprised a total of 12 days. The land area of the wind farm envelope and area of transmission line corridor is 5,010 hectares, Biota surveyed 3,650 hectares of land which was the entire wind farm envelope and one possible line route within the transmission line corridor.
- 4.3.2 The windiest areas of the Proposal are generally the highest locations and many of these locations are covered with native vegetation. It is for this reason that investigation into the importance of the vegetation was undertaken by Biota on behalf of Verve Energy. Following the investigation it was determined that the entire footprint of the wind farm and infrastructure (except the transmission line) would be located in agricultural land and that no vegetation clearing would be undertaken. Figure 19 shows the site layout and site constraints, which are all the non modified vegetation units that have been mapped by Biota and are shown in Annex 3.
- 4.3.3 The wind farm design is flexible however no vegetation clearing is intended to occur within the wind farm envelope area as shown in Figure 5 and 6. This envelope area was developed

to allow flexibility in turbine positions whilst avoiding site constraints which are the sensitive vegetation identified in the assessment of Annex 3.

- 4.3.4 Although the wind farm is designed to avoid vegetation clearing in the wind farm envelope, a minor amount of clearing of up to 0.7 hectares may be required along the transmission line route. Biota has surveyed the likely line route and this route contains no Priority Ecological Communities or Threatened Ecological Communities. One Priority 4 species was identified nearby however this is over 10 metres from the clearing route and is intentionally avoided along this line route. This potential clearing is less than 1% of the total 82.5 hectare footprint of the wind farm.
- 4.3.5 This line route may change subject to geotechnical issues or a route with lesser overall impacts. It is for this reason approval of a transmission line corridor is proposed as shown in Figures 5 and 6. Any change in route would be subject to a flora survey in advance of construction to ensure that the route would not affect Priority Species, Priority Ecological Communities or Threatened Ecological Communities. Any clearing will be limited to 0.7 hectares and a clearing permit secured from the DEC prior to the clearing activity.
- 4.3.6 Twenty-five intact vegetation units were identified within the study area (within the wind farm boundary and likely transmission line route) and most were in very good to excellent condition. These are shown in Annex 3, Appendix 7. None of the vegetation types represent Priority Ecological Communities. Two of the vegetation types appear similar to the description that is available for the Lesueur-Coomallo Floristic Community, which is listed as a Threatened Ecological Community. A total of 406 plant species from 167 genera belonging to 55 families were recorded from the study area. This number would appear to be within the expected range for a study area of this size, taking into consideration that the region is characterised by high species richness and endemism. The suite of species and the dominant genera and plant families were largely typical of the region. Four species listed as Threatened under the WA Wildlife Conservation Act 1950-1979 were recorded. Two of these are also listed as Endangered under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999. Twenty-two (22) species listed as Priority flora under the WA Wildlife Conservation Act 1950-1979 were recorded. One previously undescribed species was identified and seven species were range extensions for the locality. The locations of these species are shown on Figure 6.1 in Annex 3.



Star Sun Orchid (Thelymitra stellata) found in one of the vegetation units. This Endangered species has been intentionally avoided. See Annex 3 for details.

- 4.3.7 Twenty-one (21) species of introduced flora (weeds) were recorded from the study area, with grasses and daisies most common. The majority were non-invasive species however one individual of a Declared Plant, *Echium plantagineum*, was recorded.
- 4.3.8 Five broad fauna habitats occur in the study area (modified vegetation, drainage areas, loam/clay plains, stony hills and slopes, and sandy plains and low hills). These are considered to be common and widespread within the Lesueur Sandplains subregion. Database searches indicate that up to 187 native vertebrate fauna species may occur in the study area locality, comprising 133 bird species, 10 native mammals, and 44 herpetofauna species (eight amphibians and 36 reptiles). The actual number occurring in the study area is likely to be a considerably lower subset of this total.
- 4.3.9 The desktop review identified 12 fauna species of conservation significance for the locality: three Schedule 1 species, five Schedule 3, one Priority 3, and three Priority 4 species. Carnaby's Cockatoo is believed to be of most relevance to the proposed wind farm, as foraging habitat (vegetation dominated by a species-rich proteaceous heath) is present in the study area. The Storr-Johnstone Bird Data Bank indicates that this species has been recorded near the study area, with most observations comprising autumn-winter visitors.

- 4.3.10 No roost sites, or potential roost sites, were observed during the field visit. If clearing of foraging habitat is kept to a minimum, the local and regional conservation status of this species is unlikely to be affected.
- 4.3.11 Impact to fauna may occasionally occur due to mortality arising from construction activities and clearing of vegetation. There is also a low to moderate risk that individual avifauna mortalities may occur as a result of bird strikes with wind turbine blades. However, given the widespread distribution of these species and their ability to fly competently in all conditions, it is unlikely to affect population numbers at a local or regional scale. Verve Energy's experience is that there have been very low rates of bird strike on its existing wind farm assets.
- 4.3.12 As a result of the Flora and Fauna assessment, the wind farm has been designed to avoid locating any wind farm infrastructure (except transmission lines) in any areas of vegetation. The only possibly vegetation clearing that is proposed is for up to 0.7 hectares along the transmission line corridor, to accommodate a 4m wide access track underneath the transmission lines and the tower footprints where they occur within the vegetated areas. This potential clearing is less than 1% of the total 82.5 hectare footprint of the wind farm, and avoids the Threatened Ecological Community. As no roost sites, or potential roost sites, were observed during the field visit along the line route or in any location across the Proposal, this clearing is unlikely to affect Carnaby's Cockatoos.

4.4 Noise

- 4.4.1 Wind turbines generate noise from various aerodynamic and mechanical sources. Aerodynamic noise originates from the flow of air around the blades and generally increases with rotor speed. Aerodynamic noise is typically the largest source of wind turbine noise. Mechanical noise originates from the relative motion of mechanical components and dynamic response, such as; gearbox, generator, yaw drives, cooling fans and auxiliary equipment.
- 4.4.2 Wind technology has advanced significantly and wind turbines are much quieter than they were 15 to 20 years ago. Noise from wind turbines still raises public concern however, and thus Verve Energy has commissioned independent noise modelling by a recognised expert to ensure that noise levels are within allowed limits.
- 4.4.3 Verve Energy engaged specialist consultant Herring Storer Acoustics ("HSA") to undertake a Noise Impact Assessment for the Warradarge Wind Farm. A prediction of worst case noise propagation from the proposed wind farm was undertaken and background noise measurements undertaken. The Noise Impact Assessment is in Annex 4. The background noise measurements took place over 6 weeks and the results of these have set the noise limits to be applied to nearby noise sensitive premises such as residential properties, this report is in Annex 5.
- 4.4.4 The Noise Impact Assessment has been carried out in accordance with the EPA of South Australia "Wind Farms – Environmental noise guidelines – July 2009" which is the guidelines recognised by the Department of Environment and Conservation WA for the assessment of wind farms. The noise limits for new wind farm developments, based on these, is for the predicted noise level to not exceed 35 dB(A) at relevant receivers in

localities which are primarily living, or, the background noise (LA90, 10 minute) by more than 5 dB(A), whichever is the greater.



One of the noise monitoring devices deployed around the wind farm site.

- 4.4.5 The assessment shows the measured and predicted background noise (Table 6.4 Annex 4) for all noise sensitive premises and nearby unoccupied buildings which have the potential to be a residence. The report demonstrates that there is compliance with the above regulations and guidelines at all surrounding noise sensitive premises. The noise from the wind farm will not exceed the noise limits at these existing premises.
- 4.4.6 The wind turbine considered in the impact assessment is the noisiest likely turbine at the highest likely hub height (100m) therefore all smaller and quieter turbines will comply with the noise limits also.
- 4.4.7 The wind farm layout considered has wind turbines as close to the boundary as possible to ensure the greatest impact on nearby noise sensitive receivers is assessed. Should the wind farm design change within the wind farm envelope, the proponent will ensure that any wind farm noise will not exceed the noise limits.
- 4.4.8 Verve Energy has negotiated secure tenure through option agreements to lease Lots 10847, 10848, 10850, 10851 and 10853 for the purposes of the Proposal. These leases contain a noise buffer clause that allows for noise to exceed the greater of either 35dB(A) or 5dB(A) above background noise, in areas of land away from noise sensitive premises, such as houses. This ensures that no future noise sensitive premises will be constructed

throughout the life of the wind farm in areas of the Lots where the wind farm may exceed the allowable noise limits.

- 4.4.9 There is one property that has been and continues to be unoccupied in the centre of the wind farm on Lot 10853. The proponent has entered into a financial agreement with the owner for the construction of the wind farm and to ensure that this property continues to remain unoccupied throughout the wind farm's lifetime. The noise limits for noise sensitive premises therefore do not apply.
- 4.4.10 Annex 4 and Annex 5 demonstrate that there is compliance with the assessment guidelines from the EPA of South Australia (Wind Farms – Environmental noise guidelines – July 2009). At all surrounding noise sensitive premises, the noise from the wind farm would not exceed the noise limits specified in the guidelines.
- 4.4.11 Inspection of the noise contour map for the 8m/s wind speed scenario (Annex 4-Appendix B, Map 3A) indicated that there are some land areas within the 35 dB(A) contour, being the minimum background noise criteria, which are owned by non-participants of the wind farm development. These areas are within Lots 10849, 10854, 10877, 10878, 10855 and 11017.
- 4.4.12 This presents a risk to the Proposal that future residences, or other noise sensitive premises, could be built at a later date in these areas. If a noise sensitive premise was built and the owners then complained about excessive noise being greater than 35dB(A) or 5dB(A) above background noise the Proponent may have to reduce the output of turbines at night to ensure compliance. This is a risk to the Proponent, however the wind farm could conceivably continue to be operated under this scenario and meet the noise criteria.
- 4.4.13 Further analysis of Annex 5 shows that the recorded background noise at 8m/s (LA90,10 minute) is at least 34 dB(A). Using the + 5 dB(A) above background noise as the limit means that the noise limit is likely to be 39 dB(A), which by interpolation between the contours (Annex 4-Appendix B, Map 3A) shows that only areas of 10849, 10854, 10877 and 10878 may be locations where a future noise sensitive premise may be a risk.
- 4.4.14 Although it is the Proponent's risk to take, it is in discussion with the owners of Lots 10849, 10854, 10877 and 10878 to form a noise buffer agreement, whereby the Proponent seeks to limit the building of a noise sensitive premise throughout the life of the wind farm. This reduces the risk of turbines having to be operated at reduced output to ensure compliance.
- 4.4.15 Noise buffer leases or easements are being negotiated with these nearby landowners to agree that no noise sensitive receiver premises will be constructed during the lifetime of the wind farm in these locations. This will ensure that no future noise sensitive premises will be constructed throughout the life of the wind farm in areas of the Lots where the wind farm may exceed the allowable noise limits.
- 4.4.16 It should be noted that the final design of the wind farm and its capacity may be dependent on these agreements. Should one or more wind farm neighbour agreements not be reached this will not affect the ability to operate a wind farm, but may affect the position and overall number of turbines within the wind farm envelope.
- 4.4.17 During construction, working hours will generally be 6am - 7pm Monday to Saturday and 9am - 7pm on Sundays and public holidays. Noise during construction would be managed to ensure compliance with the Environmental Protection (Noise) Regulations (Department of Environmental and Conservation 1997).

- 4.4.18 During operation of the wind farm, other than the wind turbines, there will be limited noise associated with light vehicle movements and routine maintenance tasks being carried out by site personnel.
- 4.4.19 There may be increased noise associated with non-routine maintenance (such as the replacement of a blade, generator, etc) but these events are unlikely to happen and would be managed separately to ensure compliance with the Environmental Protection (Noise) Regulations (Department of Environmental and Conservation 1997).

4.5 Broadcasting and radiocommunication

- 4.5.1 An investigation on the impact of the wind farm on broadcasting and radiocommunication services has been undertaken by Lawrence Derrick & Associates (Engineering Consultants). This is shown in Annex 6.
- 4.5.2 Interference to MF and FM sound broadcasting is not expected. There are currently no potential conflicts between any point to point radio system paths identified and the wind turbines anywhere within the wind farm envelope.
- 4.5.3 There are no radio sites close enough to the wind turbines to require buffer zones to be specified. Mobile radio and other radiocommunication services in the area are not expected to be significantly impacted by the wind farm or its operation.
- 4.5.4 Analogue TV reception at dwellings within about 3 km of the wind farm turbines and with antennas facing with +/- 20 degrees of a nearby turbine could have some minor TV reception effects at times. Any degradation of reception experienced may be time variant depending on wind direction and speed. However, as analogue TV transmission is scheduled to end in 2013, this will not be an issue once the wind farm is built in 2015. Digital TV is not susceptible to visible ghosting degradation where the signal level is above a minimum threshold.
- 4.5.5 Overseas experience indicates that electromagnetic interference produced by the wind farm generators and controls is insignificant and therefore no electrical noise measurements from the electrical generators are required.
- 4.5.6 Further consultation has been undertaken as suggested in the report and there are no reported conflicts between the proposal and any point to point operators. A list of these organisations is in Annex 12 and Chapter 2.

4.6 Aviation

- 4.6.1 An Aviation Impact Statement has been undertaken by AECOM and the Proponent has consulted with Air Defence, Airservices Australia and the Civil Aviation Safety Authority. These bodies have raised no objections to the wind farm. Local aerial crop sprayers have been contacted and raised no objections to the wind farm.
- 4.6.2 The wind farm is located in an area of farming communities and minor mining at Eneabba. Aerodromes are small and unregistered within the vicinity of the proposed wind farm with most low airspace aviation related to the farming communities, mining and light general aviation.

- 4.6.3 The site of the proposed wind farm is on a prominent hill, and minor adjustments to aviation charts will potentially be required to highlight the proposed wind farm, as the turbines need to be stated as obstacles when they are above 110m in height.
- 4.6.4 Published air routes, both high and low domestic routes, are 6 Nautical Miles (11km) or greater distance from the proposed wind farm.
- 4.6.5 No Airservices Australia surveillance radar is located within line of sight of the proposed wind farm. The nearest primary radar location is at Mt Kalamunda, Perth.
- 4.6.6 It is determined that the turbines are not required to be lit or marked for aviation purposes.

4.7 Cultural Heritage

- 4.7.1 The Proponent has considered the Cultural Heritage Due Diligence (DIA, 2011) guidelines 2011 and has undertaken a risk assessment in accordance with these guidelines.
- 4.7.2 The Proponent has consulted the Department of Indigenous Affairs (“DIA”) database and determined that no aboriginal artefacts or aboriginal sites have been recorded on the site. The likelihood of aboriginal heritage impact is Rare. This combined with a Major land activity due to land excavation, results in a Moderate risk to aboriginal heritage. Therefore no additional surveys or consultation are expected to be undertaken in advance of construction.
- 4.7.3 Verve Energy and its Contractors will meet their obligations under the Aboriginal Heritage Act (1972-1980), and this will form part of the Environmental Management Plan, a draft of which is detailed in Annex 11.
- 4.7.4 If any personnel identify any material suspected to be of aboriginal or archaeological significance during site activities, works will be suspended immediately near any suspected material and the Site Manager informed. The Site Manager will contact the Department of Indigenous Affairs and will suspend any further work that could disturb the suspected material until advice from an appropriately qualified consultant or the Department of Indigenous Affairs has been received.

4.8 Socioeconomic

- 4.8.1 The wind farm is expected to provide opportunities to supply both services and labour during the construction phase of the Proposal and during decommissioning. To assist local businesses Verve Energy has set up a supplier database for those local businesses who think they may be able to assist during the wind farm construction. This database will be supplied to the principal contractor who will build the wind farm, so they are aware of local businesses that are available to supply services. These services include plant hire, labour, accommodation, workshops, transportation, concrete, environmental services, catering, and materials supply.
- 4.8.2 There will be full time maintenance roles required when the wind farm is operational and where possible this team will be resourced from the local area. The team will have a regular presence at the wind farm to carry out scheduled and unscheduled maintenance.

4.9 Shadow Flicker and Blade Glint

- 4.9.1 Blade glint can be produced when the sun's light is reflected from the surface of white wind turbine blades. Blade glint has the potential to annoy people. All major wind turbine blade manufacturers currently finish their blades with a matt grey treatment, therefore eliminating blade glint from occurring.
- 4.9.2 Shadow flicker occurs when a particular combination of conditions coincide in specific locations at particular times of the day and year. It happens when the sun is low in the sky and shines on a building from behind a turbine rotor. This can cause the shadow of the turbine blades to be cast on the building, which appears to flick on and off as the turbine rotates. When this flicking shadow is viewed through a narrow opening, such as a window it is known as shadow flicker.
- 4.9.3 Shadow flicker is generally not a disturbance in the open as light outdoors is reflected from all directions. The possibility of disturbance is greater for occupants of buildings when the moving shadow is cast over an open door or window, since the light source is more directional.
- 4.9.4 Whether shadow flicker is a disturbance depends upon the observer's distance from the turbine; the direction of the dwelling and the orientation of its windows and doors from the wind farm; the frequency of the flicker and the duration of the effect, either on any one occasion or averaged over a year. The longest distance of shadow flicker occurs in the early morning west of turbines and in late afternoon to the east of turbines. When the sun is higher in the sky the shadows to the south of turbines are shorter.
- 4.9.5 The draft National Wind Farm Development Guidelines (2010) which have now been abandoned have reviewed other countries methodologies and suggest that shadow flicker is unlikely to cause a problem to residences beyond 265 times the width of the blade and shadow flicker does not need assessing beyond this distance. The likely blade chord distance is less than 4.5m therefore, the area within which shadow flicker may occur is $(265 \times 4.5\text{m})$ 1,192.5m of each turbine.
- 4.9.6 Figure 17 shows the nearest houses in relation to the wind farm. Only one residence is within this 1,192.5m radius and this is located in the north east of the site boundary. The house is within a possible shadow flicker area of one turbine. As the house is to the south a shadow flicker analysis demonstrates that no shadow flicker would occur at this property.

5 MITIGATION AND CONCLUSIONS

5.1 Mitigation and Conclusions

- 5.1.1 Following the independent assessments discussed in Chapter 4. The design of the wind farm has been undertaken in conjunction with Verve Energy's Warradarge Wind Farm consultant team and Verve Energy now seeks the Mid-West Joint Development Assessment Panels consideration of the wind farm and associated infrastructure for development approval. The wind farm has been designed to balance the benefits of generating renewable energy against minimal environmental impacts.
- 5.1.2 The 100 turbine wind farm would produce on average 875 million Kilowatt-hours (kWh) of electricity every year which is equivalent to the average annual electricity needs of 140,000 west Australian homes. The wind farm will also prevent at least 700,000 tonnes of CO₂ from entering the atmosphere annually.
- 5.1.3 The final number, make and model of the wind turbines that comprise the wind farm is not yet finalised. Therefore development approval is sought for a 100 turbine wind farm and all associated infrastructure to be located within a wind farm envelope, as shown in Figure 5 and Figure 6.
- 5.1.4 To assess the Proposal, the worst case wind farm design has been presented. It is designed with the greatest likely footprint and the north south/east-west extents are shown as spaced across the greatest amount of overall land area within the wind farm envelope.
- 5.1.5 As such the width of any view under this worst case scenario of the wind farm is greater from all viewpoints than is expected once the final siting and design of the wind farm is completed. Smaller and fewer number of turbines or 100 turbines located in different locations within the wind farm envelope is also encompassed by the worst case design presented.
- 5.1.6 The turbines assessed are the noisiest likely wind turbine to be installed and therefore if a quieter turbine was installed the noise impact would be lesser and therefore quieter turbines are also encompassed by this assessment.
- 5.1.7 Within the wind farm envelope there are a number of intentionally excluded areas where no turbines or associated infrastructure will be located. The Proposal footprint within the wind farm envelope is on cleared land and does not require clearing of remnant vegetated areas. Important vegetated areas that contain threatened ecological communities have been intentionally avoided.
- 5.1.8 The exact route of the transmission line is not yet finalised but a likely route has been selected and the corridor for this line route is presented. The final line route will be dependant on Western Power's connection requirements and the type and number of towers used within the transmission line corridor, as shown of Figure 5 and Figure 6. Up to 0.7 hectares of land may require clearing for the transmission line and this will be subject to a clearing permit being obtained by the DEC. The likely transmission line route has been surveyed to ensure no significant species will be affected by its construction.
- 5.1.9 The wind farm away has been sited away from nearby residential properties and as such the operational noise from the facility is predicted from noise modelling to meet the noise

limits for wind farm developments. The noise limits at relevant receivers that will be complied with is 35 dB(A) or the background noise (LA90,10 minute) plus 5 dB(A), whichever is greater.

- 5.1.10 The wind farm location and its design complies with the Visual Landscape Planning Manual of Western Australia. Although the wind farm will be visible from a number of locations in the immediate area, this assessment demonstrates that in a compact area this wind farm is acceptable from a landscape and visual perspective, provided that the wind farm is limited to 100 turbines up to 152m high within the wind farm envelope. The majority of landscape impacts have been mitigated through wind turbine siting and wind farm design.
- 5.1.11 The wind farm is not expected to be a conflict to air safety, radiocommunications and broadcasting.
- 5.1.12 The wind farm is proposed at a distant to nearby properties and no shadow flicker is predicted to occur.
- 5.1.13 The proposed Warradarge Wind Farm will be a significant project for the Shires of Coorow and Carnamah and for Verve Energy. The Warradarge Wind Farm feasibility study to date has found that a wind farm can be built at the proposed site that meets the technical, social and environmental constraints imposed on it.
- 5.1.14 The majority of the impacts associated with the wind farm development have been mitigated through careful site selection and design.
- 5.1.15 The Warradarge Wind Farm Feasibility study is still to be completed but Development Approval is one important aspect of the study. There are remaining issues relating to outstanding statutory approvals, the resolution of project financing arrangements and approval from Verve Energy's Board of Directors before Verve Energy can proceed with the project. However, the results to date suggest that the project has significant merit.
- 5.1.16 The Proponent will need to finalise grid connection, turbine supply, construction contractor, finance, the electricity buyer (power offtaker) and a host of other agreements prior to construction proceeding. It is predicted that more time than two years could be required from granting of Development Approval to construction. It is therefore requested that the Development Approval be valid for at least 5 years from the date of Development Approval to allow for construction to commence.
- 5.1.17 There are a number of obligations outlined in this report and Annexes. Table 9 is a summary of the obligations outlined in the report to ensure that the wind farm development is constructed and operated in an effective way.

Table 9 Development obligations

1	Commence development within five years of the date of approval.
2	Tip height of each turbine to be no more than 152 metres above ground level.
3	Decommissioning of each stage of the wind farm will be complete within 28 years of the date of commissioning of the relevant stage
4	Provide a baseline dilapidation report to the public road network prior to works starting on site with a final report upon the date of commissioning.
5	Repair road damage caused by construction.
6	Implement a Traffic Management Plan.
7	Implement Environmental Management Plan.
8	Implement Occupational Health, Safety and Environment (OHSE) plan.
9	Operational noise to comply with noise limits outlined in Environmental noise assessment Annex 4.
10	Contact Dept. of Indigenous Affairs if any material suspected to be of aboriginal or archaeological significance is discovered during site construction.
11	Supplier database to be supplied to the Principal Contractor.
12	No vegetation clearing within wind farm envelope as shown in Figures 5 and 6. Clearing to be less than 0.7 Hectares in the transmission line corridor as shown in Figures 5 and 6.
13	A clearing permit to be applied for and granted by the DEC prior to any vegetation clearing.

5.1.18 Verve Energy has undertaken extensive consultation on the Warradarge Wind Farm project and has received no objection and general support from the local community to build the project. If all approvals are received the first stage of the wind farm would take approximately two years to construct and turbines are aimed to be installed and generating in 2015.

5.1.19 The Warradarge Wind Farm is a forward thinking step which represents a clean and sustainable future.



Warradarge Wind Farm

Planning and Context Statement

May 2012

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1	Introduction.....	5
2	Warradarge Wind Farm Proposal	6
3	Development Approval Approach	8
4	Site Analysis.....	9
4.1	Significant Features	9
4.2	Sites of Cultural Significance.....	9
4.3	Key Characteristics.....	10
4.4	Contours.....	10
4.5	Existing Land Uses	10
4.6	Land Ownership	10
5	Federal Planning and Environmental Framework.....	12
5.1	Renewable Energy (Electricity) Act 2000.....	12
5.2	Environmental Protection and Biodiversity Conservation Act 1999 – Policy Statement 2.3 – Wind Farm Industry	12
6	State Planning Framework.....	13
6.1	State Planning Strategy	13
6.2	State Sustainability Strategy	13
6.3	Environmental Protection Authority – Position Statement No.2 – Environmental Protection of Native Vegetation in Western Australia	14
6.4	Planning Bulletin No.67 - Guidelines for Wind Farm Development (WAPC 2004)	14
6.5	Visual Landscape Planning in Western Australia – A Manual for Evaluation, Assessment, Siting and Design WAPC 2007	14
6.6	Relevant State Planning Policies (SPPs).....	15
6.6.1	State Planning Policy No.2 (SPP2) – Environment and Natural Resources Policy	15
6.6.2	State Planning Policy No.2.5 (SPP 2.5) – Agricultural and Rural Land Use Planning.....	15
6.7	Energy 2031 - Strategic Energy Initiative – Office of Energy	15
7	Regional Planning Framework	17
7.1	Mid West Regional Planning and Infrastructure Framework – The Way Forward (Draft)	17
8	Local Planning Framework.....	18
8.1	Shire of Coorow Town Planning Scheme No.2.....	18
8.2	Shire of Coorow Local Planning Strategy	19
8.3	Shire of Coorow Local Strategic Plan 2007	20
8.4	Shire of Coorow Plan For The Future 2010-2015	20
8.5	Shire Of Carnamah Town Planning Scheme No.1	20
8.6	Shire of Carnamah Plan for the Future 2009-2011	22
9	Conclusion	23

FIGURES:

Figure 1 – LOCATION PLAN (SOURCE: URBIS).....	7
Figure 2 – REGISTERED SITES OF ABORIGINAL HERITAGE (SOURCE: DEPARTMENT OF INDIGENOUS AFFAIRS)	10
Figure 3 – SHIRE BOUNDARY (SOURCE: LANDGATE)	11
Figure 4 – SHIRE OF COOROW TPS2 – SCHEME EXTRACT (SOURCE: WAPC)	18
Figure 5 – SHIRE OF CARNAMAH TPS1 – SCHEME EXTRACT (SOURCE: WAPC).....	21

TABLES:

TABLE 1 – LAND TENURE (SOURCE: LANDGATE) 11

1 Introduction

This Planning and Context Statement (Statement) describes the key social, economic, environmental and planning context of the Warradarge Wind Farm proposal, located within the Shire of Coorow and Shire of Carnamah. Specifically, this Statement addresses the following key elements:

- A description of the Warradarge Wind Farm Proposal.
- The proposed Development Approval approach.
- Site Analysis –
 - Significant Features.
 - Sites of Cultural Significance.
 - Characteristics.
 - Contours.
 - Existing Land Uses.
 - Land Ownership.
- Current Planning Framework –
 - State Planning Framework considerations.
 - Regional Planning Framework considerations.
 - Local Planning Framework considerations.

This document is intended to be read in conjunction with the Development Application Report and the Planning Compliance Report (Annex 1). The primary purpose of this report is simply to identify those components of the planning framework, in which the Development Application will be considered. It is the function of the Planning Compliance Report to assess the development application against this framework.

2 Warradarge Wind Farm Proposal

Urbis understands Verve Energy is seeking development approval to construct the Warradarge Wind Farm on rural land between Rose Thomson Road and Garibaldi Willis Road. The proposed wind farm is located predominately within the Shire of Coorow, however a transmission line crosses into the Shire of Carnamah. The proposed Wind Farm is approximately 15 kilometres north-east of Warradarge, 15 kilometres south-east of Eneabba and 40 kilometres south-west of Carnamah. The Warradarge farm will have an overall electrical capacity of up to 250 MW and may contain up to 100 individual wind turbines. The location of the proposed wind farm is shown in Figure 1, overleaf.

We understand the construction of the wind farm will be progressed over 3 stages, with the first stage expected to be commenced in 2014 and the final Stage to be completed by 2020.

Furthermore, we understand that Verve Energy is seeking flexibility in their development approval as the final number, location and make/model of each turbine is not yet determined due to the fact the capacity of a proposed new 330.kV transmission line proposed to be utilised by the Warradarge proposal is not yet known and the make/model of the individual turbines will not be determined until a post Development Approval tender process. Accordingly, in seeking flexibility in the first place, Verve intend on seeking approval for the largest number of wind turbines with the greatest impact specifications (i.e. largest and noisiest turbines possible). In this way if smaller turbines with a lesser impact are provided, they should be deemed to comply with the requirements and standards of the state and local authority, without the need for re-approval. Our report has been prepared on this basis.

Specifically the proposal comprises:

- 100 wind turbines with an overall tip height of 152m. The turbines are located on Lots 10850, 10851 and 10853.
- 5 wind monitoring masts.
- Underground cabling between turbines and substation
- A substation compound including a metering building, site office and workshop and communication mast,.
- A 10km transmission line connection the onsite substation to the Eneabba to Karara line. This line would comprise 22 pylons, up to 63 m in height, spaced every 500m.
- 40 x 25 metre hard-stand areas adjacent to each of the 100 wind turbine pylons, as well as 5 masts, totalling 105,000m².
- 8.5km of new and upgraded tracks.
- A construction compound containing site offices and welfare facilities.

Overall the proposal will have a development footprint of approximately 82.5 hectares. A wind farm layout is shown in Figures 3 and Figure 4 of the Development Application Report. The development application is for a 100 turbine wind farm and all associated infrastructure to be located within the wind farm envelope, as shown in Figure 5 and Figure 6 of the Development Application Report. Within the wind farm envelope are a number of excluded areas where no turbines or associated infrastructure will be located. These are vegetated areas and have been intentionally avoided to minimise the environmental disturbance of the Proposal.

The exact route of the transmission line is not finalised but a likely route through the transmission line corridor has been selected. Depending on Western Power's final connection requirements and the type and number of towers used, the line route may vary within the transmission line corridor as shown in Figure 5 and Figure 6 of the Development Application Report.

FIGURE 1 – LOCATION PLAN (SOURCE: URBIS)



 Wind Farm Subject Site

3 Development Approval Approach

As discussed previously in this Statement, Verve Energy is seeking flexibility in their development approval for the proposed Warradarge Wind Farm. This flexibility is required for the following reasons:

- The proposed wind farm is dependent upon the proposed Mid-West Energy Project (MWEP), which involves the construction of a 330kV transmission line from Pinjar substations to Eneabba, onto Three Springs and the Karara mine. The overall capacity of the proposed Wind Farm will therefore be dependent upon the capacity of this transmission line to accommodate power generated by the wind farm. Accordingly, whilst 100 turbines is proposed, a lesser number of turbines may be constructed.
- The exact make, model and size of turbines will not be determined until a tender process for a preferred supplier has been undertaken. It is understood that this tender process will be progressed after development approval has been issued. The turbine with the maximum tip height of 152 metres has been proposed in the Development Application, however the turbine constructed may be of a lesser height.

Consequently, in obtaining Development Approval for the Warradarge Wind Farm, Verve Energy is seeking for flexibility in the size, make/model and location of turbines. Accordingly, through technical investigations, a 'Wind Farm Envelope' has been determined in which the proposed turbines will be located. This 'Wind Farm Envelope' assumes the 'worst-case scenario' from a turbine size and noise emission perspective. In this way, lesser turbines would be deemed to comply.

In addition, it is acknowledged that the Shire of Coorow Town Planning Scheme No.2 states that development approvals lapse should development not be substantially commenced within 2 years from the date of development approval. Given the lengthy timeframes proposed by Verve Energy, a change to this provision is requested to allow works to be commenced within 5 years. Once Stage 1 has commenced, the proposal would be "substantially completed" and therefore there would be no need to obtain new approvals for the additional 2 stages. The validity period for a development approval within the Shire of Carnamah is at the discretion of Council. Accordingly, a development approval period of 5 years will be requested.

4 Site Analysis

4.1 SIGNIFICANT FEATURES

The subject site is predominately cleared agricultural land and does not comprise any significant features. There is a fault line which is located within the southern portion of the subject site, however preliminary investigations indicates that the earth quake potential is lower than that of the Perth metropolitan area.

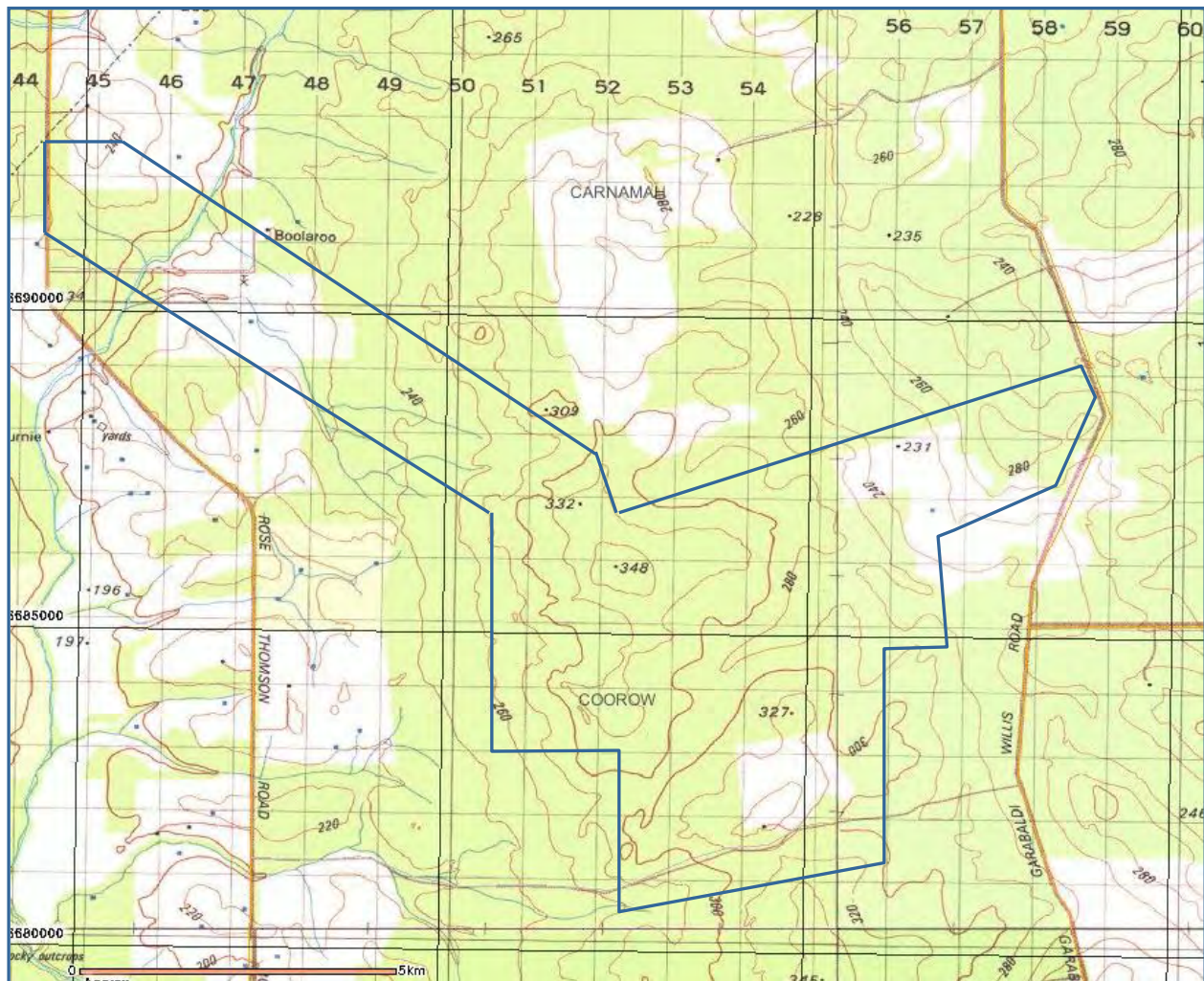
Significant areas of remnant native vegetation exist directly north, east and south of the study area, as well as several national parks and nature reserves within 10 kilometre radius of the study area, including:

- Alexander Morrison National Park (South, South East).
- Tathra National Park (North).
- Wotto Nature Reserve (North).
- Eneabba Nature Reserve (East).
- Coomallo Nature Reserve (South).

4.2 SITES OF CULTURAL SIGNIFICANCE

There are no registered sites of Aboriginal heritage within the proposed Warradarge Wind Farm area, as shown on Figure 2, below:

FIGURE 2 – REGISTERED SITES OF ABORIGINAL HERITAGE (SOURCE: DEPARTMENT OF INDIGENOUS AFFAIRS)



 Indicative Wind Farm Subject Site

4.3 KEY CHARACTERISTICS

The study area is predominantly cleared farm land with pockets of remnant native vegetation. Several small creeks/drainage channels also traverse the subject site, as well as several dwellings, which are located around the subject site.

4.4 CONTOURS

The subject site is characterised by gentle undulating plains with areas of complex table-top topography. This topography of the site is shown previously in Figure 2.

4.5 EXISTING LAND USES

The subject site is currently used for predominately rural agricultural purposes (agricultural grazing), with scattered private housing.

4.6 LAND OWNERSHIP

The proposed Warradarge Wind Farm is across two Shires and contained within Part Lot 10847, Part Lot 10848, Part Lot 10850, Part Lot 10851 and Part Lot 10853 as shown in Table 1 and Figure 3, below:

LOT NO.	PLAN/DIAGRAM	TOTAL LOT AREA (HA)	REGISTERED PROPIETER
Part Lot 10848	P210798	1441.4ha	Judeen Nominees Pty Ltd
Part Lot 10850	P210795	2001.7ha	Judeen Nominees Pty Ltd
Part Lot 10851	P210795	1825.7ha	Judeen Nominees Pty Ltd
Part Lot 10853	P210795	2012.0ha	Gary Marshall Chivers
Part Lot 10847	P210798	1806.4ha	Judeen Nominees Pty Ltd

[illegible]

- URBIS
PLANNING AND CONTEXT STATEMENT 23MAY2012

5 Federal Planning and Environmental Framework

5.1 RENEWABLE ENERGY (ELECTRICITY) ACT 2000

The Mandatory Renewable Energy Target Scheme (MRET) is a market based scheme designed to encourage investment in renewable energy generation capacity, contributing to development of an Australian renewable energy industry and to cut greenhouse gas emissions from electricity generation. The MRET commenced on 1 April 2001 by means of the *Renewable Energy (Electricity) Act 2000* (the Act).

They key objectives of the Act are to:

- Encourage the additional generation of electricity from renewable sources;
- Reduce emissions of greenhouse gases in the electricity sector; and
- Ensure that renewable energy sources are ecologically sustainable.

The MRET operates by placing a responsibility on wholesale electricity purchasers to source specific proportions of total electricity sales from renewable energy sources according to a fixed timeframe, with the scheme running until at least 2020. The Western Australian Government has been active in supporting the national target and in attracting renewable energy investors to provide the renewable energy certificates necessary to satisfy Western Australia's liability from within the State.

5.2 ENVIRONMENTAL PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999 – POLICY STATEMENT 2.3 – WIND FARM INDUSTRY

Policy Statement 2.3 is one of a series of *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) policy statements aimed at providing more detailed guidance on how the EPBC Act may apply to specific places, species, ecological communities or industry sectors and activities. Importantly, this Policy Statement intends to assist Applicants in deciding whether or not a wind farm application should be referred for Federal Environmental Approval under the EPBC Act.

Policy Statement 2.3 indicates that federal environmental approval will be required if a wind farm proposal has or is likely to have a significant impact on one or more matters of national environmental significance, including:

- World Heritage properties.
- National Heritage properties.
- Ramsar Wetlands of international importance.
- Listed threatened species and communities.
- Migratory species protected under international agreements.
- The Commonwealth Marine environment.

6 State Planning Framework

This section provides an explanation of the strategic and statutory planning context for the subject site in the State Government context.

6.1 STATE PLANNING STRATEGY

The State Planning Strategy is a land use planning strategy for Western Australia's development up to the year 2029.

The Strategy prepares for significant population growth, an expanding economy, a changing and vibrant community and a sustainable future. It provides a vision to assist strategic decision-making and a set of principles by which coordinated, sustainable development will be implemented. It is a plan to meet community needs and aspirations, and facilitate wealth creation, the provision of public infrastructure and the protection and improvement of the environment.

A key principal of the Strategy, relevant to the Warradarge Wind Farm proposal is to:

'Protect and enhance the key natural and cultural assets of the State and deliver to all Western Australians a high quality of life which is based on environmentally sustainable principles'.

The Strategy aims to increase use of energy sources which have minimal impact on the environment, prevent further loss in biodiversity, ensure that air, water and soil quality are protected and where necessary improved, reduce consumption of materials and promote recycling, promote management and protection of resources, protect landscape, open space and public access, enhance the quality of life for all Western Australians and protect the State's cultural heritage.

6.2 STATE SUSTAINABILITY STRATEGY

The State Sustainability Strategy (the Strategy) provides a framework for the State Government to respond to its sustainability agenda. The Strategy proposes a set of sustainability principles that guide how government, industry and communities think about and approach the management of resources. These principles are aimed at facilitating change that has net social, environmental and economic benefit for current and future generations.

The Strategy identifies six broad goals and forty-two strategy areas which are intended to guide Government action towards achieving its vision for a sustainable Western Australia. The six broad goals are:

- Sustainability and Governance,
- Contribution to Global Sustainability,
- Sustainable Natural Resource Management,
- Sustainability and Settlements,
- Sustainability and Community, and
- Sustainability and Business.

In relation to sustainable and renewable energy sources, the Strategy identifies the need to facilitate renewable energy generation in the electricity market by removing impediments and ensuring the new electricity market provides opportunities for effective participation. The development of wind farm operations is closely aligned with this objective.

This Strategy reflects on the imperative of ensuring land use and development is consistent with the efficient use of energy and the minimisation of greenhouse gas emissions. Energy produced by wind farms is considered as a clean and sustainable energy which thereby embodies the principles of this Strategy and the broader international and national agenda to reduce greenhouse gas emissions.

6.3 ENVIRONMENTAL PROTECTION AUTHORITY – POSITION STATEMENT NO.2 – ENVIRONMENTAL PROTECTION OF NATIVE VEGETATION IN WESTERN AUSTRALIA

This Position Statement provides an overview of the EPA's position on the clearing of native vegetation in Western Australia with particular reference to clearing within agricultural areas. Where a proposed wind farm involves clearing of remnant vegetation, the proposal should be assessed against the EPA Position Statement No.2.

In assessing a proposal, the EPA will consider supporting clearing in an agricultural area where:

- The proposed land use addresses alternative mechanisms for protecting biodiversity. Opportunities for addressing biodiversity could include rehabilitation of disturbed areas and/or acquisition of areas containing remnant native vegetation. The EPA would like to see an overall environmental benefit as a result of the proposal, such as ensuring protection and management of higher quality remnant native vegetation in the general area (not necessarily on the same property).
- The area proposed for clearing is relatively small, depending on the scale over which significant biodiversity changes occur in the particular area, including the extent of vegetation in the surrounding area, and recognising that the values will vary for different ecosystems.
- The proponent demonstrates that the elements set out in the Position Statement are being met (eg. biodiversity values, Indigenous plants and animals, on and off-site impacts managed appropriately, etc). This will require extensive local and regional biodiversity work.

6.4 PLANNING BULLETIN NO.67 - GUIDELINES FOR WIND FARM DEVELOPMENT (WAPC 2004)

Planning Bulletin No.67 (PB67) was prepared to provide local government, other relevant approval authorities and wind farm developers with a guide to the planning framework for the balanced assessment of land-based wind farm developments throughout Western Australia. PB67 identifies key planning issues relevant to wind farm developments, and provides guidance in the design and siting of wind farms, as well as assisting local governments in their assessment process. The key objectives of PB67 are as follows:

- Facilitate the development of wind farms in an efficient, cost-effective and environmentally responsible manner that meets community needs, while taking into account the needs of developers, and State and national imperatives.
- Promote community understanding of the issues involved in the design and installation of wind farm infrastructure and provide opportunities for community input into decision-making.
- Promote a consistent approach in the preparation, assessment and determination of applications for planning approval for wind farm developments.
- Minimise disturbance to the environment (including landscape) and loss of public amenity in the establishment, operation, maintenance and decommissioning of wind farms.

6.5 VISUAL LANDSCAPE PLANNING IN WESTERN AUSTRALIA – A MANUAL FOR EVALUATION, ASSESSMENT, SITING AND DESIGN WAPC 2007

The Visual Landscape Planning Manual has been developed to help public and private sector planners to address visual landscape matters in the planning process. The Manual explains the fundamental planning tools of visual landscape evaluation and visual impact assessment and provides guidelines for siting and design in relation to a range of landscape types and land uses.

The Manual acknowledges that wind farms have a context that is broader than other utility towers. Although wind farms involve planning issues at local level (as with other utility services) they also

'involve more global issues such as climate change. In this context, the planning processes need to be cognisant of the broad context while dealing with the local planning considerations.'

The Manual establishes a series of state, regional, local and site level principles and guidelines with respect to wind farms. This includes addressing factors with respect to avoiding significant landscapes, minimising impact through the layout, size, number and colour of turbines and associated infrastructure, minimising earthworks and implementing a program of rehabilitation.

6.6 RELEVANT STATE PLANNING POLICIES (SPPS)

6.6.1 STATE PLANNING POLICY NO.2 (SPP2) – ENVIRONMENT AND NATURAL RESOURCES POLICY

SPP2 is primarily concerned with the conservation and protection of environmental assets and biodiversity as well as sustainable management of natural resources across Western Australia. The key objectives of SPP 2 are as follows:

- Integrate environment and natural resource management within broader land use planning and decision making.
- Protect, conserve and enhance the natural environment.
- Promote and assist in the wise and sustainable use and management of natural resources.

Specifically, SPP 2 recognises there is widespread awareness of the need to increase the efficiency with which energy is used in Western Australia, including the need to reduce reliance on energy produced from non-renewable resources such as fossil fuels. SPP 2 indicates that planning decision-making should:

'Support the use of alternative energy generation, including renewable energy, where appropriate'.

6.6.2 STATE PLANNING POLICY NO.2.5 (SPP 2.5) – AGRICULTURAL AND RURAL LAND USE PLANNING

SPP 2.5 focuses on the identification and appropriate zoning of highly productive agricultural land throughout Western Australia.

Given the proposed Warradarge Wind Farm is located within a 'Rural' Zone of the Shire of Coorow Town Planning Scheme No.2 and the Shire of Carnamah Town Planning Scheme No.1, it will be important to consider the key objectives and elements of SPP 2.5. Importantly, the proposal will need to consider the following:

- Potential for land use conflict –an adequate separation distance has been provided between the proposed wind farm and potential conflicting/sensitive land uses.
- Site Selection – a comprehensive site selection process has been undertaken, in relation to key technical, environmental, statutory planning and community aspects.

6.7 ENERGY 2031 - STRATEGIC ENERGY INITIATIVE – OFFICE OF ENERGY

The WA State Government Office of Energy released *Energy 2031 – Strategic Energy Initiative* in March 2011, which proposes a vision for the next 20 years. The initiative proposes to develop plans, strategies, policies and regulatory frameworks to ensure a range of energy supply options is available to meet WA's future needs under various scenarios. The Strategic Energy Initiative process aims to develop:

- An energy vision for 2031, including a range of demand scenarios and potential supply options;

- A set of clear goals to guide decisions by policy makers and investors;
- A range of flexible strategies to allow industry and the community to adapt to emerging opportunities and challenges; and
- Policy and regulatory frameworks to promote investment and competitiveness in the energy value chain and remove impediments to technological change.

This Strategic Initiative highlights that the introduction of the Commonwealth Government's Renewable Energy Target (RET) Scheme and the introduction of the carbon pricing system will drive low emission generation technology (for example, renewable energy) and carbon offset technology (for example, carbon capture and storage).

7 Regional Planning Framework

This section provides an explanation of the strategic and statutory planning context for the subject site in the Regional Planning context.

7.1 MID WEST REGIONAL PLANNING AND INFRASTRUCTURE FRAMEWORK – THE WAY FORWARD (DRAFT)

The Warradarge Wind Farm proposal is situated within the Mid-West region of Western Australia. Once finalised, the Mid-West Regional Planning and Infrastructure Framework (the Framework), released in November 2011, will become a second tier document preceded by the WA State Planning Strategy (1997) and will be recognised as a regional strategy under the State Planning Framework. The key objectives of the Draft Framework are to:

- Provide the regional context for land-use planning in the Mid-West.
- Provide an overview of the major regional economic, social, cultural and environmental issues.
- Identify the priority actions required to enable the comprehensive regional and sub-regional planning, and
- Identify the priority regional infrastructure projects to facilitate the economic and population growth in the Mid-West.

The Framework identifies several key themes to assist in achieving the above objectives. The themes which are considered to be directly relevant to the Warradarge Wind Farm proposal are as follows:

- A green region that should grow within the constraints of its diverse and unique natural assets and that seeks to utilise its renewable assets.
- A responsible region that ensures that future growth is sustainable, responsible and in keeping with the natural landscape.
- An innovative region that embraces technology to add value to its industries, support the delivery of services and stimulate new technology-based enterprises.

The Draft Framework identifies that the Mid-West region has abundant renewable energy resources, such as solar, wind and geothermal, and specifically highlights the Greenough River Solar Farm proposal by Verve Energy, in an effort to showcase the strong renewable energy push in the Mid-West region. The Framework also identifies that a key challenge in future energy production in the region will be the increasing transmission capability for the Mid-West region including support for renewable energy production and supply.

The Framework indicates that a Mid-West Energy Strategy will be prepared, and will be guided by the State Energy Strategy, to focus on the delivery of regional energy infrastructure necessary to meet anticipated demand and support regional development. The Strategy will identify opportunities to further diversify regional power generation, including potential renewable energy projects (including wind) and also the viability of towns to support alternative energy sources. This Strategy is identified as a flagship priority project.

8 Local Planning Framework

This section provides an explanation of the strategic and statutory planning context for the subject site in the Local Government context.

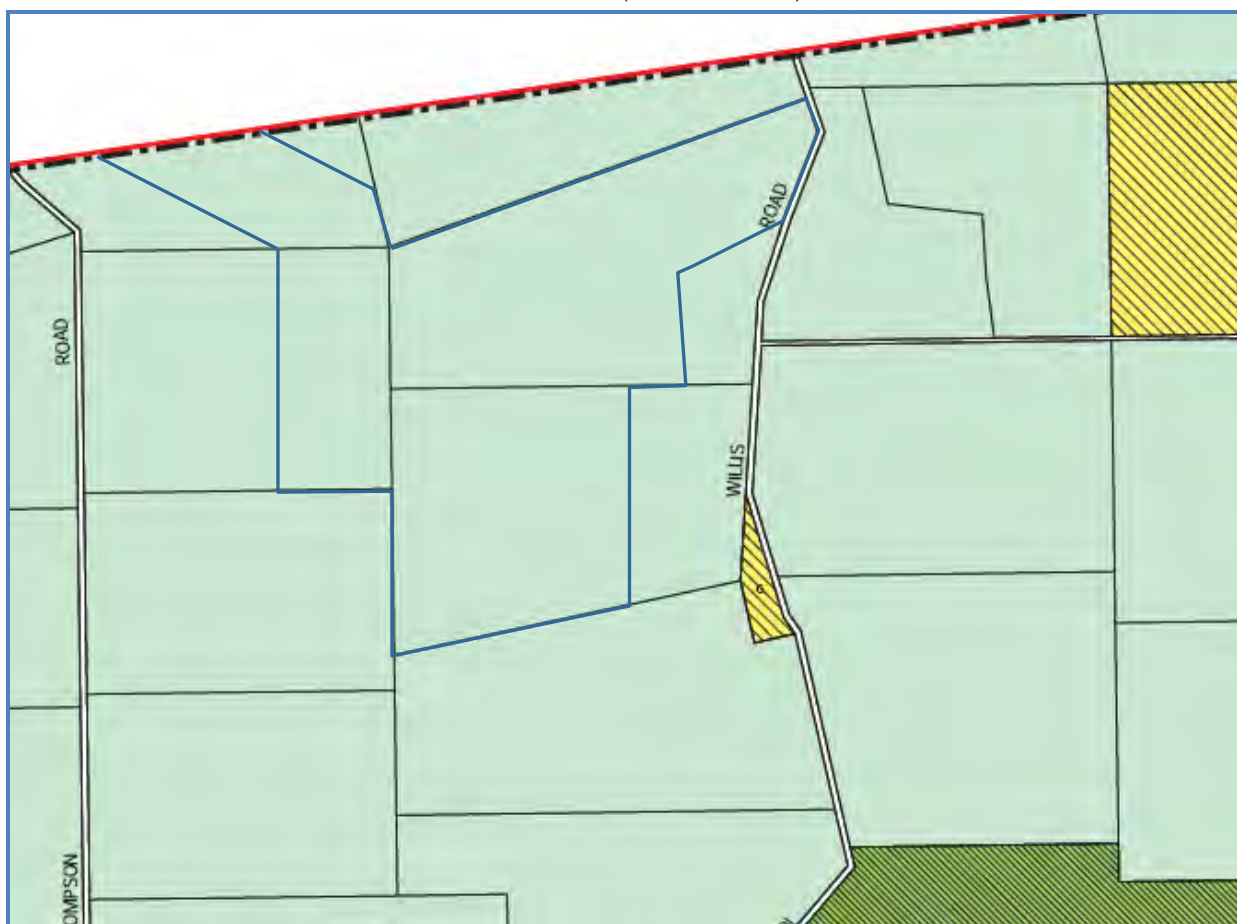
8.1 SHIRE OF COOROW TOWN PLANNING SCHEME NO.2

The Shire of Coorow Town Planning Scheme No.2 (TPS2) provides the local statutory framework for land use and development control within the Warradarge locality. An assessment of the proposed Warradarge Wind Farm against relevant provisions of TPS2 is provided within the following sections.

Zoning

The proposed Warradarge Wind Farm is located within a 'Rural' zone of the Shire of Coorow's TPS2, as shown below:

FIGURE 4 – SHIRE OF COOROW TPS2 – SCHEME EXTRACT (SOURCE: WAPC)



LOCAL SCHEME RESERVES



PUBLIC PURPOSES
DENOTED AS FOLLOWS:

- | | |
|----|----------------------------|
| A | AMBULANCE SUB CENTRE |
| CO | COUNCIL OFFICE |
| CW | CAMPING & WATER |
| D | DRAIN |
| EX | COUNTRY AUTOMATIC EXCHANGE |
| FP | FORESTRY PURPOSES |
| G | GRAVEL |

ZONES



RURAL



RURAL RESIDENTIAL



Subject Site

The general objectives of each zone are set out in Clause 4.2 of TPS2. The key objective of the 'Rural' zone is as follows

'To provide for a range of rural pursuits such as broadacre and diversified farming which are compatible with the capability of the land and retain the rural character and amenity of the locality'.

Clause 1.6 of TPS2 sets out the general objectives of the Scheme. The key objectives for the Scheme, relevant to the proposed Warradarge Wind Farm are as follows:

- To promote the sustainable use of rural land for agricultural purposes whilst accommodating other rural activities.
- To protect and enhance the environmental values and natural resources of the Scheme area and to promote ecologically sustainable land use and development.
- To safeguard and enhance the character and amenity of the built and natural environment of the Scheme area.

Land Use Definition

As outlined in Planning Bulletin 67, the Model Scheme Text does not include a definition for wind farms or wind energy facilities, hence wind farm developments are typically classified as a 'use not listed' in town planning schemes. A 'wind farm' as a use class is not specifically defined in the Shire of Coorow's TPS2 and therefore it is classified as a 'use not listed' in accordance with Clause 4.4.2 of TPS2.

'If a person proposes to carry out on land any use that is not specifically mentioned in the Zoning Table and cannot reasonably be determined as falling within the type, class or genus of activity of any other use category, the local government may –

- (a) determine that the use is consistent with the objectives of the particular zone and is therefore permitted;*
- (b) determine that the use may be consistent with the objectives of the particular zone and thereafter follow the advertising procedures of clause 9.4 in considering an application for planning approval; or*
- (c) determine that the use is not consistent with the objectives of the particular zone and is therefore not permitted.*

It is expected that the Shire will determine that either the use is or may be consistent with the objectives of the Rural zone (Items (a) and (b) above). Based on initial discussions with the Shire of Coorow, the application is unlikely to be inconsistent with the objectives of the Rural zone.

8.2 SHIRE OF COOROW LOCAL PLANNING STRATEGY

This Local Planning Strategy was prepared to provide strategic guidance for the future development of the Shire by providing an explanation of the content of the Scheme. The Strategy provides a detailed overview of state and regional context, a profile and key issues within the area, and a focus upon town site strategies.

The key objectives for development within the 'Rural' zone of the Strategy are as follows:

- To ensure the continuation of the basic rural use within the zone, encouraging where appropriate, the retention and expansion of present agricultural activities.
- To consider granting Planning Consent to non-rural uses where these can be demonstrated to be of benefit to the district and not detrimental to the area's natural resources and environment generally.
- To permit, subject to Planning Consent, development providing facilities for tourists, travellers and for recreational usage.

8.3 SHIRE OF COOROW LOCAL STRATEGIC PLAN 2007

This Shire of Coorow Strategic Plan provides a present and future blueprint for the future growth and development of the Shire. Goal 5 of the Local Strategic Plan deals specifically with the local environment, aiming to *'enhance, utilise and conserve natural resources'*. The Strategic Plan indicates that this will be achieved through:

- Value adding.
- Initiatives to maintain and improve the Shire's environment.
- Developing initiatives for water.

8.4 SHIRE OF COOROW PLAN FOR THE FUTURE 2010-2015

The Shire of Coorow 'Plan for the Future' provides the direction for the Shire over the period 2010/11 to 2014/15. The Vision Statement outlined in the Shire's Plan for the Future is as follows:

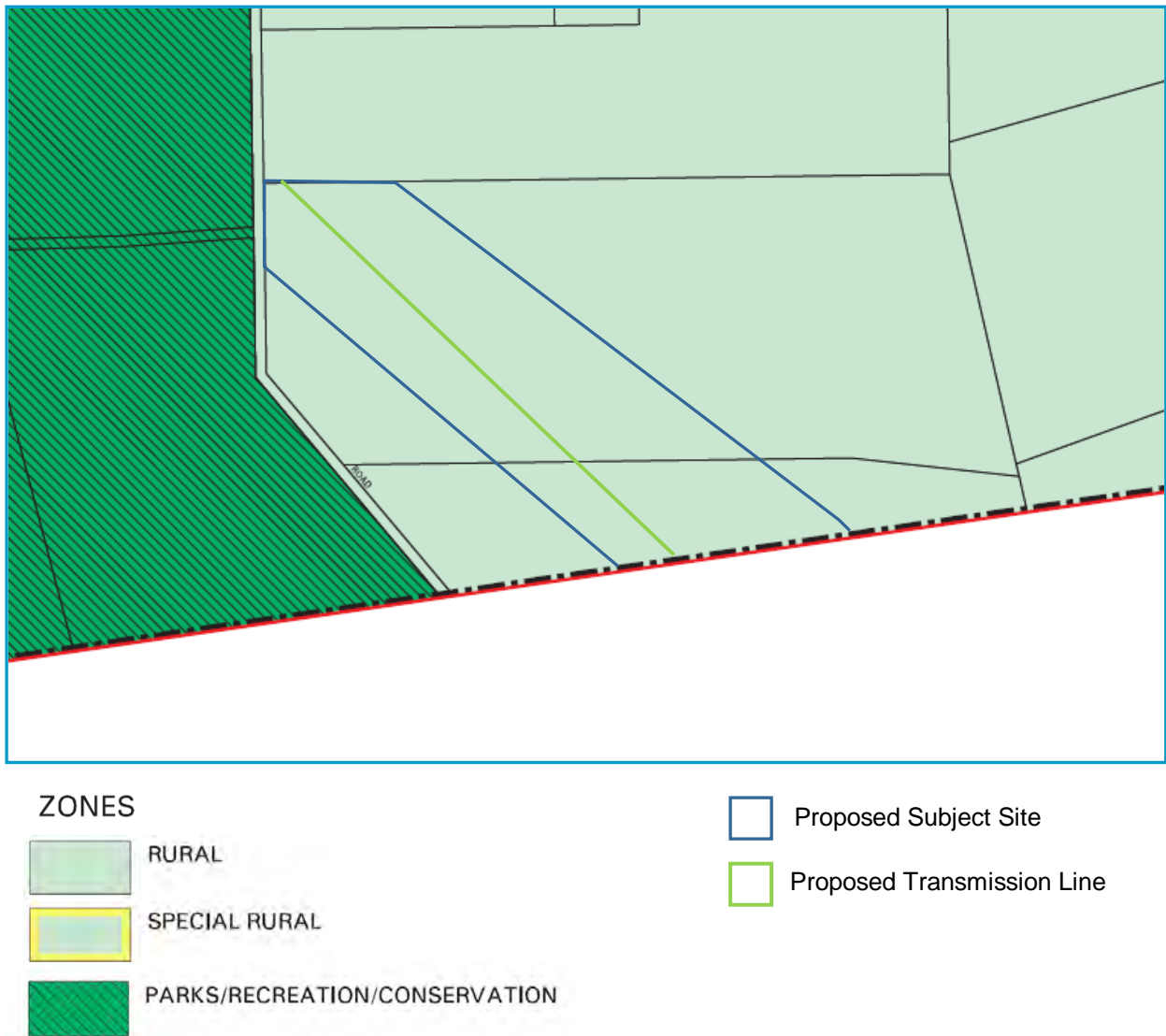
'The Shire of Coorow will be a sustainable, progressive, desirable and caring community which recognises and values its diversity'.

8.5 SHIRE OF CARNAMAH TOWN PLANNING SCHEME NO.1

The Warradarge Wind Farm proposes a transmission line which runs north-west of the proposed wind farm, crossing into the Shire of Carnamah. Accordingly, there is a requirement to obtain planning approval from the Shire of Carnamah for the development of the transmission line. Based on Verve Energy's understanding of the Shire of Carnamah TPS1, it is understood an application will need to be made to the Shire of Carnamah for the portion of the transmission line only.

The proposed transmission line is located within a 'Rural' zone of the Shire of Carnamah's Town Planning Scheme No.1 (TPS1), as shown below:

FIGURE 5 – SHIRE OF CARNAMAH TPS1 – SCHEME EXTRACT (SOURCE: WAPC)



The key objectives of the 'Rural' zone in TPS1 are as follows:

- a) *To give priority to the continuation of viable agriculture production in a manner consistent with sound land use and management practices;*
- b) *To provide for and monitor mining activities and associated works; and*
- c) *Without necessarily limiting the activities at (a) and (b), to conserve and preserve national bushland, waterways, and Indigenous flora and fauna so that the viability of any natural ecosystem is not adversely affected'.*

Development Requirements

In considering development within the 'Rural' zone, the Shire of Carnamah will have regard for the following (in accordance with Clause 5.7 of TPS1):

- (a) *'The need to ensure that the continuation of Rural land is protected, encouraging where appropriate, the retention and expansion of agricultural activities, and supporting proposal which promote the retention of the predominant lot sizes in the locality.*

- (b) The need to preserve the rural character and rural appearance of the land within this zone.*
- (c) The need to protect, preserve and enhance any natural undeveloped land areas throughout the zones by requiring as conditions on any planning consent issued, the planting of vegetation which will assist in the balancing of the greenhouse effect, provision for shade, prevention of erosion, reduction in salinity, or the provision of habitats for fauna.*
- (d) The State Planning Commission Policy DC3.4 – Rural Land Use Planning Policy’.*

Similarly to the Shire of Coorow TPS2, a ‘wind farm,’ as a use class is not specifically defined in the Shire of Carnamah TPS1, therefore it will be classified as a ‘use not listed’ and will likely need to be advertised for a minimum period of 14 days.

The proposed transmission line (for the purpose of transmitting power from the proposed wind farm to the existing Eneabba to Karara line) will result in minimal onsite modification to the existing rural landform of and minimal modification to vegetation in the ‘Rural’ zone.

8.6 SHIRE OF CARNAMAH PLAN FOR THE FUTURE 2009-2011

The Shire of Carnamah’s Plan for the Future, released in 2009, provides a general overview of the key strategies of the Shire’s Strategic Plan and provides a report on the current status of the implementation of these strategies.

9 Conclusion

This Planning and Context Statement has considered the local site analysis and various frameworks (planning, environmental, social and political) in which the Warradarge Wind Farm proposal will be considered at both a local and state (JDAP) level.

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Warradarge Wind Farm

Planning Compliance Report

May 2012

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1	Introduction	4
2	Understanding of the Warradarge Wind Farm Proposal	5
3	Site Analysis.....	7
3.1	Significant Features	7
3.2	Sites of Cultural Significance.....	7
3.3	Key Characteristics.....	8
3.4	Contours.....	8
3.5	Existing Land Uses	8
3.6	Land Ownership	8
4	Federal Planning and Environmental Framework.....	10
4.1	Renewable Energy (Electricity) Act 2000.....	10
4.2	Environmental Protection and Biodiversity Conservation Act 1999 – Policy Statement 2.3 – Wind Farm Industry	10
5	State Planning Framework.....	12
5.1	State Planning Strategy	12
5.2	State Sustainability Strategy	12
5.3	Environmental Protection Authority – Position Statement No.2 – Environmental Protection of Native Vegetation in Western Australia	14
5.4	Environmental Protection Authority (South Australia) - Wind Farm Environmental Noise Guidelines	15
5.4.1	Compliance Checklist	17
5.5	Planning Bulletin No.67 - Guidelines for Wind Farm Development (WAPC 2004)	19
5.5.1	Planning and Environmental Issues	19
5.5.2	Compliance Matrix	21
5.6	Visual Landscape Planning in Western Australia – A Manual for Evaluation, Assessment, Siting and Design WAPC 2007	22
5.7	Relevant State Planning Policies (SPPs).....	24
5.7.1	State Planning Policy No.2 (SPP2) – Environment and Natural Resources Policy	24
5.7.2	State Planning Policy No.2.5 (SPP 2.5) – Agricultural and Rural Land Use Planning	24
5.8	Energy 2031 - Strategic Energy Initiative – Office of Energy	26
6	Regional Planning Framework	27
6.1	Mid West Regional Planning and Infrastructure Framework – The Way Forward (Draft)	27
7	Local Planning Framework	28
7.1	Shire Of Coorow Town Planning Scheme No.2	28
7.1.1	Zoning.....	28
7.1.2	Scheme Objectives.....	29
7.1.3	Land Use Definition	30
7.1.4	Advertising Requirements.....	30
7.1.5	Accompanying Material.....	30
7.2	Shire of Coorow Local Planning Strategy	32
7.3	Shire Of Coorow Local Strategic Plan 2007.....	33
7.4	Shire Of Coorow Plan For The Future 2010-2015	33
7.5	Shire Of Carnamah Town Planning Scheme No.1	34
7.5.1	Development Requirements.....	35
7.6	Shire of Carnamah Plan for the Future 2009-2011	35
8	Relevant Studies	37

8.1	Best Practice Guidelines for Implementation of Wind Energy Projects in Australia (December 2006).....	37
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9	Conclusion	39
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FIGURES:

Figure 1 – LOCATION PLAN (SOURCE: URBIS)	6
Figure 2 – REGISTERED SITES OF ABORIGINAL HERITAGE (SOURCE: DEPARTMENT OF INDIGENOUS AFFAIRS).....	8
Figure 3 – SHIRE BOUNDARY (SOURCE: LANDGATE).....	9
Figure 4 – SHIRE OF COOROW TPS2 – SCHEME EXTRACT (SOURCE: WAPC).....	28
Figure 5 – SHIRE OF CARNAMAH TPS1 – SCHEME EXTRACT (SOURCE: WAPC)	34

TABLES:

TABLE 1 – LAND TENURE (SOURCE: LANDGATE)	9
TABLE 2 –WIND FARM ENVIRONMENTAL NOISE GUIDELINES COMPLIANCE CHECKLIST (SOUTH AUSTRALIA) (SOURCE: EPA SA 2012).....	17
TABLE 3 – PLANNING BULLETIN 67 – GUIDELINES FOR WIND FARM DEVELOPMENT – COMPLIANCE CHECKLIST	21
TABLE 5 – PLANNING APPLICATION REQUIREMENTS - CHECKLIST.....	31

1 Introduction

This purpose of this Planning Compliance Report is to assess the compliance of the proposed Warradarge Wind Farm Proposal against key federal, state and local planning and environment frameworks. Specifically, this Report addressing the following key elements:

- Understanding of the Warradarge Wind Farm Proposal.
- Site Analysis –
 - Significant Features.
 - Sites of Cultural Significance.
 - Characteristics.
 - Contours.
 - Existing Land Uses.
 - Land Ownership.
- Current Planning Framework and Compliance –
 - Federal Planning and Environmental Framework considerations.
 - State Planning Framework considerations (including noise and landscape and visual assessment considerations).
 - Regional Planning Framework considerations.
 - Local Planning Framework considerations.
- Relevant Studies.
- Planning and Environmental Processes.

2 Understanding of the Warradarge Wind Farm Proposal

Urbis understands Verve Energy is seeking development approval to construct the Warradarge Wind Farm on rural land between Rose Thomson Road and Garibaldi Willis Road. The proposed wind farm is located predominately within the Shire of Coorow, however a transmission line crosses into the Shire of Carnamah. The proposed Wind Farm is approximately 15 kilometres north-east of Warradarge, 15 kilometres south-east of Eneabba and 40 kilometres south-west of Carnamah. The Warradarge farm will have an overall electrical capacity of up to 250 MW and may contain up to 100 individual wind turbines. The location of the proposed wind farm is shown in Figure 1, overleaf.

We understand the construction of the wind farm will be progressed over 3 stages, with the first stage expected to be commenced in 2014 and the final Stage to be completed by 2020.

Furthermore, we understand that Verve Energy is seeking flexibility in their development approval as the final number, location and make/model of each turbine is not yet determined due to the fact the capacity of a proposed new 330.kV transmission line proposed to be utilised by the Warradarge proposal is not yet known and the make/model of the individual turbines will not be determined until a post Development Approval tender process. Accordingly, in seeking flexibility in the first place, Verve intend on seeking approval for the largest number of wind turbines with the greatest impact specifications (i.e. largest and noisiest turbines possible). In this way if smaller turbines with a lesser impact are provided, they should be deemed to comply with the requirements and standards of the state and local authority, without the need for re-approval. Our report has been prepared on this basis.

Specifically the proposal comprises:

- 100 wind turbines with an overall tip height of 152m. The turbines are located on Lots 10850, 10851 and 10853.
- 5 wind monitoring masts.
- Underground cabling between turbines and substation
- A substation compound including a metering building, site office and workshop and communication mast,.
- A 10km transmission line connection the onsite substation to the Eneabba to Karara line. This line would comprise 22 pylons, up to 63m in height, spaced every 500m.
- 40 x 25 metre hard-stand areas adjacent to each of the 100 wind turbine pylons, as well as 5 masts, totalling 105,000m².
- 8.5km of new and upgraded tracks.
- A construction compound containing site offices and welfare facilities.

Overall the proposal will have a development footprint of approximately 82.5 hectares. A wind farm layout is shown in Figures 3 and Figure 4 of the Development Application Report. The development application is for a 100 turbine wind farm and all associated infrastructure to be located within the wind farm envelope, as shown in Figure 5 and Figure 6 of the Development Application Report. Within the wind farm envelope are a number of excluded areas where no turbines or associated infrastructure will be located. These are vegetated areas and have been intentionally avoided to minimise the environmental disturbance of the Proposal.

The exact route of the transmission line is not finalised but a likely route through the transmission line corridor has been selected. Depending on Western Power's final connection requirements and the type and number of towers used, the line route may vary within the transmission line corridor as shown in Figure 5 and Figure 6 of the Development Application Report.

FIGURE 1 – LOCATION PLAN (SOURCE: URBIS)



 Wind Farm Subject Site

3 Site Analysis

3.1 SIGNIFICANT FEATURES

The subject site is predominately cleared agricultural land and does not comprise any significant features. There is a fault line which is located within the southern portion of the subject site, however preliminary investigations indicates that the earth quake potential is lower than the Perth metropolitan area.

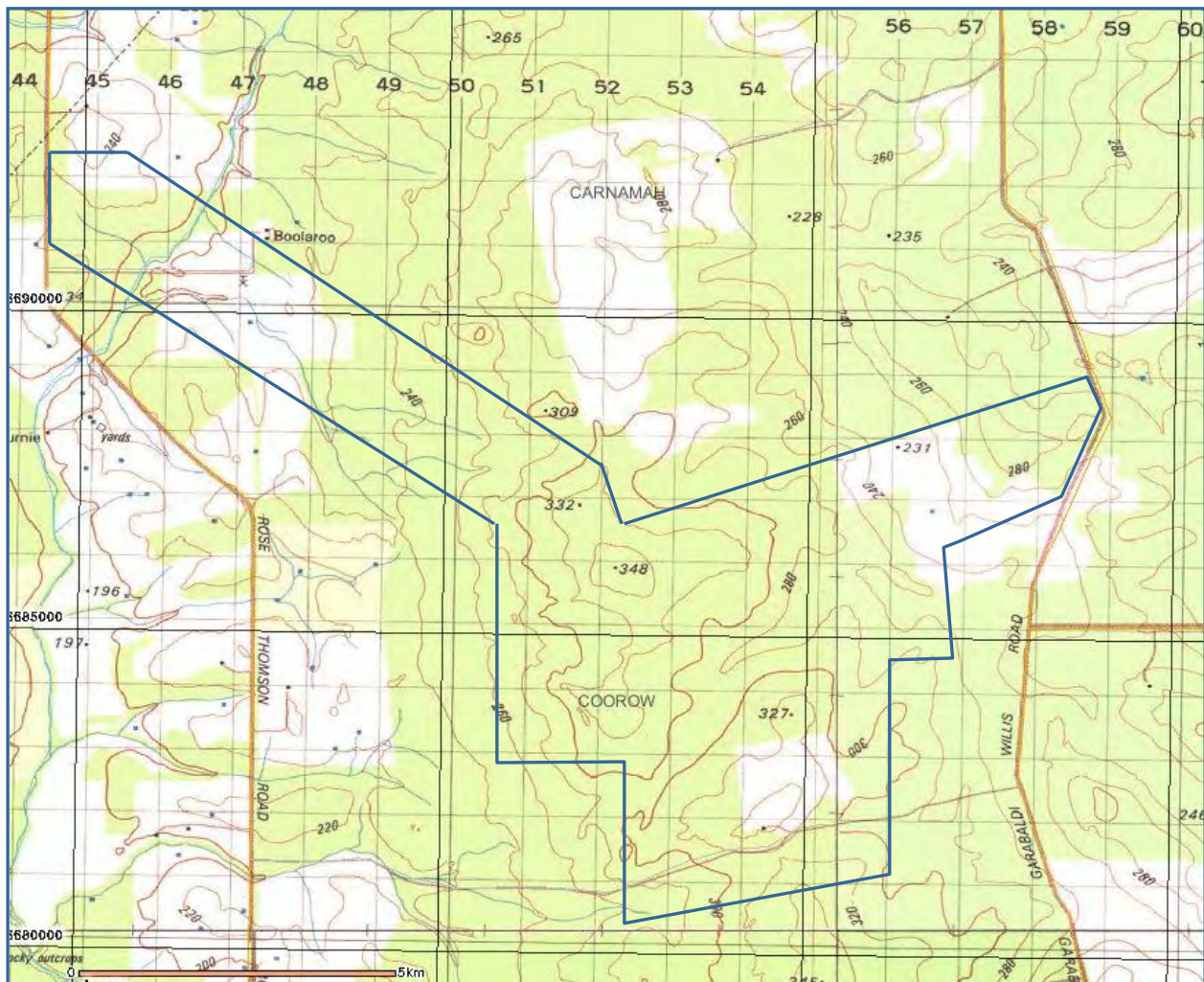
Significant areas of remnant native vegetation exist directly north, east and south of the study area, as well as several national parks and nature reserves within 10 kilometre radius of the study area, including:

- Alexander Morrison National Park (South, South East).
- Tathra National Park (North).
- Wotto Nature Reserve (North).
- Eneabba Nature Reserve (East).
- Coomallo Nature Reserve (South).

3.2 SITES OF CULTURAL SIGNIFICANCE

There are no registered sites of Aboriginal heritage within the proposed Warradarge Wind Farm area, as shown on Figure 2, below:

FIGURE 2 – REGISTERED SITES OF ABORIGINAL HERITAGE (SOURCE: DEPARTMENT OF INDIGENOUS AFFAIRS)



Indicative Wind Farm Subject Site

3.3 KEY CHARACTERISTICS

The study area is predominantly cleared farm land with pockets of remnant native vegetation. Several small creeks/drainage channels also traverse the subject site, as well as several dwellings, which are located around the subject site.

3.4 CONTOURS

The subject site is characterised by gentle undulating plains with areas of complex table-top topography. This topography of the site is shown previously in Figure 2.

3.5 EXISTING LAND USES

The subject site is currently used for predominately rural agricultural purposes.

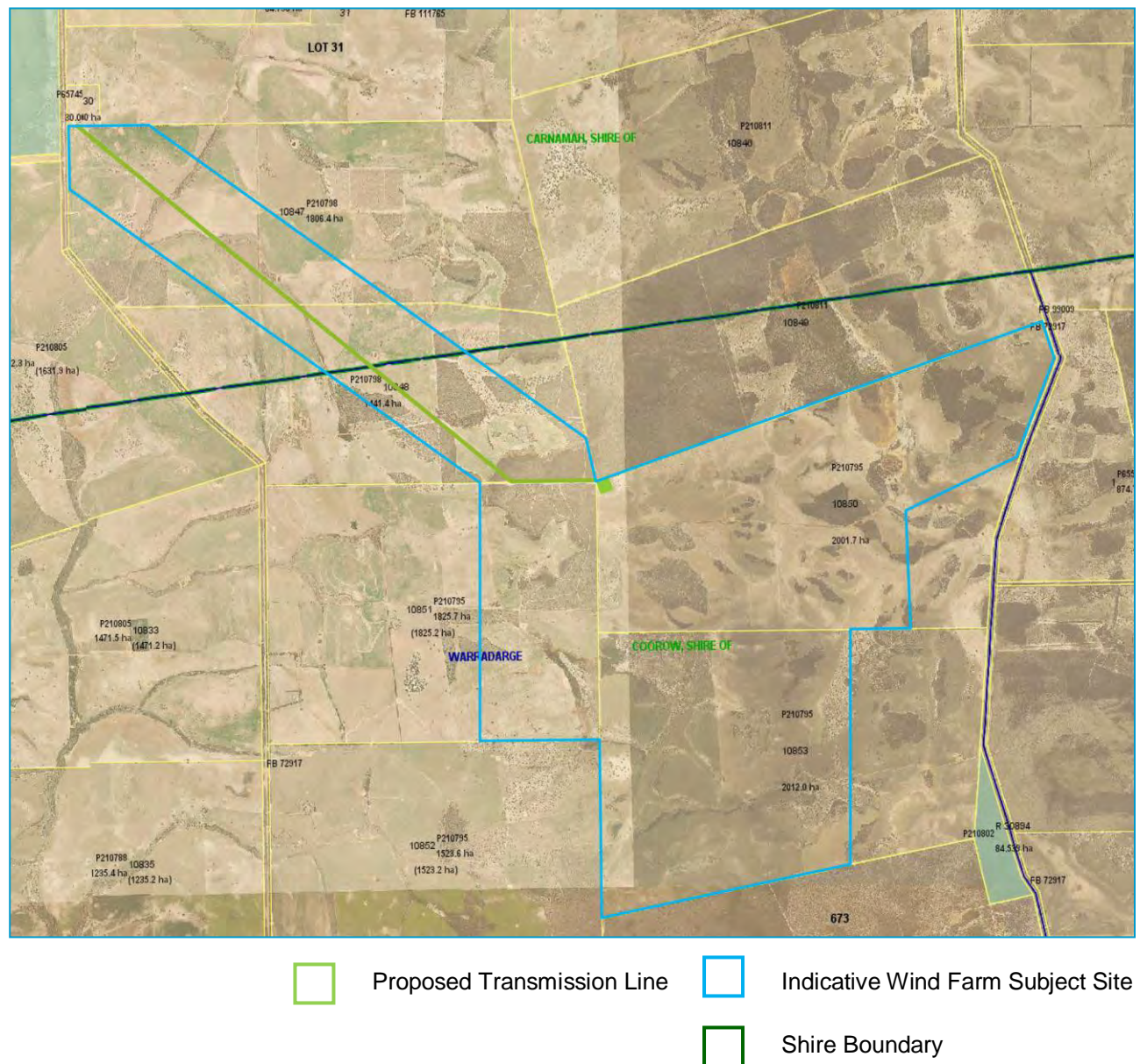
3.6 LAND OWNERSHIP

The proposed Warradarge Wind Farm is contained within Part Lot 10847, Part Lot 10848, Part Lot 10850, Part Lot 10851 and Part Lot 10853 as shown in Table 1 and Figure 3, below:

TABLE 1 – LAND TENURE (SOURCE: LANDGATE)

LOT NO.	PLAN/DIAGRAM	TOTAL LOT AREA (HA)	REGISTERED PROPIETER
Part Lot 10848	P210798	1441.4ha	Judeen Nominees Pty Ltd
Part Lot 10850	P210795	2001.7ha	Judeen Nominees Pty Ltd
Part Lot 10851	P210795	1825.7ha	Judeen Nominees Pty Ltd
Part Lot 10853	P210795	2012.0ha	Gary Marshall Chivers
Part Lot 10847	P210798	1806.4ha	Judeen Nominees Pty Ltd

FIGURE 3 – SHIRE BOUNDARY (SOURCE: LANDGATE)



4 Federal Planning and Environmental Framework

4.1 RENEWABLE ENERGY (ELECTRICITY) ACT 2000

The Mandatory Renewable Energy Target Scheme (MRET) is a market based scheme designed to encourage investment in renewable energy generation capacity, contributing to development of an Australian renewable energy industry and to cut greenhouse gas emissions from electricity generation. The MRET commenced on 1 April 2001 by means of the *Renewable Energy (Electricity) Act 2000* (the Act).

They key objectives of the Act are to:

- Encourage the additional generation of electricity from renewable sources;
- Reduce emissions of greenhouse gases in the electricity sector; and
- Ensure that renewable energy sources are ecologically sustainable.

The MRET operates by placing a responsibility on wholesale electricity purchasers to source specific proportions of total electricity sales from renewable energy sources according to a fixed timeframe, with the scheme running until at least 2020. The Western Australian Government has been active in supporting the national target and in attracting renewable energy investors to provide the renewable energy certificates necessary to satisfy Western Australia's liability from within the State.

Renewable energy proposals such as the Warradarge Wind Farm are critical in achieving this renewable energy target. The proposed 100-turbine facility is estimated to produce, on average, a total of 875 million Kilowatt-hours (kWh) of electricity annually, which is equivalent to the average annual electricity needs of 140,000 West Australian homes, and will prevent at least 700,000 tonnes of carbon dioxide from entering the atmosphere annually.

COMPLIANCE STATEMENT

- ***The proposed Warradarge Wind Farm directly responds to the Commonwealth Government's Renewable Energy Target (RET) Scheme and the Act as it will contribute to the development of the States renewable energy industry and aim to cut greenhouse gas emissions from electricity generation. The construction, operation and rehabilitation of the proposed Warradarge Wind Farm will also be undertaken in an ecologically sustainable manner, to respect and retain and rural integrity of the locality.***

4.2 ENVIRONMENTAL PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999 – POLICY STATEMENT 2.3 – WIND FARM INDUSTRY

Policy Statement 2.3 is one of a series of *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) policy statements aimed at providing more detailed guidance on how the EPBC Act may apply to specific places, species, ecological communities or industry sectors and activities. Importantly, this Policy Statement intends to assist Applicants in deciding whether or not a wind farm application should be referred for Federal Environmental Approval under the EPBC Act.

Policy Statement 2.3 indicates that federal environmental approval will be required if a wind farm proposal has or is likely to have a significant impact on one or more matters of national environmental significance, including:

- World Heritage properties.
- National Heritage properties.
- Ramsar Wetlands of international importance.
- Listed threatened species and communities.

- Migratory species protected under international agreements.
- The Commonwealth Marine environment.

Policy Statement 2.3 provides specific guidance in relation to matters of national environmental significance which may be particularly relevant to wind farms. The Policy Statement indicates that, to date, the primary environmental concern arising from wind farm developments in Australia and overseas is the mortality of bird and bat species from collision with turbines. The groups which are most at risk include the following:

- Waterbirds that are listed threatened species, listed migratory species and/or part of the ecological character of a Ramsar wetland.
- Seabirds that are listed threatened species.
- Listed migratory species and listed threatened species that migrate within Australia.
- Species that are at risk of extinction.

Other major issues which should be considered are as follows:

- The disturbance or alienation of important sites, on or off the wind farm, such as those where listed threatened animals concentrate when roosting, feeding, breeding or on migration,
- The clearance or disturbance of native vegetation for turbines and other infrastructure.
- Impacts on World Heritage properties and/or National Heritage properties.

Policy Statement 2.3 also provides guidance on practices that may assist in avoiding or mitigation impacts or matters of national environmental significance. The Policy Statement identifies that whilst a wind farm proposal may potentially impact on a matter of national environmental significance, demonstration that carefully researched mitigation procedures will be followed could favourably affect the decision. This could potentially include the location of the wind farm itself, placement of turbines, roads and infrastructure and turbine design.

COMPLIANCE STATEMENT

- ***The Flora, Vegetation and Fauna Assessment identified 12 fauna species of conservation significance in the locality, with the Carnaby's (Black) Cockatoo's foraging habitat documented as being present in the study area. The Assessment, however, states that no roost sites (or potential roost sites) were observed during a site visit, and that if clearing of foraging habitat is kept to a minimum, the local and regional conservation status of the species is unlikely to be affected. Accordingly, the proposed wind farm proposes only 0.7 hectares of clearing to accommodate the transmission line, and avoids any Threatened Ecological Communities and Priority species.***
- ***The Flora, Vegetation and Fauna Assessment identifies that a large portion of the study area (76%) comprises cleared land which has no conservation value as vegetation.***
- ***The Assessment however identifies 2 vegetation types which appear similar to the description of the Lesueur-Coomallo Floristic Community, which is listed as a Threatened Ecological Community and are considered to be of high conservation significance. Again however, the wind farm proposes only 0.7ha of clearing to accommodate the proposed transmission line, and will avoid all Threatened Ecological Communities of high conservation significance and Priority species.***
- ***All significant vegetated areas, Threatened Ecological Communities and Priority species, protected by federal and state environmental legislations have been intentionally avoided. No impact on matters of national environmental significance are anticipated and therefore EPBC referral should not be necessary.***

5 State Planning Framework

5.1 STATE PLANNING STRATEGY

The State Planning Strategy is a land use planning strategy for Western Australia's development up to the year 2029.

The Strategy prepares for significant population growth, an expanding economy, a changing and vibrant community and a sustainable future. It provides a vision to assist strategic decision-making and a set of principles by which coordinated, sustainable development will be implemented. It is a plan to meet community needs and aspirations, and facilitate wealth creation, the provision of public infrastructure and the protection and improvement of the environment.

A key principal of the Strategy, relevant to the Warradarge Wind Farm proposal is to:

'Protect and enhance the key natural and cultural assets of the State and deliver to all Western Australians a high quality of life which is based on environmentally sustainable principles'.

The Strategy aims to increase use of energy sources which have minimal impact on the environment, prevent further loss in biodiversity, ensure that air, water and soil quality are protected and where necessary improved, reduce consumption of materials and promote recycling, promote management and protection of resources, protect landscape, open space and public access, enhance the quality of life for all Western Australians and protect the State's cultural heritage.

The development of the Warradarge Wind Farm is closely aligned with this strategic environmental aim of the State.

COMPLIANCE STATEMENT

- ***The development of the Warradarge Wind Farm is closely aligned with the strategic intent of the State from an environmental perspective, in that it is based on environmentally sustainable principles and aims to protect and improve the States environment through improving the sustainable production of energy in Western Australia.***

5.2 STATE SUSTAINABILITY STRATEGY

The State Sustainability Strategy (the Strategy) provides a framework for the State Government to respond to its sustainability agenda. The Strategy proposes a set of sustainability principles that guide how government, industry and communities think about and approach the management of resources. These principles are aimed at facilitating change that has net social, environmental and economic benefit for current and future generations.

The Strategy identifies six broad goals and forty-two strategy areas which are intended to guide Government action towards achieving its vision for a sustainable Western Australia. The six broad goals are:

- Sustainability and Governance,
- Contribution to Global Sustainability,
- Sustainable Natural Resource Management,
- Sustainability and Settlements,
- Sustainability and Community, and
- Sustainability and Business.

In relation to sustainable and renewable energy sources, the Strategy identifies the need to facilitate renewable energy generation in the electricity market by removing impediments and ensuring the new electricity market provides opportunities for effective participation. The development of wind farm operations is closely aligned with this objective.

This Strategy reflects on the imperative of ensuring land use and development is consistent with the efficient use of energy and the minimisation of greenhouse gas emissions. Energy produced by wind farms is considered as a clean and sustainable energy which thereby embodies the principles of this Strategy and the broader international and national agenda to reduce greenhouse gas emissions.

Specifically, the Warradarge Wind Farm responds to the 'Sustainable Energy' sub-strategy of the State Sustainability Strategy as it encourages and facilitates movement away from the current reliance on fossil fuels to practices that conserve energy and encourage the use of more benign alternative forms of renewable energy. The vision of this sub-strategy is as follows:

'(To promote) Western Australia's transition to a sustainable energy future is globally responsible and locally innovative'.

The proposed Warradarge Wind Farm is also directly aligned with the key objectives and initiatives of the 'Sustainable Energy' sub-strategy, as outlined below:

- The proposal adopts best practice energy management in the WA community. The Strategy also specifically highlights Verve Energy's Albany Wind Farm, commenting that it is an example of 'best practice turbine technology (which) demonstrates a new control system that maximises wind turbine performance'. The proposed Warradarge Wind Farm will be designed and constructed to the same high standard.
- The proposal demonstrates a greater awareness of the environmental, economic and social benefits of energy efficiency and renewable energy as it will:
 - Providing a clean source of energy which has a much lower environmental impact than conventional energy technologies.
 - Bring economic benefits to the local regional community as the development and installation of wind farms creates new jobs, regional development and long term economic growth.
- The proposal facilitates the replacement of old electricity generators in the State with new, cleaner and more efficient technologies.
- The proposal is aligned with the State Government actions and Federal Government initiatives, including the Mandatory Renewable Energy Target (MRET). The MRET aims to increase the amount of energy generated from renewable sources and recognises the benefits of demand-side initiatives for energy conservation.

The desire by Verve Energy to construct a wind farm at Warradarge is driven by this sustainability agenda while being cognisant of the importance of minimising the potential impacts (including visual and environmental) of the proposal on the site and its surrounds. These potential impacts are addressed in detail throughout this report.

Once constructed, the Warradarge Wind Farm has the potential to produce up to 875 Million Kilowatt-hours of electricity, on average every year, equivalent to the annual electricity demand of 140,000 households. This represents a significant project for the region that will assist in achieving one of the principal intents of the State Sustainability Strategy.

COMPLIANCE STATEMENT

- ***The desire by Verve Energy to construct a wind farm at Warradarge is consistent with the State Sustainability Strategy while being cognisant of the importance of minimising the potential impacts (including visual and environmental) of the proposal on the site and its surrounds.***
- ***Specifically, the Warradarge Wind Farm proposal is closely aligned with the 'Sustainable Energy' sub-strategy outlined in the State Sustainability Strategy, as it encourages and facilitates movement away from the current reliance on fossil fuels to practices that conserve energy and encourage the use of more benign alternative forms of renewable energy***

5.3 ENVIRONMENTAL PROTECTION AUTHORITY – POSITION STATEMENT NO.2 – ENVIRONMENTAL PROTECTION OF NATIVE VEGETATION IN WESTERN AUSTRALIA

This Position Statement provides an overview of the EPA's position on the clearing of native vegetation in Western Australia with particular reference to clearing within agricultural areas. Where a proposed wind farm involves clearing of remnant vegetation, the proposal should be assessed against the EPA Position Statement No.2.

In assessing a proposal, the EPA will consider supporting clearing in an agricultural area where:

- The proposed land use addresses alternative mechanisms for protecting biodiversity. Opportunities for addressing biodiversity could include rehabilitation of disturbed areas and/or acquisition of areas containing remnant native vegetation. The EPA would like to see an overall environmental benefit as a result of the proposal, such as ensuring protection and management of higher quality remnant native vegetation in the general area (not necessarily on the same property).
- The area proposed for clearing is relatively small, depending on the scale over which significant biodiversity changes occur in the particular area, including the extent of vegetation in the surrounding area, and recognising that the values will vary for different ecosystems.
- The proponent demonstrates that the elements set out in the Position Statement are being met (eg. biodiversity values, Indigenous plants and animals, on and off-site impacts managed appropriately, etc). This will require extensive local and regional biodiversity work.

A large proportion of the study area in **Annex 3** (76%) comprises cleared land, predominately for pasture, which has no conservation value as vegetation. The remainder of the site comprises the following:

- Twenty five intact vegetation units in Very Good to Excellent condition.
- Two vegetation types are similar to the description available for 'Lesueur-Coomallo Floristic Community', which is listed as a Threatened Ecological Community, and is therefore considered to be of Very High Conservation Significance.
- The remainder of the vegetation is of High Conservation significance.

The Warradarge Wind Farm proposal does not require further clearing of vegetated areas, with the exception of 0.7 hectares, to accommodate the proposed transmission line. All significant vegetated areas that contain Threatened Ecological Communities and Priority species have been avoided in this area.

Refer Section 4.3.12 of the Development Application Report and Annex 3 in relation to the proposed vegetation clearing.

COMPLIANCE STATEMENT

- **25 intact vegetation units (and 406 plant species) were identified within the study area and were found to be in very good to excellent condition. 4 species are listed as Threatened and 22 are listed as Priority flora under the WA Wildlife Conservation Act. The proposed wind farm however has been designed to avoid a significant amount of clearing, with only 0.7ha of clearing required to accommodate the proposed transmission line. This clearing is less than 1% of the total 82.5 hectare footprints and will avoid all significant Threatened Ecological Communities, Priority Ecological Communities and Priority flora that were identified.**
- **A desktop review identified 12 fauna species of conservation significance (with the Carnaby's Cockatoo believed to be the most relevant, given foraging habitat is present within the proposed wind farm area). No roost sites, or potential roost sites, were observed during the field visit. If clearing of foraging habitat is kept to a minimum, the local and regional conservation status of this species is unlikely to be affected.**
- **The Flora and Fauna Assessment concludes that individual avifauna mortalities as a result of bird strikes with wind turbine blades is unlikely to affect population numbers at a local or regional scale. In addition the risk to bats was considered not significant.**
- **All important vegetated areas, Threatened Ecological Communities and Priority species, protected by federal and state environmental legislations have been intentionally avoided.**
- **It is acknowledged that a clearing permit would be applied for in advance of any clearing.**

5.4 ENVIRONMENTAL PROTECTION AUTHORITY (SOUTH AUSTRALIA) - WIND FARM ENVIRONMENTAL NOISE GUIDELINES

Until such time as a formal policy is adopted in Western Australia, the Department of Environment and Conservation (DEC) endorses the criteria and approach of assessing wind farms based on background noise levels, as described in the South Australian guidelines – *Environmental Protection Authority – Wind Farms Environmental Noise Guidelines (South Australia)* (Noise Guidelines).

In accordance with the Noise Guidelines, the predicted equivalent noise level (LAeq,10), adjusted for tonality should not exceed:

- 35dB(A) at relevant receivers in localities which are primarily intended for rural living*, or
- 40dB(A) at relevant receivers in localities in other zones; or
- Background noise (LA90,10) by more than 5dB(A),

whichever is the greater, at all relevant receivers for wind speed from cut-in to rated power of the Wind Turbine Generator (WTG) and each integer wind speed in between. The background noise should be determined by the data collection and regression analysis procedure recommended under Section 3 of these Guidelines.

Section 4.4.1 outlines the information and documentation requirements of the *Noise Guidelines*.

COMPLIANCE STATEMENT

- **Based on a detailed Noise Impact Assessment in relation to the proposed Warradarge Wind Farm, noise emissions at domestic receiver points have been calculated to comply with the background noise criteria under all wind conditions.**

COMPLIANCE STATEMENT

- *Noise levels at one non-domestic receiver point has been calculated to exceed the background noise criteria, however it is noted that the criteria is not applicable at this location. Verve Energy has negotiated secure tenure through lease agreements in relation to Lots 10847, 10848, 10850, 10851 and 10853. These leases contain a noise buffer clause to allow wind turbine noise to exceed the greater of either 35dB(A) or 5dB(AB) above background noise, in areas of land away from noise sensitive premises. This will ensure no future noise sensitive premises will be constructed throughout the life of the wind farm in areas of each lot where the wind farm may exceed permissible limits.*

5.4.1 COMPLIANCE CHECKLIST

Table 2 below, provides a checklist of the information and documentation required to undertake noise modelling for the Warradarge Wind Farm proposal against the South Australian Noise Guidelines, in the absence of WA specific noise guidelines for wind farms:

TABLE 2 –WIND FARM ENVIRONMENTAL NOISE GUIDELINES COMPLIANCE CHECKLIST (SOUTH AUSTRALIA) (SOURCE: EPA SA 2012)

COMPLIANCE CHECKLIST EXTRACT	COMPLIANCE	DISCUSSION
PREDICTED NOISE FROM THE WIND FARM		
Make and model of WTGs to be used	✓	Siemens SWT-3.0-101, at the highest hub height under construction (100m). This represents the noisiest turbine possible for the proposed wind farm.
Octave one-third octave band sound power levels and associated wind speed of WTGs to be used	✓	The one-third octave and data sound power levels for Vestas 112 3MW Turbines, at a hub height of 84m has been utilised for a low frequency assessment. One-third octave band data was not used, as low frequency data was not available for Siemens SWT-3.0-101 turbine.
Positions of all WTGs shown on a map	✓	Refer Annex 4 – Noise Impact Assessment (Appendix A of 14014-8-11250).
Table of WTGs and relevant receivers coordinates	✓	Refer Annex 4 – Noise Impact Assessment (Appendix A of 14014-8-11250).
Description of zone category, zone maps for all receivers.	✓	All areas assumed to be Rural Living.
Predicted noise levels for those premises in worst-case wind direction for wind speeds from cut-in speed to the speed of WTG rated power	✓	
Model used and method for deriving noise levels	✓	
Indication of accuracy of wind farm noise prediction	✓	
Amount of noise reduction	✓	Noisiest operating condition utilised for modelling hence no noise reduction (other than distance).
Topographic map of wind farm and affected premises showing labelled noise contour lines	✓	See Annex 4 – Noise Impact Statement (Appendix A of 14014-8-11250).
Location of wind measuring position(s) used for noise assessment and compliance purposes.	✓	Refer Annex 4 – Noise Impact Assessment and Annex 5 – Background Noise Monitoring (Appendix A of Background Noise Monitoring Report – ref. 14290-4-11250-01).

MEASUREMENT AND ASSESSMENT OF BACKGROUND NOISE		
Description of noise measuring equipment used (make, model, type)	✓	Sound Level Meter – Black Box 1 S/N: Logger 69, Class 1. Model: RTA02, S/N: 052, Class 2
Noise measurement position including height above ground, wind speed and distance to nearest building structure.	✓	Refer Annex 4 – Noise Impact Statement (Appendix A – Residential and Wind Turbine Locations) and Annex 5 – Background Noise Monitoring (Table 3.2 – Monitoring Location Details).
Description and photograph of measurement position showing nearby trees and building structures.	✓	Refer Annex 5 – Background Noise Monitoring Report (Appendix B of Background Noise Monitoring Report – ref. 14290-4-11250-01).
Angle direction between the line connecting the noise measurement point and nearest WTG	✓	Information not needed for this area as background noise levels do not change with wind direction.
Atmospheric conditions	✓	Refer Annex 4 – Noise Impact Statement (Table 4.2) Temperature - 15°C Relative Humidity – 70% Atmospheric Pressure – 101.325 kPa
Wind speed data at noise measurement site	✓	
Time and duration of monitoring	✓	
Sampling time for wind and noise measurements	✓	
Total number of data pairs measured and number of data pairs measured at worst wind conditions between cut-in speed to the speed of WTG rated power	✓	
Description of regression analysis method	✓	
Graphical plot of data in Section 3.4 of Guidelines	✓	Refer Annex 4 – Noise Impact Statement (Appendix B – Predicted Noise Level Contours)
Correlation coefficient and equation for the regression curve	✓	

5.5 PLANNING BULLETIN NO.67 - GUIDELINES FOR WIND FARM DEVELOPMENT (WAPC 2004)

Planning Bulletin No.67 (PB67) was prepared to provide local government, other relevant approval authorities and wind farm developers with a guide to the planning framework for the balanced assessment of land-based wind farm developments throughout Western Australia. PB67 identifies key planning issues relevant to wind farm developments, and provides guidance in the design and siting of wind farms, as well as assisting local governments in their assessment process. The key objectives of PB67 are as follows:

- Facilitate the development of wind farms in an efficient, cost-effective and environmentally responsible manner that meets community needs, while taking into account the needs of developers, and State and national imperatives.
- Promote community understanding of the issues involved in the design and installation of wind farm infrastructure and provide opportunities for community input into decision-making.
- Promote a consistent approach in the preparation, assessment and determination of applications for planning approval for wind farm developments.
- Minimise disturbance to the environment (including landscape) and loss of public amenity in the establishment, operation, maintenance and decommissioning of wind farms.

PB67 is the principal tool for the assessment of planning applications relating to wind farms in Western Australia.

5.5.1 PLANNING AND ENVIRONMENTAL ISSUES

The following provides a summary of the key planning and environmental issues cited in PB67 that will be considered in the decision-making process.

- **Land Use and Planning Controls** – PB67 indicates that the Model Scheme Text does not include a definition of wind farms, hence wind farm applications are typically assessed as a ‘use not listed’. In this instance, the Warradarge Wind Farm is classified as a ‘use not listed’ under the Shire of Coorow Town Planning Scheme No.2 and the Shire of Carnamah Town Planning Scheme No.1, and will be required to be advertised for public comment. The proposal will be determined on its merits, having regard to the overall context of the area and its ability to accommodate the wind farm development.
- **Public Health and Aircraft Safety** – PB67 indicates that wind farm developments must be highlighted on all navigational maps and equipped with tower safety lighting or marking to minimise any impact upon the safety of aircraft and the operation of airfields. An Aviation Assessment has been undertaken to determine any impacts on flight paths in the area (see Annex 7 of the Development Application Report).
- **Socio-economic Benefits** – wind farm developments may have direct and indirect benefits for the community and its economy. The assessment and consultation process should allow for any potential negative impacts to be considered. PB67 indicates that a Management Plan for visitors should be considered if the wind farm is to be accessible or visible to the public. Given the proposed Warradarge Wind Farm is located in a General Rural area, away from the built up areas of Leeman, Greenhead, Coorow, Eneabba and Carnamah, and will not be open to the general public, it is considered such a Management Plan is not required. The Proponent has set up a supplier database for the local businesses who think they may be able to assist during the wind farm construction. This database will be supplied to the principal contractor who will build the wind farm, so they are aware of local businesses that are available to supply services.
- **Construction, Infrastructure and Utilities** – the transport of equipment and freight to the site should be carefully managed in consultation with local government.

- Landscape and Visual Impact – the degree to which a wind farm development will impact on the landscape will depend on:
 - Siting, layout and design of the turbines, infrastructure, signage and ancillary facilities.
 - Number, colour, shape, height and surface reflectivity of the towers and blades.
 - Visibility of the development, having regard to the location, distance from which the development is visible, skyline and view-sheds.
 - Significance and sensitivity of the landscape, having regard to topography, the extent and type of vegetation, natural features, land use patterns, built form character and community values.

This is discussed in Section 4.2 of the Development Application Report and is supported by a comprehensive Landscape and Visual Assessment has been undertaken and is included within **Annex 2**.

- Noise – a wind energy facility can create noise from the turbine gearbox or generator, movement of the blades, and construction noise, however, the noise characteristics vary according to the make and model. As a guide, in order to achieve acceptable noise levels, the minimum separation distance between a wind turbine and noise sensitive land use not associated with the wind farm is likely to be 1 kilometre. Section 4.4 of the Development Application Report broadly considers Noise, with a formal noise assessment attached as **Annex 4 and 5**.
- Other Possible Amenity Effects – other potential amenity effects include shadow flicker and glint. These elements are considered in further detail as part of Section 4.9 of the Development Application Report.
- Vegetation and Fauna – the types, location and significance of flora and fauna should be mapped. Where a proposed wind farm involves clearing of remnant vegetation, the proposal should be assessed against the EPA's Position Statement No.2 – Environmental Protection of Native Vegetation in WA. The impact of wind farms against birds and bats should also be considered. Vegetation and Fauna are considered earlier in this report and in the formal Flora, Vegetation and Fauna Study included as **Annex 3** of the Development Application Report.

Electromagnetic Interference – based on a detailed Investigation of Possible Impacts on Broadcasting and Radiocommunication Services, there are currently no potential conflicts between any point to point radio system paths and the proposed wind turbines. Whilst this is based on current wind turbine locations, if any turbines are repositioned within the Wind Farm Envelope, no conflict with current radio link ray lines or radio sites is predicted. This is considered in a formal assessment in **Annex 6**.

COMPLIANCE STATEMENT

- ***Refer to the compliance matrix overleaf.***

5.5.2 COMPLIANCE MATRIX

Table 3, below, provides a checklist of the key information requirements outlined in PB67:

TABLE 3 – PLANNING BULLETIN 67 – GUIDELINES FOR WIND FARM DEVELOPMENT – COMPLIANCE CHECKLIST

PLANNING BULLETIN REQUIREMENT EXTRACT	COMPLIANCE	REFERENCE IN DEVELOPMENT APPLICATION REPORT
7.1 Site Analysis – <ul style="list-style-type: none"> Context Statement (planning framework, site detail/characteristics, contours, land uses, ownership etc). 	✓	Refer Annex 1
<ul style="list-style-type: none"> Technical Assessment (wind information, landscape significance, ground conditions, erosion factors, surface and groundwater conditions) 	✓	Section 1 of Development Application Report.
<ul style="list-style-type: none"> Access to the electricity network. 	✓	Section 3.7 of Development Application Report.
7.2 Wind Farm Design Statement – including detail regarding turbine design, layout, siting & orientation, road design, plans and cross-sections, top soil, vegetation clearing and rehabilitation areas, electrical specifications, operational and maintenance arrangements.	✓	Section 3.1 – 3.3 and 4.2 of Development Application Report.
7.3 Impact Assessment and Mitigation Measures – addressing: <ul style="list-style-type: none"> Landscape and Visual Impact Statement. Noise Impacts. Environmental Impacts. Amenity Impacts. Construction Impacts. Power network connection and transmission line infrastructure. Decommissioning and reinstatement proposals. Social and economic benefits, tourism benefits, relationship to other land uses, design life span etc. 	✓	Section 3 and 4 of Development Application Report, and various Annexures.
7.4 Consultation – including proposals for consultation with Government agencies, stakeholder meeting details and community consultation details.	✓	Section 2 and Annex 12 – Stakeholder Consultation.

5.6 VISUAL LANDSCAPE PLANNING IN WESTERN AUSTRALIA – A MANUAL FOR EVALUATION, ASSESSMENT, SITING AND DESIGN WAPC 2007

The Visual Landscape Planning Manual has been developed to help public and private sector planners to address visual landscape matters in the planning process. The Manual explains the fundamental planning tools of visual landscape evaluation and visual impact assessment and provides guidelines for siting and design in relation to a range of landscape types and land uses.

A detailed landscape and visual impact assessment has been undertaken in accordance with this Manual to determine the potential impact of the Warradarge Wind Farm proposal on the landscape. The assessment is based on the maximum potential impact of the proposed wind farm development ('worst case scenario'), which is 100 turbines at a tip height of 152 metres. A complete copy of this assessment is provided in Annex 2 of the Development Application Report.

The Manual acknowledges that wind farms have a context that is broader than other utility towers. Although wind farms involve planning issues at local level (as with other utility services) they also

'involve more global issues such as climate change. In this context, the planning processes need to be cognisant of the broad context while dealing with the local planning considerations.'

The Manual establishes a series of state, regional, local and site level principles and guidelines with respect to wind farms. This includes addressing factors with respect to avoiding significant landscapes, minimising impact through the layout, size, number and colour of turbines and associated infrastructure, minimising earthworks and implementing a program of rehabilitation.

The components of wind turbines that may have an impact on the surrounding landscape and visual character comprise:

- Wind farm project area.
- Layout of wind farm.
- Turbine size (tower height and rotor size)
- Turbine rotational speed.
- Number of turbines.
- Colour of turbines.
- Reflectivity of rotating blades.
- Access roads.
- Ancillary features including associated buildings, signage, telecommunications infrastructure and transmission lines.
- Extent of clearing required.
- Construction procedures.
- Rehabilitation measures.

The design of the Warradarge Wind Farm has sought to minimise visual impact from both a regional, local and site perspective. This includes:

- Views of the proposed wind farm will occur from within a 25km radius of the study area.
- There will be open views towards the site from numerous stretches of road. However, due to the low nature of the roadside and intervening vegetation and generally flat to undulating topography, views will be filtered in some locations.

- Figures 5 and 6 in Annex 2 shows the turbines that are visible from the hub (100m) upwards and the tip height (152m). These figures show that beyond 10km from the wind farm the number of turbines visible to the west reduces to zero except on a few elevated areas. In areas to the south and north the turbines are theoretically visible out to 15km, beyond which they are only seen in isolated areas. To the west the tips of the turbines are theoretically visible to 25km except in lower areas of the landform but it can be seen that the hubs are not as visible beyond 15km, and this is due to the screening effect of the topography.
- The proposed wind farm will however have a large impact upon landscape character within 5km of the site. From 5 km to 10 km and 10 km to 25 km in distance from the site, and beyond, due to the reducing visibility of the wind turbines, intervening vegetation and variation in topography the wind farm has a reduced impact on the landscape character. Generally, due to distance, local topography and intervening vegetation, the visual impact on areas further than 25km from the site will be negligible.
- The dominant land use of the study area is agricultural grazing with scattered private housing. Wildflower tourist drives occur on all roads surrounding the site, with pockets of nature reserves. It is evident that human activities have shaped the local landscape. The land is used intensively and the proposed wind farm is considered to be an activity that does not conflict with the prominent land uses.
- The strong vertical form of the turbines as well as the overhead power lines, will dominate the landscape when viewing from a close distance. However, the general site layout, in combination with the existing agricultural land use will result in a clear and cohesive image, which will be aesthetically acceptable. The only variation to this will be in the north-east corner where turbines are more spread out, less cohesive and appear as large, individual elements. This may create a larger impact when viewed from the eastern side of the study area in a north or south direction.

In the context of providing a sustainable energy resource for the Mid-West region of WA, the Warradarge Wind Farm has been designed in an effort to minimise its impact on the site as well as the local and broader regional context in which it is located.

COMPLIANCE STATEMENT

- ***In designing the wind farm, Verve Energy has taken into consideration the Visual Landscape Planning Manual key principles. Table 8 (Section 4.2.27) of the Development Application Report provides an assessment of the proposed wind farm against these guidelines.***

5.7 RELEVANT STATE PLANNING POLICIES (SPPS)

5.7.1 STATE PLANNING POLICY NO.2 (SPP2) – ENVIRONMENT AND NATURAL RESOURCES POLICY

SPP2 is primarily concerned with the conservation and protection of environmental assets and biodiversity as well as sustainable management of natural resources across Western Australia. The key objectives of SPP 2 are as follows:

- Integrate environment and natural resource management within broader land use planning and decision making.
- Protect, conserve and enhance the natural environment.
- Promote and assist in the wise and sustainable use and management of natural resources.

Specifically, SPP 2 recognises there is widespread awareness of the need to increase the efficiency with which energy is used in Western Australia, including the need to reduce reliance on energy produced from non-renewable resources such as fossil fuels. SPP 2 indicates that planning decision-making should:

‘Support the use of alternative energy generation, including renewable energy, where appropriate’.

Based on the above review, the Warradarge Wind Farm proposal is considered to be closely aligned with the strategic intent of SPP 2, in that it will contribute to national and international efforts to reduce emissions of greenhouse gases and other air pollutants and improve sustainable production of electricity in Western Australia. Wind energy is a renewable energy technology, which fits closely with the ideals of this Policy.

COMPLIANCE STATEMENT

- ***The Warradarge Wind Farm proposal will contribute to national and international efforts to reduce emissions of greenhouse gases and other air pollutants and improve sustainable production of electricity in Western Australia.***

5.7.2 STATE PLANNING POLICY NO.2.5 (SPP 2.5) – AGRICULTURAL AND RURAL LAND USE PLANNING

SPP 2.5 focuses on the identification and appropriate zoning of highly productive agricultural land throughout Western Australia.

A summary of the key objectives of SPP 2.5 is provided below:

- Protect agricultural land resources wherever possible by—
 - a) discouraging land uses unrelated to agriculture from locating on agricultural land;
 - b) minimising the ad hoc fragmentation of rural land; and
 - c) improving resource and investment security for agricultural and allied industry production.
- Minimise the potential for land use conflict by—
 - a) providing adequate separation distance between potential conflicting land uses;
 - b) introducing management requirements that protect existing agricultural land uses;
 - c) identify areas that are suitable and capable for intensive agricultural pursuits as agricultural priority areas; and
 - d) avoid locating new rural settlements in areas that are likely to create conflict with established or proposed agricultural priority areas.

- Carefully manage natural resources by—
 - a) discouraging development and/or subdivision that may result in land or environmental degradation;
 - b) integrating land, catchment and water resource management requirements with land use planning controls;
 - c) assisting in the wise use of resources including energy, minerals and basic raw materials;
 - d) preventing land and environmental degradation during the extraction of minerals and basic raw materials; and
 - e) incorporating land management standards and sequential land use change in the land use planning and development process.

Given the proposed Warradarge Wind Farm is located within a 'Rural' Zone of the Shire of Coorow Town Planning Scheme No.2 and the Shire of Carnamah Town Planning Scheme No.1, it will be important to consider the key objectives and elements of SPP 2.5. Importantly, the proposal will need to consider the following:

- Potential for land use conflict –an adequate separation distance has been provided between the proposed wind farm and potential conflicting/sensitive land uses. As part of the Development Application process, sensitive land uses in proximity to the wind farm have been identified and an assessment of potential impacts undertaken (eg. Visual, noise, amenity, shadow flicker)
- Site Selection – a comprehensive site selection process has been undertaken, in relation to key technical, environmental, statutory planning and community aspects. The proposed location of the Warradarge Wind Farm is not considered to have the potential to diminish the agricultural and rural integrity of the area.

COMPLIANCE STATEMENT

- ***The Warradarge Wind Farm is considered to be consistent with the rural/agricultural setting and the subject land has low agricultural value. The wind farm footprint only removes less than 1% of the agricultural land from production across the subject Lots.***
- ***In relation to potential noise impacts, based on a detailed Noise Impact Assessment in relation to the proposed Warradarge Wind Farm, noise emissions at domestic receiver points have been calculated to comply with the background noise criteria under all wind conditions.***
- ***Verve Energy has negotiated secure tenure option agreements to all subject Lots with respect to a noise buffer clause. This allows noise to exceed the required level in areas away from noise sensitive premises. With such management procedure in place, the potential for land use conflict with sensitive uses is therefore considered to be minimal. Various restrictions will also be placed on construction hours to maintain the rural/agricultural amenity of the area.***
- ***Verve Energy is negotiating noise buffer agreements with neighbouring lots and this allows noise to exceed the required level in areas away from noise sensitive premises. With such management procedure in place, the potential for land use conflict with sensitive uses is therefore considered to be minimal. In the event an agreement cannot be reached with neighbouring Lot owners the turbines can be sited to avoid causing excessive noise over third party land.***
- ***The location of the proposed wind farm within a Rural area is considered appropriate as it is located a considerable distance from the townships of Leeman, Coorow, Greenhead, Eneabba and Carnamah, and will therefore have a minimal effect on the locality.***

5.8 ENERGY 2031 - STRATEGIC ENERGY INITIATIVE – OFFICE OF ENERGY

The WA State Government Office of Energy released *Energy 2031 – Strategic Energy Initiative* in March 2011, which proposes a vision for the next 20 years. The initiative proposes to develop plans, strategies, policies and regulatory frameworks to ensure a range of energy supply options is available to meet WA's future needs under various scenarios. The Strategic Energy Initiative process aims to develop:

- An energy vision for 2031, including a range of demand scenarios and potential supply options;
- A set of clear goals to guide decisions by policy makers and investors;
- A range of flexible strategies to allow industry and the community to adapt to emerging opportunities and challenges; and
- Policy and regulatory frameworks to promote investment and competitiveness in the energy value chain and remove impediments to technological change.

This Strategic Initiative highlights that the introduction of the Commonwealth Government's Renewable Energy Target (RET) Scheme and the introduction of the carbon pricing system will drive low emission generation technology (for example, renewable energy) and carbon offset technology (for example, carbon capture and storage).

COMPLIANCE STATEMENT

- ***The proposed Warradarge Wind Farm is closely aligned with the overall intent of this initiative, as it will 'ensure energy production and use is compatible with good environmental stewardship and minimises carbon emissions'. The proposed Warradarge Wind Farm aims to deliver a clean and renewable source of energy have the potential to reduce reliance on fossil fuels and the emission of greenhouse gases into the Western Australian environment.***
- ***The 100 turbine wind farm would produce on average every year, 875 million Kilowatt-hours (kWh) of electricity which is equivalent to the average annual electricity needs of 140,000 west Australian homes. The wind farm would also prevent at least 700,000 tonnes of CO₂ from entering the atmosphere annually.***

6 Regional Planning Framework

6.1 MID WEST REGIONAL PLANNING AND INFRASTRUCTURE FRAMEWORK – THE WAY FORWARD (DRAFT)

The Warradarge Wind Farm proposal is situated within the Mid-West region of Western Australia. Once finalised, the Mid-West Regional Planning and Infrastructure Framework (the Framework), released in November 2011, will become a second tier document preceded by the WA State Planning Strategy (1997) and will be recognised as a regional strategy under the State Planning Framework. The key objectives of the Draft Framework are to:

- Provide the regional context for land-use planning in the Mid-West.
- Provide an overview of the major regional economic, social, cultural and environmental issues.
- Identify the priority actions required to enable the comprehensive regional and sub-regional planning, and
- Identify the priority regional infrastructure projects to facilitate the economic and population growth in the Mid-West.

The Framework identifies several key themes to assist in achieving the above objectives. The themes which are considered to be directly relevant to the Warradarge Wind Farm proposal are as follows:

- A green region that should grow within the constraints of its diverse and unique natural assets and that seeks to utilise its renewable assets.
- A responsible region that ensures that future growth is sustainable, responsible and in keeping with the natural landscape.
- An innovative region that embraces technology to add value to its industries, support the delivery of services and stimulate new technology-based enterprises.

The Draft Framework identifies that the Mid-West region has abundant renewable energy resources, such as solar, wind and geothermal, and specifically highlights the Greenough River Solar Farm proposal by Verve Energy, in an effort to showcase the strong renewable energy push in the Mid-West region. The Framework also identifies that a key challenge in future energy production in the region will be the increasing transmission capability for the Mid-West region including support for renewable energy production and supply.

The Framework indicates that a Mid-West Energy Strategy will be prepared, and will be guided by the State Energy Strategy, to focus on the delivery of regional energy infrastructure necessary to meet anticipated demand and support regional development. The Strategy will identify opportunities to further diversify regional power generation, including potential renewable energy projects (including wind) and also the viability of towns to support alternative energy sources. This Strategy is identified as a flagship priority project.

COMPLIANCE STATEMENT

- ***The Warradarge Wind Farm proposal represents a significant renewable energy project in the Mid-West region, and will actively assist in achieving the above objectives and themes of the Draft Framework. Specifically, the proposal demonstrates a commitment to achieving sustainable and responsible future growth, whilst respecting and retaining the natural rural landscape. The proposal also represents a significant innovative project which will add value to the local community and wider Mid-West region.***

7 Local Planning Framework

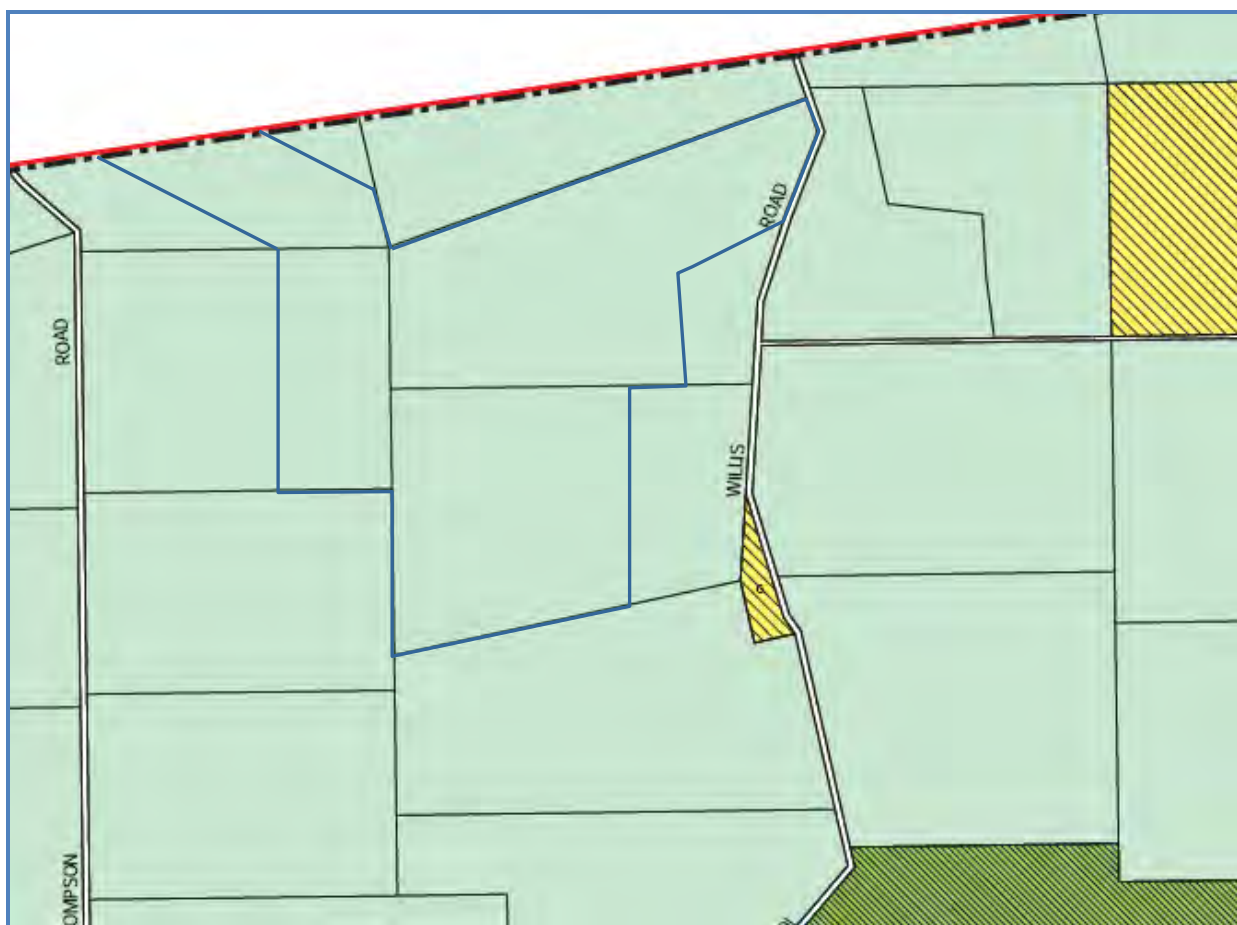
7.1 SHIRE OF COOROW TOWN PLANNING SCHEME NO.2

The Shire of Coorow Town Planning Scheme No.2 (TPS2) provides the local statutory framework for land use and development control within the Warradarge locality. An assessment of the proposed Warradarge Wind Farm against relevant provisions of TPS2 is provided within the following sections.

7.1.1 ZONING

The proposed Warradarge Wind Farm is located within a 'Rural' zone of the Shire of Coorow's TPS2, as shown in Figure 4, below:

FIGURE 4 – SHIRE OF COOROW TPS2 – SCHEME EXTRACT (SOURCE: WAPC)




LOCAL SCHEME RESERVES

PUBLIC PURPOSES	DENOTED AS FOLLOWS:
A	AMBULANCE SUB CENTRE
CO	COUNCIL OFFICE
CW	CAMPING & WATER
D	DRAIN
EX	COUNTRY AUTOMATIC EXCHANGE
FP	FORESTRY PURPOSES
G	GRAVEL

ZONES

RURAL
RURAL RESIDENTIAL

 Subject Site

The general objectives of each zone are set out in Clause 4.2 of TPS2. The key objective of the 'Rural' zone is as follows:

'To provide for a range of rural pursuits such as broadacre and diversified farming which are compatible with the capability of the land and retain the rural character and amenity of the locality'.

In considering the Warradarge Wind Farm proposal's consistency with the objective of the 'Rural' zone, consideration has been given to the proposal in the context of the site and its local and broader regional surrounds. In this regard, the following is considered relevant:

- The construction of the Wind Farm will require minimal clearing of existing vegetation. Clearing will be limited to turbine sites, a substation (including buildings), transmission line and access roads between the turbines and to external roads. The site for each turbine has been carefully considered to minimise the disturbance of priority flora by siting within agricultural land.
- Of the 82.5 hectare development footprint proposed, only 0.7 hectares of land will be cleared. This minimal amount of clearing will ensure the natural rural form of the site will be retained.
- The proposal, whilst not a typical form of farming, is a diversified form of farming that has local, regional, and state benefits.
- A detailed landscape and visual impact assessment of the proposal has been conducted (**Annex 2**) to assist in determining the visual impact of the proposal on the surrounding rural environment. The landscape and visual impact assessment has been prepared in accordance with State Planning guidelines and illustrates the visual impact of the wind farm on the rural landscape.

Overall, the proposed Warradarge Wind Farm will result in minimal onsite modification to the existing rural landform and minimal modification to vegetation in the Rural zone. Whilst it is acknowledged that the Wind Farm will be visible from surrounding local and regional locations, these views are limited as a consequence of the distance of the site from developed areas (i.e. Coorow, Leeman, Greenhead, Eneabba and Carnamah). Approval of this proposal will provide the opportunity to establish a Wind Farm that has the potential to generate enough power equivalent to the needs of over 140,000 homes annually and reduce the impact on the environment which would have otherwise resulted from the burning of fossil fuels to supply electricity to these homes.

7.1.2 SCHEME OBJECTIVES

Clause 1.6 of TPS2 sets out the general objectives of the Scheme. The key objectives for the Scheme, relevant to the proposed Warradarge Wind Farm are as follows:

- To promote the sustainable use of rural land for agricultural purposes whilst accommodating other rural activities.
- To protect and enhance the environmental values and natural resources of the Scheme area and to promote ecologically sustainable land use and development.
- To safeguard and enhance the character and amenity of the built and natural environment of the Scheme area.

The Warradarge Wind Farm proposal is generally aligned with the above aims of the Scheme as it demonstrates the sustainable use of rural land for other rural activities such as wind farming. The proposal also aims to protect and enhance the environmental values of the rural locality and safeguards amenity of the Shire through locating in an area which is away from major towns in the Shire and involves minimal clearing of vegetation. The proposal also ensures the natural rural form of the site is retained.

7.1.3 LAND USE DEFINITION

As outlined in Planning Bulletin 67, the Model Scheme Text does not include a definition for wind farms or wind energy facilities, hence wind farm developments are typically classified as a 'use not listed' in town planning schemes. A 'wind farm' as a use class is not specifically defined in the Shire of Coorow's TPS2 and therefore it is classified as a 'use not listed' in accordance with Clause 4.4.2 of TPS2, meaning that:

'If a person proposes to carry out on land any use that is not specifically mentioned in the Zoning Table and cannot reasonably be determined as falling within the type, class or genus of activity of any other use category, the local government may –

- (a) determine that the use is consistent with the objectives of the particular zone and is therefore permitted;*
- (b) determine that the use may be consistent with the objectives of the particular zone and thereafter follow the advertising procedures of clause 9.4 in considering an application for planning approval; or*
- (c) determine that the use is not consistent with the objectives of the particular zone and is therefore not permitted.*

It is expected that the Shire will determine that either the use is or may be consistent with the objectives of the Rural zone (Items (a) and (b) above). The application is unlikely to be inconsistent with the objectives of the Rural zone.

7.1.4 ADVERTISING REQUIREMENTS

Notwithstanding Clause 4.4.2, Clause 9.4.1 of TPS2 states that:

'Where an application is made for planning approval to commence a use or commence or carry out development which involves a use which is:

...(b) a use not listed in the Zoning Table.

the local government is not to grant approval to that application unless notice is given in accordance with clause 9.4.3'.

Clause 9.4.3 of TPS2 identifies that for an application for planning approval for a 'use not listed', the Shire will require advertising in one or more of the following ways:

- Notification of surrounding landowners and occupiers;
- A notice to be placed in the newspaper circulating in the Scheme area; and
- A sign to be erected on the subject site.

In all instances, a 14-day advertising period is identified, after which the Shire is required to make a recommendation to the Mid-West Joint Development Assessment Panel (JDAP). This application period may be extended, however, given the nature and scale of the development proposed.

7.1.5 ACCOMPANYING MATERIAL

Clause 9.2 of TPS2 outlines the information that is required to be submitted, where applicable, with an Application for Planning Approval. Table 4, provides a checklist of these requirements:

TABLE 4 – PLANNING APPLICATION REQUIREMENTS - CHECKLIST

APPLICATION REQUIREMENTS	COMPLIANCE	NOTE
Detailed Site Plan	✓	<p>Included at Figure 4 of The Development Application Report.</p> <p>This site plan included as part of this Development Application Report presents one design outcome only, and therefore Development Approval is requested to encompass all potential wind turbine configurations of a 100 turbine wind farm within the site boundary.</p> <p>The final design and location of the turbines will be subject to a tender process once Development Approval is obtained</p>
Information regarding the existing and proposed use of the site, including buildings and structure proposed.	✓	Refer Section 1.8, 1.9 and Figure 17 of Development Application Report
Existing and proposed access	✓	Refer Section 3.8, 3.18 and Figure 14 of Development Application Report.
Details regarding proposed carparking	✓	Refer Figure 12 and 13 (Construction and Administration carparking).
Plans/Elevations and Sections	✓	Refer to all Figures in the Development Application Report.
Any specialist studies	✓	<p>Landscape and Visual Impact Assessment (Annex 2)</p> <p>Flora, Vegetation and Fauna Assessment (Annex 3)</p> <p>Investigation on Possible Impacts on Broadcasting and Communication Services (Annex 6)</p> <p>Aviation Impact Statement (Annex 7)</p> <p>Noise Impact Assessment (Annex 4)</p> <p>Background Noise Monitoring (Annex 5)</p>
Any other information that the local government may require to enable the application to be determined	✓	Refer Development Application Report.

This Development Application Report is accompanied by a comprehensive suite of technical and background information necessary in order to enable the Shire of Coorow to consider and make a recommendation to the Mid-West Joint Development Assessment Panel (JDAP).

COMPLIANCE STATEMENT

- *The Warradarge Wind Farm is generally aligned with the Shire of Coorow's TPS2. Specifically, the proposed Wind Farm will result in minimal onsite modification to the existing rural landform and minimal modification to vegetation in the 'Rural' zone. Whilst not a typical rural pursuit, the proposal is a form of diversified farming, which the Rural zone provides for.*
- *It is acknowledged that that the proposal will be considered a 'use not listed' and therefore is required to be advertised in accordance with the requirements of Clause 9.4.3 of TPS 2.*
- *Whilst it is acknowledged the Wind Farm will be visible from surrounding local and regional locations, these views are limited as a consequence of the distance of the site from developed areas (Coorow, Leeman, Greenhead, Eneabba and Carnamah).*
- *This application for Development Approval includes all relevant accompanying material.*

7.2 SHIRE OF COOROW LOCAL PLANNING STRATEGY

This Local Planning Strategy was prepared to provide strategic guidance for the future development of the Shire by providing an explanation of the content of the Scheme. The Strategy provides a detailed overview of state and regional context, a profile and key issues within the area, and a focus upon town site strategies.

The key objectives for development within the 'Rural' zone of the Strategy are as follows:

- To ensure the continuation of the basic rural use within the zone, encouraging where appropriate, the retention and expansion of present agricultural activities.
- To consider granting Planning Consent to non-rural uses where these can be demonstrated to be of benefit to the district and not detrimental to the area's natural resources and environment generally.
- To permit, subject to Planning Consent, development providing facilities for tourists, travellers and for recreational usage.

Of particular note is the second objective, which indicates the Shire will be supportive of permitting non-rural land uses (such as wind farms) in Rural zones where it can be demonstrated that the proposal will be of benefit to the district and not detrimental to the areas natural resources and environment generally. Given the proposed Warradarge Wind Farm has the potential to generate enough power equivalent to the needs of over 140,000 homes and reduce the impact on the environment which would have otherwise resulted from the burning of fossil fuels, the proposal is considered to be of significant benefit to the local community and district. The proposal will also have the secondary benefits of increased local employment (needed for construction) and tourism.

Verve Energy also propose to pay rent to the relevant landowner throughout the life of the Warradarge Wind Farm ensuring the landowner has a long term income stream from the land regardless of climate..

As has been outlined previously, the proposed wind farm will not be detrimental to the areas natural resources and rural environment.

COMPLIANCE STATEMENT

- ***The Warradarge Wind Farm is generally aligned with the Shire of Coorow Local Planning Strategy, the wind farm footprint only removes less than 1% of the agricultural land from production across the subject Lots so rural use can continue.***
- ***Whilst not a typical rural pursuit, the proposal is a form of diversified farming, however where the Wind Farm is considered a non-rural use, however will be of significant benefit to the local community and will not be detrimental to the area's natural resources or landscape.***

7.3 SHIRE OF COOROW LOCAL STRATEGIC PLAN 2007

This Shire of Coorow Strategic Plan provides a present and future blueprint for the future growth and development of the Shire. Goal 5 of the Local Strategic Plan deals specifically with the local environment, aiming to 'enhance, utilise and conserve natural resources'. The Strategic Plan indicates that this will be achieved through:

- Value adding.
- Initiatives to maintain and improve the Shire's environment.
- Developing initiatives for water.

The proposed Warradarge Wind Farm will demonstrate the Shire's willingness to introduce sustainable initiatives to maintain and improve the Shire's environment, and therefore is consistent with the key elements of this Plan.

COMPLIANCE STATEMENT

- ***The proposed Warradarge Wind Farm will demonstrate the Shire's willingness to introduce sustainable initiatives to maintain and improve the Shire's environment, and therefore is closely aligned with the key elements of this Plan.***

7.4 SHIRE OF COOROW PLAN FOR THE FUTURE 2010-2015

The Shire of Coorow 'Plan for the Future' provides the direction for the Shire over the period 2010/11 to 2014/15. The Vision Statement outlined in the Shire's Plan for the Future is as follows:

'The Shire of Coorow will be a sustainable, progressive, desirable and caring community which recognises and values its diversity'.

The proposed Warradarge Wind Farm is closely aligned with this vision statement, as it will provide an innovative and sustainable alternative energy source, reducing the regional community's dependence on fossil fuels.

COMPLIANCE STATEMENT

- ***The proposed Warradarge Wind Farm is closely aligned with this vision statement, as it will provide an innovative and sustainable alternative energy source, reducing the regional community's dependence on fossil fuels. This is aligned with the Shire's Plan for the Future.***

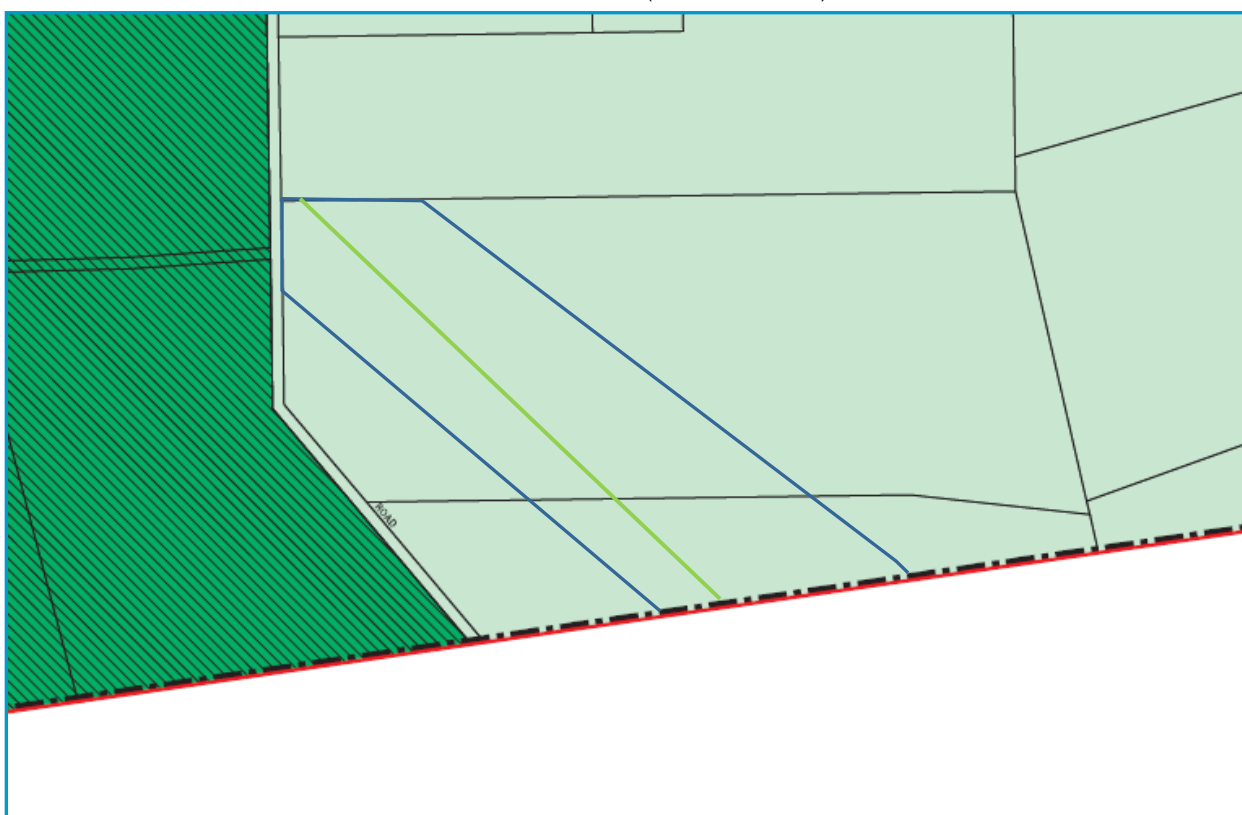
7.5 SHIRE OF CARNAMAH TOWN PLANNING SCHEME NO.1

The Warradarge Wind Farm proposes a transmission line which runs north-west of the proposed wind farm, crossing into the Shire of Carnamah. Accordingly, there is a requirement to obtain planning approval from the Shire of Carnamah for the development of the transmission line. Based on Verve Energy's understanding of the Shire of Carnamah TPS1, it is understood an application will need to be made to the Shire of Carnamah for the portion of the transmission line only.

The transmission line is 10 kilometres in length, however only a portion of the transmission line will be located within the Shire of Carnamah. The transmission line will connect the onsite substation to the recently constructed Eneabba to Karara line. This is proposed to compose of 22 pylons, 63 m in height, with a space between pylons of around 500m. It is understood the proposed transmission line will traverse through Lots 10847 and 10848 to the grid connection point.

The proposed transmission line is located within a 'Rural' zone of the Shire of Carnamah's Town Planning Scheme No.1 (TPS1), as shown in Figure 5:

FIGURE 5 – SHIRE OF CARNAMAH TPS1 – SCHEME EXTRACT (SOURCE: WAPC)



ZONES



RURAL



SPECIAL RURAL



PARKS/RECREATION/CONSERVATION



Proposed Subject Site



Proposed Transmission Line

The key objectives of the 'Rural' zone in TPS1 is as follows:

- a) To give priority to the continuation of viable agriculture production in a manner consistent with sound land use and management practices;*
- b) To provide for and monitor mining activities and associated works; and*
- c) Without necessarily limiting the activities at (a) and (b), to conserve and preserve national bushland, waterways, and Indigenous flora and fauna so that the viability of any natural ecosystem is not adversely affected'.*

7.5.1 DEVELOPMENT REQUIREMENTS

In considering development within the 'Rural' zone, the Shire of Carnamah will have regard for the following (in accordance with Clause 5.7 of TPS1):

- (a) 'The need to ensure that the continuation of Rural land is protected, encouraging where appropriate, the retention and expansion of agricultural activities, and supporting proposal which promote the retention of the predominant lot sizes in the locality.*
- (b) The need to preserve the rural character and rural appearance of the land within this zone.*
- (c) The need to protect, preserve and enhance any natural undeveloped land areas throughout the zones by requiring as conditions on any planning consent issued, the planting of vegetation which will assist in the balancing of the greenhouse effect, provision for shade, prevention of erosion, reduction in salinity, or the provision of habitats for fauna.*
- (d) The State Planning Commission Policy DC3.4 – Rural Land Use Planning Policy'.*

Similarly to the Shire of Coorow TPS2, a 'wind farm,' as a use class is not specifically defined in the Shire of Carnamah TPS1, therefore it will be classified as a 'use not listed' and will likely need to be advertised for a minimum period of 14 days.

The proposed transmission line (for the purpose of transmitting power from the proposed wind farm to the existing Eneabba to Karara line) will result in minimal onsite modification to the existing rural landform of and minimal modification to vegetation in the 'Rural' zone.

COMPLIANCE STATEMENT

- ***The proposed transmission line is generally aligned with the Shire of Carnamah's TPS1. Whilst not a typical Rural activity, the transmission line will assist in transmitting power from the proposed Warradarge Wind Farm to the existing Eneabba to Karara power line to contribute to the development of the States renewable energy industry and aim to cut greenhouse gas emissions from electricity generation.***
- ***Specifically, the proposed transmission line will result in minimal onsite modification to the existing rural landform and minimal modification to vegetation in the 'Rural' zone.***

7.6 SHIRE OF CARNAMAH PLAN FOR THE FUTURE 2009-2011

The Shire of Carnamah's Plan for the Future, released in 2009, provides a general overview of the key strategies of the Shire's Strategic Plan and provides a report on the current status of the implementation of these strategies. The Shire's Strategic Plan is, however, not publicly available. Whilst the Plan is now out-dated (2011), an assessment of the report has been undertaken in the absence of an updated and current Plan.

The key strategies relevant to the Warradarge Wind Farm proposal are as follows;

- Economic Development – to retain existing industries and encourage the establishment of new industries to broaden the districts economic base.
- Environmental Management – to provide sustainable management of resources and the protection and enhancement of biodiversity, land water and air.

In accordance with the above strategies, the Warradarge Wind Farm and associated portion of the transmission line (for the purposes of transmitting power from the proposed wind farm to the existing Eneabba to Karara line) will encourage investment in sustainable processes using innovative technology, which is in line with the Plan.

COMPLIANCE STATEMENT

- ***The Proponent has set up a supplier database for the local businesses who think they may be able to assist during the wind farm construction. This may retain existing industries and encourage the establishment of new industries, consistent with the strategy.***
- ***The proposed Wind farm and transmission line will promote natural resources management that improves productivity and safeguards the welfare of future generations by reducing regional dependence on fossil fuels. This is closely aligned with the Shire of Carnamah's Plan for the Future.***

8 Relevant Studies

8.1 BEST PRACTICE GUIDELINES FOR IMPLEMENTATION OF WIND ENERGY PROJECTS IN AUSTRALIA (DECEMBER 2006)

These Best Practice Guidelines, prepared by Auswind in December 2006, aim to provide detailed best practice guidelines for the planning and operation of wind farms in Australia, including key project processes and other technical considerations. The Guidelines also place an emphasis on the environmental, amenity and stakeholder consultation aspects of the planning and operation of wind farms.

The Guidelines follow a chronological path through the following project development phases, including:

- Site Selection – the Guidelines indicate that the key reference document in relation to wind farm site selection in Western Australia is *Planning Bulletin 67 – Wind Farm Development* (as discussed previously in this report). This Planning Bulletin aims to facilitate a high-level site selection process. According to the Guidelines, through the site selection process, sites must satisfy five (5) crucial technical criteria for successful development. These are:
 - Good potential wind resource.
 - Potential for reasonable size of generation facility.
 - Cost effective electrical connection access.
 - Suitable landownership and usage patterns.
 - Ease of construction.
- Project Feasibility – community and consultation requirements, technical and environmental considerations.
- Project Detailed Assessment – technical and environmental assessments.
- Development Application – the need to obtain approval from the relevant planning authority.
- Construction – legal, environmental and other considerations, consultation with landowners, the Civil Aviation Safety Authority
- Wind Farm Operation.
- Decommissioning – environmental assessment, legal requirements, preparation of a Decommissioning and Rehabilitation Plan, consultation with stakeholders as required.

COMPLIANCE STATEMENT

- ***The Warradarge Wind Farm proposal is aligned with the Best Practice Guidelines for the planning and operation of wind farms in Western Australia. Specifically, the proposal site has been selected based on the crucial technical criteria (refer Section 1.8 of Development Application Report) and aims to protect the rural integrity of the locality by retaining, where possible, existing remnant vegetation and the natural rural landscape. Verve Energy have also undertaken all required consultation, environmental and technical assessments within the Project Feasibility and Detailed Assessment phases to determine the suitability of the site selected for the Warradarge Wind Farm.***
- ***In relation to decommissioning, once the operational period is completed for each stage (1, 2 or 3), that stage of the wind farm will be decommissioned. This will involve the deconstruction and removal of the turbine, recycling the tower and relevant parts of the blades. The turbines may be refurbished and replacement towers nacelle and blades installed, and this would be dependent on land agreements with Lot owners and the market for the electricity. The decommissioning period for each stage is likely to be completed within two years. Further information regarding the decommissioning of the wind farm is***

COMPLIANCE STATEMENT

provided in Section 3.21 of the Development Application Report.

9 Conclusion

This Planning Compliance Report has considered the various frameworks (planning, environmental, social and political) in which the Warradarge Wind Farm proposal will be considered at both a local and state (JDAP) level.

The wind farm presented for assessment in the Development Application Report is one with the greatest likely footprint and the north-south/east-west extents are spaced across the greatest amount of overall land area within the wind farm envelope. Therefore if the final development results in smaller or fewer numbers of turbines within the wind farm envelope or the anticipated 100 wind turbines are located in different locations within the wind farm envelope this has also been covered by the Development Application Report.

The turbines assessed are the noisiest likely wind turbine to be installed and therefore if a quieter turbine was installed the noise impact would be lesser and therefore quieter turbines have also been covered by this Development Application Report.

Overall it is considered the proposal appears generally consistent with the relevant federal, state, regional and local requirements and should be granted development approval. Specifically, the proposal achieves the following:

- The proposed Warradarge Wind Farm directly responds to the Commonwealth Government's Renewable Energy Target (RET) Scheme and the Act as it will contribute to the development of the States renewable energy industry
- The desire by Verve Energy to construct a wind farm at Warradarge is consistent with the State Sustainability Strategy while being cognisant of the importance of minimising the potential impacts (including visual and environmental) of the proposal on the site and its surrounds.
- The Warradarge Wind farm is proposing the clearing of upto 0.7ha of existing vegetation to accommodate the proposed transmission line. This represents less than 1% of the overall wind farm footprint. All important vegetated areas, the Threatened Ecological Communities and Priority species, protected by federal and state environmental legislations have been intentionally avoided, therefore EPBC referral and EPA referral is not required.
- The 100 turbine wind farm would produce on average every year, 875 million Kilowatt-hours (kWh) of electricity which is equivalent to the average annual electricity needs of 140,000 west Australian homes. The wind farm would also prevent at least 700,000 tonnes of CO₂ from entering the atmosphere annually.
- Noise emissions at domestic receiver points have been calculated to comply with the background noise criteria under all wind condition, with secure tenure agreements with subject and adjoining lots in place to allow wind turbine noise to exceed prescribed levels.
- Interference to broadcasting and radio communication networks, as well as impacts of blade glint and shadow flicker is not expected in this locality.
- The Warradarge Wind Farm is considered to be consistent with the rural/agricultural setting, and is located a considerable distance from the townships of Leeman, Coorow, Greenhead, Eneabba and Carnamah, and will therefore have a minimal effect on the locality.
- The proposal achieves the requirements of *Planning Bulletin 67 – Guidelines for Wind Farm Development*, with respect to environmental, planning, landscape and visual assessment, noise, public health, aircraft, consultation and socio-economic matters.
- The Warradarge Wind Farm proposal represents a significant renewable energy project in the Mid-West region and demonstrates a commitment to achieving sustainable and responsible future growth, whilst respecting and retaining the natural rural landscape. The proposal also represents a significant innovative project which will add value to the local community and wider Mid-West region.
- The Warradarge Wind Farm is generally aligned with the Shire of Coorow and Shire of Carnamah Town Planning Schemes as it will result in minimal onsite modification to the existing rural landform and minimal modification to vegetation in the respective 'Rural' zones. Whilst not a

typical rural pursuit, the proposal is a form of diversified farming, which the Rural zone provides for.

- The proposed Warradarge Wind Farm will demonstrate the Shire of Coorow and Carnamah's willingness to introduce sustainable initiatives to maintain and improve the Shire's environment.
- The wind farm is expected to provide opportunities to supply both services and labour during the construction phase of the Proposal and during decommissioning.

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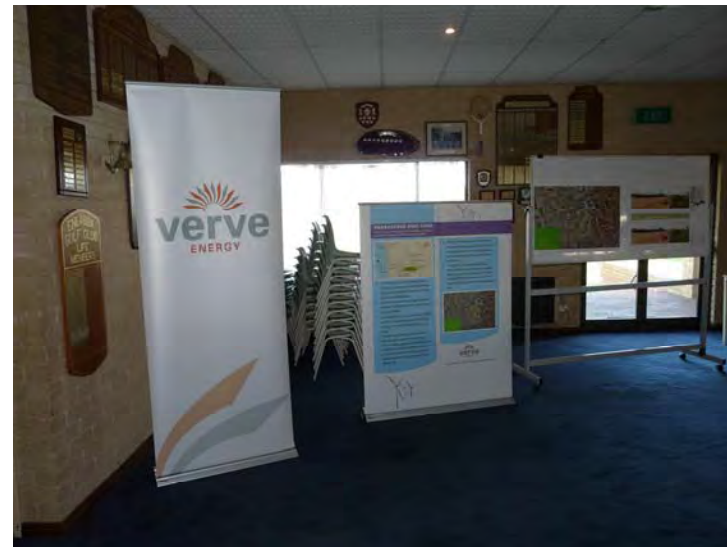
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Warradarge Wind Farm Public Information Session, Eneabba

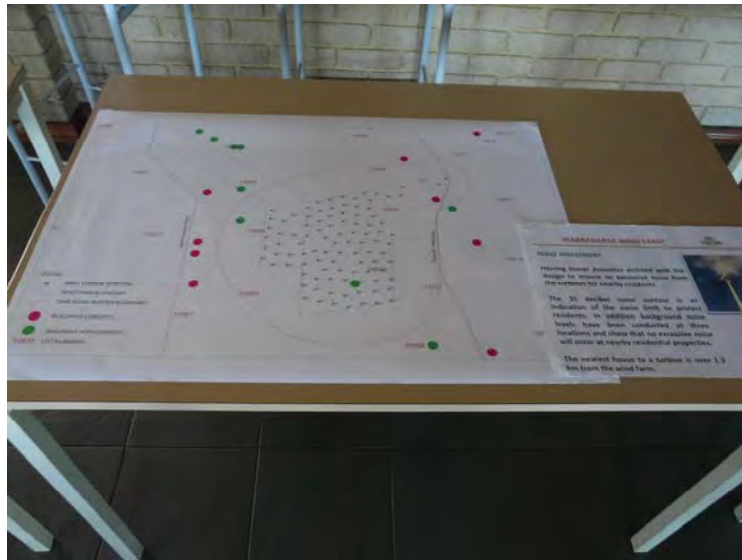


Warradarge Wind Farm Public Information Session, Eneabba

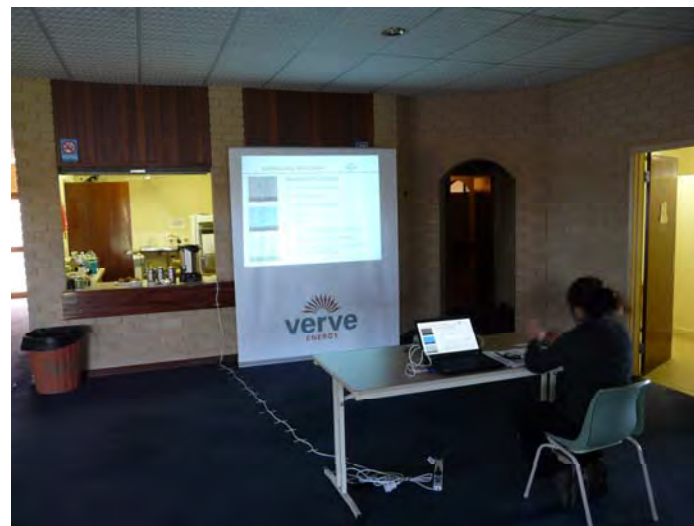


Warradarge Wind Farm

Public Information Session, Eneabba



Warradarge Wind Farm Public Information Session, Eneabba



STAKEHOLDER CONSULTATION WITH AUTHORITIES, STATUTORY REGULATORS AND ORGANISATIONS

No.	Stakeholder	Contact name	Position / Department	Date consulted	Response date	Stakeholder response	Comments
1	Airservices Australia	Mr Joe Doherty		10/01/2012	25/01/2012	Undertake an aviation assessment	Was recommended that Verve Energy undertake an aviation assessment to assess any potential impacts.
2	Airservices Australia	Mr Joe Doherty		10/04/2012		Awaiting response	Aviation Assessment submitted to Joe Doherty for information
3	Airservices Australia	Mr John Egerton		21/11/2011	9/01/2012		Advised that AIS only map obstacles. John Egerton suggested contacting Gary Lee.
4	Airservices Australia	Mr Bruce Bilton	Communications Section, Planning and Integration	19/03/2012	27/03/2012	No interference to communications equipment	
5	Australian Broadcasting Corporation	Mr Mark Spurway	Head of Transmission Network Services	19/03/2012	17/05/2012	Limited analysis indicates that it's not likely to cause unacceptable interference to services	Verve Energy to advise ABC if there are any significant changes in future.
6	Broadcast Australia			19/03/2012		No response	
7	Bureau Of Meteorology			19/03/2012		No response	
8	Civil Air Service Australia	Mr Greg Doherty		21/11/2011		No reponse	
9	Civil Air Service Australia	Mr Greg Doherty		10/04/2012		No reponse	Aviation assessment submitted on 10/04/12 to Greg Doherty for information
10	DBNGP (WA) Nominees Pty Ltd			19/03/2012		No response	
11	Department of Conservation and Land Management and Department of the Environment						Not contacted directly as they are within DEC and was consulted by Biota.
12	Department of Environment and Conservation			3/11/2011	3/11/2011	Fauna Consultant). Additional information was obtained from DEC by Biota at various times.	Information is within Biota's flora and fauna study report
13	Department of Environment and Conservation			19/03/2012		No response	
14	Department of Indigenous affairs		Aboriginal Heritage Inquiry System	12/04/2012	12/04/2012		AHIS database consulted. No aboriginal sites or heritage surveys appear to exist within development area.
15	Department of Industry and Resources						Not contacted as this is now Dept. of Mining and Petroleum
16	Department of Land		Landgate				Landgate have been consulted and have provided maps and plans
17	Department of Mines and Petroleum		TENGRAPH Online				Online map checked and Empire Oil is only company affected
18	Department of Planning			24/04/2012	26/04/2012	Clarified application process for DAP	
19	Department of Sustainability, Environment, Water, Population and Communities		National Environmental Significance Database	7/11/2011	7/11/2011	18 Threatened Species and 8 Migratory Species. 5 Marine species and 2 Natural reserves	Passed on details to Biota (flora and fauna consultant)
20	Department of Water	Ms Katrina Wheeler		20/12/2011	21/02/2012	Provided information on available aquifers in the area	This information is provided in the development application
21	Dunstan Holdings					Expired Lease	
22	Electricity Networks Corporation			19/03/2012		No response	
23	Empire Oil	Mr Craig Marshall		12/04/2012	12/04/2012	Empire Oil are not concerned about the wind farm development	
24	Eneabba Airport						Consulted via AECOM during aviation assessment
25	Environmental Protection Authority	Mr Hans Jacob		24/11/2011	18/01/2012		Met with EPA on 18/01/12 to advise them of our Proposal. Suggest that we also include the transmission connection infrastructure as part of Referral so it can be assessed as a complete project.
26	FESA (Fire & Emergency Services Authority of WA)	Mr Steve McDonald	District Manager Midwest Gascoyne	7/05/2012	9/05/2012		All clear for FESA - apply for fire ban exemption at start of construction
27	Geraldton Telecasters Pty Ltd			19/03/2012		No response	
28	Green Head Community Association	Ms Sandra Trenowdin		20/02/2012		No reponse	
29	Iluka Resources Limited			19/03/2012		No response	
30	Leeman Airport						Consulted via AECOM during aviation assessment
31	Leeman Progress Association	Ms Gloria Litchfield					Contact details supplied by Mark Hook, following request by Verve Energy.

32	Main Roads WA	Mr Peter Herbert		11/01/2012	19/11/2012	Naomi Mynott responded to email on behalf of Peter Herbert to request a further information.	
33	Main Roads WA	Ms Naomi Mynott					Advised by phone that Main Roads is not concerned but waiting for confirmation in writing
34	Mid West Development Commission	Ms Anne Finlay		11/01/2012	13/01/2012	No observations	
35	Midwest Aerial Ag Pty Ltd	Mr Allan Griffith		9/01/2012		No reponse	
36	NACC (Northern Agricultural Catchments Council)	Ms Lindy White	Administration Officer	20/02/2012		No reponse	
37	Nixon Communications Pty Ltd			19/03/2012		No response	
38	Optus Mobile Pty Ltd	Mr Jayantha Wickramasinghe	Technical Specialist, Radio Transmission Planning - National, Networks	19/03/2012	4/04/2012	No impact on Optus mobile network in the area	
39	Repacholi Aviation Pty Ltd	Mr Gerald Repacholi		9/01/2012		No reponse	
40	Royal Australian Air Force	Mr Gary Lee		21/11/2011	20/01/2012	No objection	Verve Energy to inform AIS of tall structures over 45m when they are being built. Reconsulted with Gary Lee on 20/02/12 advising of increased turbine height of up to 152m. Taller turbines approved.
41	Royal Flying Doctor Service	Mr Gavin Healy		11/01/2012			Awaiting response
42	SBS Corporation			19/03/2012		No response	
43	Shire of Carnamah	Mr Bill Atkinson	CEO	29/11/2011		Advised to submit planning application and keep community informed.	Verve Energy presented project at Council meeting on 15/02/12.
44	Shire of Carnamah			19/03/2012		No response	
45	Shire of Coorow	Mr Mark Hook	CEO	29/11/2011		Advised to submit planning application and keep community informed.	Verve Energy presented project at Council meeting on 15/02/12.
46	Shire of Morawa			19/03/2012		No response	
47	Singtel Optus Pty Ltd	Mr Ross Costanzo	Technical Specialist, Radio Access Engineering SA / WA	19/03/2012	1/05/2012	No impact on Optus radio communications	
48	St John Ambulance Australia WA			19/03/2012		No response	
49	Telstra Corporation Limited			19/03/2012		No response	
50	Tourism Western Australia					Tourism WA no longer wish to be consulted on development proposals. They leave it to the Shires to determine if they need the Tourism department's ssistance.	
51	WA Air services guide	Mr Stephen Prance		9/01/2012		No reponse	
52	Water Corporation			19/03/2012		No response	
53	Western Australian Police Service	Mr Karl Carter	Supervisor, Business Integration, Radio and Electronic Services Unit	19/03/2012	19/04/2012	No observations. Requested electronic version of maps.	Further documents emailed to Karl Carter on 19/04/12
54	WIN Television WA Pty Ltd			19/03/2012		No response	



CLIENTS | PEOPLE | PERFORMANCE

Verve Energy

Report for Warradarge Windfarm
Landscape and Visual Impact
Assessment

April 2012

This Landscape and visual impact assessment ("Report"):

1. *has been prepared by GHD Pty Ltd ("GHD") for Verve Energy;*
2. *may only be used and relied on by Verve energy;*
3. *must not be copied to, used by, or relied on by any person other than Verve Energy without the prior written consent of GHD;*
4. *may only be used for the purpose of development application (and must not be used for any other purpose).*

GHD and its servants, employees and officers otherwise expressly disclaim responsibility to any person other than Verve Energy arising from or in connection with this Report.

To the maximum extent permitted by law, all implied warranties and conditions in relation to the services provided by GHD and the Report are excluded unless they are expressly stated to apply in this Report.

The services undertaken by GHD in connection with preparing this Report:

- *were limited to those specifically detailed in section 4 of this Report;*

The opinions, conclusions and any recommendations in this Report are based on assumptions made by GHD when undertaking services and preparing the Report ("Assumptions"), including (but not limited) to those outlined in section 4.10:

GHD expressly disclaims responsibility for any error in, or omission from, this Report arising from or in connection with any of the Assumptions being incorrect.

Subject to the paragraphs in this section of the Report, the opinions, conclusions and any recommendations in this Report are based on conditions encountered and information reviewed at the time of preparation and may be relied on until, September 2012, after which time GHD expressly disclaims responsibility for any error in, or omission from, this Report arising from or in connection with those opinions, conclusions and any recommendations.

Contents

1.	Introduction	1
1.1	Background	1
1.2	Proposal Overview	2
1.3	Purpose and Structure of the Report	2
2.	Description of the Proposal	4
2.1	Study Area Locality	4
2.2	Proposal Components	4
3.	Legislative framework	6
3.1	Introduction	6
3.2	Statutory Mechanisms	6
4.	Scope and methodology	10
4.1	Scope	10
4.2	Consultation	10
4.3	Methodology	10
4.4	Assessment Guidelines	12
4.5	Impact Assessment (Landscape)	12
4.6	Impact Assessment (Visual)	14
4.7	Cumulative Impacts	17
4.8	Mitigation	17
4.9	Limitations	18
4.10	Assumptions	18
5.	Existing values	22
5.1	Introduction	22
5.2	Landscape character units	22
5.3	Sensitive receptors	25
6.	Impact Assessment	34
6.1	Introduction	34
6.2	Cumulative Impacts	51
7.	Mitigation	52
7.1	Construction	52

7.2	Operation	52
8.	Summary and Conclusions	54
9.	References	56

Table Index

Table 1	Landscape sensitivity	13
Table 2	Landscape capacity to accommodate change	13
Table 3	Assessment of Visual Impact	14
Table 4	Visual sensitivity definitions	16
Table 5	Duration of impacts	16
Table 6	Quality of the impact	16
Table 7	Significance of impact	17
Table 9	View location 2 – visual context	27
Table 10	View location 3 – visual context	28
Table 11	View location 4 – visual context	29
Table 12	View location 5 – visual context	30
Table 13	View location 6 – visual context	31
Table 14	View location 7 – visual context	32
Table 15	Summary of Impacts	55

Figure Index

Figure 1	Location Map	58
Figure 2	Topography	59
Figure 3	Photomontages Locations	60
Figure 4	Landscape Character Map	61
Figure 5	Zone of Theoretical Visibility - 100m Hub Height	62
Figure 6	Zone of Theoretical Visibility - 152m Tip Height	63
Figure 7	Cumulative Impact - Tip Height	64

Appendices

- A Maps
- B Photomontages

Glossary of terms

Term	Definition
Background view	Landscape visible in distance (6 km to 20 km) where textures are no longer visible, but mountain and valley forms, skylines and ridgelines are important.
Cumulative impact	An impact produced by the accumulation of successive additions of individual impacts, which may not themselves be significant.
Ecological community	An assemblage of populations of different species, interacting with one another.
Ecosystem	A natural unit consisting of all organisms in an area functioning together with all the non-living physical factors of the environment.
Flora	The plant life occurring in an area.
Foreground	0 to 1 km is the visual zone where colour contrast and textural detail are most clearly perceived.
Footprint	An outline or indentation left by the Proposal on the surface.
Intervisibility	Two points in the landscape that are mutually visible.
Landscape feature	A component, part or feature of the landscape that is prominent or eye-catching, e.g. hills, buildings, vegetation.
Landscape quality	Judgement of landscape value based on particular characteristics that influence the way in which the environment is experienced, including special interests such as cultural associations or heritage interests, the presence and/or type of elements and condition.
Landscape sensitivity	The extent to which landscape can accept a change of a particular type and scale without unacceptable adverse impacts on its character.
Landscape value	Areas of formally designated landscape that through national or local consensus, reflect the value placed by society on particular environments and/or their features.
Middle ground view	1 km - 6 km – different elements in the landscape are visually apparent
National Environmental Significance (NES)	Matters of NES as listed under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 which include World/National Heritage properties, Ramsar wetlands, nationally threatened species and ecological communities, migratory species, Commonwealth marine areas, nuclear actions and national heritage places.

Term	Definition
Sensitive visual receptor	Person and/or viewer group that would experience an impact.
Viewing locations	Viewing locations are used in this report to typify the views experienced by sensitive visual receptors throughout the visual catchment of the Proposal. Viewing locations in this report often represent a viewing area, rather than one exact point.
Visual amenity	The value of a particular area or view in terms of what is seen.
Visual impact	Changes in the appearance of the landscape or in the composition of available views as a result of development, to people's responses to these changes, and to the overall impacts in regard to visual amenity. This can be positive (i.e. beneficial or an improvement) or negative (i.e. adverse or a detraction).
Visual catchment (study area)	Extent of potential visibility to or from a specific area, feature or project.

Abbreviations

3D	Three dimensional
AHD	Australian Height Datum
CEMP	Construction and Environmental Management Plan
DEC	Department of Environment and Conservation
EP Act	Environment Protection Act of Western Australia
EPA	Environment Protection Agency
EPBC	Environment Protection and Biodiversity Conservation Act
ES	Environmental Statement
GA	Geoscience Australia
GIS	Geographic Information Systems
Ha	Hectare
km	Kilometres
kV	Kilovolts
LCU	Landscape Character Unit
LVIA	Landscape and visual impact assessment
m	Metres
m ²	Metres squared
mm	Millimetres
MW	Megawatts
NP	National Park
NR	Nature Reserve
SRTM	Shuttle Radar Topography Mission
WA	Western Australia
WAPC	Western Australian Planning Commission
WTG	Wind Turbine Generators
ZTV	Zone of Theoretical Visibility

1. Introduction

GHD has been commissioned by Verve Energy Pty Ltd to undertake a study of Landscape and Visual Impacts of the proposed Warradarge Wind Farm (The Proposal) (Appendix A, Figure 1). The study area is located approximately 240km north of Perth, Western Australia, and 15 kilometres (km) south east of Eneabba. The proposed wind farm is located predominately within the Shire of Coorow with a transmission line corridor passing into the Shire of Carnamah. The Warradarge Wind Farm involves the development of a wind farm capable of generating an energy output of 250 Megawatt (MW) and will comprise up to 100 individual wind turbines.

This study was commissioned in January 2012 and is to be undertaken in two key stages: preliminary information and baseline assessment comprising gathering of interim advice and data on key landscape and visual impact issues, fieldwork, baseline studies undertaken in February 2012, and; assessment reporting including development of appropriate plans and photomontages for inclusion in the final report, consultation with key stakeholders, outlining any mitigation strategies and providing a summary assessment. This landscape and visual impact assessment (LVIA) has been undertaken using the greatest impact (worst case) specification of the Proposal.

1.1 Background

The Warradarge Wind Farm proposes wind turbines sited throughout predominately cleared rural land.

The region predominantly comprises cleared rural agricultural land (and use), with pockets of remnant vegetation, together with areas of significant remnant native vegetation and ecological communities directly north, east and south of the study area. This includes a number of national parks and nature reserves as shown on figure 3 within a 25 km radius of the study area, including:

- Alexander Morrison National Park
- South Eneabba Nature Reserve
- Coomallo Nature Reserve
- Tathra National Park
- Wotto Nature Reserve

There are no registered sites of Aboriginal heritage within the proposed Warradarge Wind Farm area.

The subject site is characterised by gentle undulating plains with areas of complex table-top topography, as indicated within photomontage (Appendix B). Several small creeks/drainage channels traverse the subject site, as well as a number of residential dwellings located around the subject site.

This assessment has considered existing landscape quality as a key characteristic in reaching conclusions about the likely impact on the surrounding amenity from the point of view of both residents and visitors.

This comprehensive study has comprised the identification of key travel routes, including the West Midlands Wildflower Tourist Drives, natural characteristics and significant features including the mapping of sensitivity zones and view sheds. This information has been analysed by overlaying distance bands to help understand impacts on visual amenity as a result of the presence of the turbines.

Further to this field research: data collation and geographic information system (GIS) analyses have been carried out in order to ensure the wind farm's impact on visual amenity and the community's perception of this are assessed in both quantitative and qualitative manners. This has ensured a comprehensive assessment of the Warradarge Wind Farm and its presence within the region.

1.2 Proposal Overview

The construction of the Warradarge wind farm is likely to occur over 3 stages, with the first stage expected to be commenced in January 2015 and the final Stage to be completed by January 2021.

The final number, height, location and make/model of each turbine has not yet been determined. This is due to the fact that the capacity of a proposed new 330 kV transmission line proposed to be utilised by the Warradarge proposal is not yet known. The make/model of the individual turbines will not be determined until a post Development Approval tender process. Therefore, at the time of writing this report, the LVIA has been based upon the assumption of the „worst case' scenario (i.e. the maximum number and height of wind turbines). Therefore, this assessment also encompasses consideration for smaller turbines that may be built. Based upon this assumption, a summary of the key components of the proposal will comprise:

- 100 wind turbine generators (WTG) with an overall tip height of 152 metres (m).
- 3 anemometer masts.
- Underground cabling between turbines and substation.
- Hardstand areas for cranes and adjacent to pylons.
- A substation.
- A 10km overhead transmission line.
- New and upgraded access tracks.
- A construction compound containing site offices and welfare facilities.

1.3 Purpose and Structure of the Report

This LVIA describes the assessment of the landscape and visual effects arising as a result of the proposed Warradarge Wind Farm. The methodology of the assessment has been outlined and includes a description of the process by which impacts have been identified and the level of significance of these effects is determined. This methodology has been developed to respond specifically to both statutory and non-statutory requirements/guidelines, as set out in Section 3 below.

In summary, this report is structured as follows:

- Proposal background; description of the Proposal design and visual components; relevant consultation legislation, policies and guidelines that have been used to inform the assessment.
- Scope of the assessment; methodology adopted to assess effects upon landscape and visual amenity and the limitations and assumptions of this method.
- Evaluation of the baseline landscape and visual context, including description of the visual catchment through landscape character types and identification of representative viewing

locations/sensitive receptors, and; discussion of visual receptor sensitivity through the use of representative publicly accessible viewpoints.

- An assessment of the significance of effects upon landscape and visual amenity, including:
 - GIS viewshed analysis to understand the visual exposure of the Proposal from representative viewing locations.
 - Identification of the sources of potential landscape and visual impacts associated with the Proposal.
 - Providing a description of landscape and visual impacts for each viewing location, having regard to criteria such as scenic quality, visual and landscape sensitivity, and the significance of likely impacts.
 - Description of cumulative impacts, including GIS based modelling.
 - Proposing general mitigation strategies to avoid, reduce, remedy or offset negative visual impacts resulting from the Proposal.
- Conclusions and a summary of findings.

2. Description of the Proposal

2.1 Study Area Locality

The Proposal is proposed to be located between Rose Thomson Road and Garibaldi Willis Road, approximately 15 km north-east of Warradarge, 15 km south-east of Eneabba and 40 km south-west of Carnamah. It is proposed on private farming land (Part Lots 10848, 10850, 10851, 10853 and 10847) and will comprise a development footprint of approximately of 80 hectares (ha) with the majority being on cleared agricultural land, with upto 0.8 ha of vegetated land being developed. The site boundary itself forms an area of up to 5010 ha.

2.2 Proposal Components

The Warradarge Wind Farm will consist of up to 100 wind turbine generators (WTG) with a maximum generating capacity of 250 MW. The wind turbine design would be a three-bladed, horizontal axis wind turbine, up to 152 m maximum height to the tip.

The 100 turbine layout assessed is spaced across the greatest amount of overall land area within the site boundary and as such the width of any view of the wind farm is greatest from any viewpoint. Therefore a fewer number of turbines within the site boundary, or 100 turbines located in different locations within the wind farm envelope, as shown on Figure 1, is also encompassed by the assessment.

The wind farm would have associated above and below ground ancillary works, including (but not limited to):

- 100 WTG, with a rotor diameter of up to 104 m on a 100 m hub, giving an overall tip height of 152 m and associated 25 m x 40 m hardstands directly adjacent to enable construction and decommissioning. These will be within an area of approximately 3800 ha of the total site boundary..
- The colour and finish of the WTG rotor blades, nacelles and towers will be a pale grey colour with a semi-matt finish as is typical of many wind turbine finishes.
- Three long term anemometer masts
- Underground cabling between turbines and substation.
- A 10 km transmission line connection the onsite substation to the Eneabba to Karara line. This line would comprise up to 20 pylons, between 50 m and 63 m in height, spaced every 500 m - 600 m and would be constructed of lattice steel. This is to be routed through Lots 10847, 10848, 10850 and 10851 to the grid connection point and is shown in figure 1 as the Transmission line corridor.
- The pylon would be constructed on a cleared hardstanding area of 50 m X 30 m, totalling 1500 m² for each pylon.
- 8.5 km of new and upgraded access tracks, including access to public highway.
- Electricity transformers
- Crane hardstandings

- A 22/330 kilovolt (kV) substation comprising associated electrical infrastructure (transformers, circuit breakers, switchgear, etc), site office with toilet and welfare facilities and a storage area for maintenance equipment. Staff would not be on site permanently and the building would be visited periodically by maintenance personnel.

Whilst the proponent sees no reason install obstacle lighting it is out of the proponents control if in the future if the Civil Aviation Safety Authority (CASA) insist on these. These lights have not being considered as part of this assessment. In the instance of CASA regulations changing regarding the installation of aviation lights, the night time visibility of the aviation lights would have the same visibility as the Zone of Theoretical Visibility (ZTV) as the 100m high turbine hubs, as per Figure 5.

The wind farm is likely to be commissioned in three stages, with an approximate 2 year gap between the commissioning of each of the three stages. It is expected that construction of the first stage will start in January 2015 and take up to 24 months. Once the first stage is completed the second stage will be started and will take approximately 18 months to complete. Once stage two is complete, stage three will be started and is anticipated to also take 18 months. The first stage will take longer to construct as the site entrance, construction compound, substation and grid connection line will need to be constructed. Stages 2 and 3 will take advantage of this infrastructure to shorten the construction time.

It is expected that Stage one will supply electricity in January 2017, Stage 2 in January 2019 and Stage 3 in January 2021.

During the construction and commissioning there would be a number of temporary works including:

- A construction compound containing site offices and welfare facilities of approximately 100 m x 100 m in size.
- Temporary crane hardstands.
- Laydown area.
- Rotor assembly pads.
- Three guyed anemometer masts up to 100 metres high.
- Two site entrances off the Garabaldi Willis Road onto the site.

3. Legislative framework

3.1 Introduction

The Proposal is subject to Commonwealth, state and local government environmental legislation, which have been outlined in the following sections.

3.2 Statutory Mechanisms

Existing statutes and mechanisms that provide authority to this LVIA have been outlined below.

3.2.1 National Legislative Framework

Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) protects those aspects of the environment that are of national environmental significance and heritage value. The protection of the environment includes the qualities and characteristics of locations, places and areas; and heritage values of places.

Environmental Protection Act (EP Act) of Western Australia 1986

Part IV (Environmental Impact Assessment) of the *Environmental Protection Act of WA* has the potential to take issue on visual impact matters.

National Wind Farm Development Guidelines (Draft)

The Draft National Wind Farm Development Guidelines (the Guidelines) were prepared by the Environment Protection and Heritage Council of Australia and released in July 2010. The Draft Guidelines provide a nationally consistent set of best-practice methods for assessing the impacts that are unique or significant to wind farm developments and operations. The Guidelines have been used in conjunction with the relevant state, territory and local government planning and environmental regulations and/or guidelines.

The Guidelines specifically address impacts on landscape values which can be addressed through the preparation of visual landscape assessment/ significance analysis, view shed and view analysis.

3.2.2 State Planning Framework

Western Australian Planning Commission (WAPC)

The WAPC has developed broad statutory policy measures at regional, local and site levels. The Environment and Natural Resource State Planning Policy No.2 (2003) sets out to ensure recognition of the significance of visual and landscape protection, maintenance and enhancement:

“Protect significant natural, indigenous and cultural features, including sites and features significant as habitats and for their floral, cultural, built, archaeological, ethnographic, geological, geomorphological, visual or wilderness values”.

“Identify and safeguard landscapes with high geological, geomorphological or ecological values, as well as those of aesthetic, cultural or historical value to the community, and encourage the restoration of those that are degraded.”

“...consider the level or capacity of the landscape to absorb new activities and incorporate appropriate planning and building design and siting criteria to ensure that new development is consistent and sensitive to the character and quality of the landscape.”

“Consider the need for a landscape, cultural or visual impact assessment for land use or development proposals that may have a significant impact on sensitive landscapes.”

Planning Bulletin No.67: Guidelines for Wind Farm Development

Planning Bulletin No.67 (PB67) was prepared to provide local government, other relevant approval authorities and wind farm developers with a guide to the planning framework for the balanced assessment of land-based wind farm developments throughout Western Australia. The Bulletin is the principal tool for the assessment of planning applications relating to wind farms in Western Australia. It provides guidance in the design and siting of wind farms. The key objective of PB67 of direct relevance to this report is to:

- Minimise disturbance to the environment (including landscape) and loss of public amenity in the establishment, operation, maintenance and decommissioning of wind farms.

The following provides a summary of the key issues cited in PB67 that will be considered in the decision-making process and of direct relevance to this report. Landscape and Visual Impact – the degree to which a wind farm development will impact on the landscape will depend on:

- Siting, layout and design of the turbines, infrastructure, signage and ancillary facilities.
- Number, colour, shape, height and surface reflectivity of the towers and blades.
- Visibility of the development, having regard to the location, distance from which the development is visible, skyline and view-sheds.
- Significance and sensitivity of the landscape, having regard to topography, the extent and type of vegetation, natural features, land use patterns, built form character and community values.

Department of Environment and Conservation (DEC)

The DEC developed the *Visual Resource Management on Lands and Waters Managed by CALM* (1989) to:

“ensure that all land uses and waters managed by CALM are planned and carried out in ways that sustain the beauty of the natural environment”,

and to;

“.....ensure that all uses and activities are planned and implemented so as to complement rather than detract from the inherent visual qualities of the environments in which they occur.”

The DEC also publish data associated with the Wildflower Drives of the West Midlands Region. These are tourist drives, and do not have any formalised legislative protection or status (CALM, 2001).

Environmental Protection Agency (EPA)

The EPA provides advice on the protection of visual amenity through its *Environmental Guidance for Planning and Development: Guidance Statement No. 33* (2005). The statement aims to provide advice the protection on visual amenity (Chapter D3, Visual Amenity) and natural and human-modified

landscapes and landforms (Chapter B8 Landscape and Landforms) during land use planning and development processes under the Environmental Protection Act 1986.

Visual Landscape Planning in Western Australia – A Manual for Evaluation, Assessment, Siting and Design (2007)

The Visual Landscape Planning Manual addresses fundamental tools of visual landscape evaluation and visual impact assessment and provides guidelines for siting and design in relation to a range of landscape types and land uses. It establishes a series of state, regional, local and site level principles and guidelines with respect to wind farms (e.g. avoiding significant landscapes, minimising impact through the layout, size, number and colour of turbines and associated infrastructure, minimising earthworks and implementing a program of rehabilitation).

The components of wind turbines/wind farms identified as potentially impacting upon the surrounding landscape and visual character comprise:

- Project area.
- Layout.
- Turbine size (tower height and rotor size)
- Turbine rotational speed.
- Number of turbines.
- Colour of turbines.
- Reflectivity of rotating blades.
- Access roads.
- Ancillary features (e.g. buildings, signage, telecommunications infrastructure and transmission lines).
- Extent of clearing.
- Construction procedures.
- Rehabilitation measures.

3.2.3 Regional Planning Framework

Mid West Regional Planning and Infrastructure Framework (Draft)

The Warradarge Wind Farm proposal is situated within the Mid-West region of Western Australia. Once finalised, the Mid-West Regional Planning and Infrastructure Framework (the Framework), released in November 2011, will become a second tier document preceded by the WA State Planning Strategy (1997) and will be recognised as a regional strategy under the State Planning Framework.

The key objective of the Draft Framework of direct relevance to this study is Section 2.3.3 Landscape and Geology, which identifies the broad landscape type of the Geraldton Plain and states that: “distinct landscape features with high natural and scenic quality are retained in order to maintain the Mid West’s unique „sense of place””.

3.2.4 Local Planning Frameworks

Local Planning Frameworks identified (of relevance to this study) are identified as the Shire of Carnamah and the Shire of Coorow.

Shire of Coorow Town Planning Scheme No.2

The proposed Warradarge Wind Farm is located within a „Rural’ zone of the Shire of Coorow Town Planning Scheme No.2 (TPS2).

Clause 1.6 of TPS2 sets out the general objectives of the Scheme. The key objective for the Scheme, relevant to this report is:

- To safeguard and enhance the character and amenity of the built and natural environment of the Scheme area.

Shire of Carnamah Town Planning Scheme No.1.

A portion of the proposed transmission line which runs north-west from the proposed wind farm, crossing into the Shire of Carnamah, is located within a „Rural’ zone of the Shire of Carnamah’s Town Planning Scheme No.1 (TPS1).

Of relevance to this study and in accordance with Clause 5.7 of TPS1 is:

“...the need to preserve the rural character and rural appearance of the land within this zone’.

3.2.5 Other Relevant Studies

Relevant studies considered within the writing of this report include:

- Best Practice Guidelines for Implementation of Wind Energy Projects in Australia (2006)
- Wind Farms and Landscape Values: Stage One Final Report – Identifying Issues (2005)
- Windfarms and Landscape Value (2004)
- Visual Assessment of Windfarms Best Practice (2002)
- Renewable Energy Handbook for Western Australia (2006)

4. Scope and methodology

4.1 Scope

The term „landscape’ describes a range of environmental topics including landscape character, landscape context, views and prospects, historical landscapes and anthropogenic landscapes.

Landscape and visual impact assessment is a combination of two separate but closely related aspects. The first is the assessment of impact upon the character of the landscape, that is, changes in the landscape, its character and quality, as a result of the new development. The second is visual impact, that is, the appearance of the changes and the resulting effects on visual amenity.

The central purpose of the LVIA is to identify potentially significant adverse impacts at the Proposal planning stage and to propose measures to mitigate or ameliorate such impacts.

4.2 Consultation

Local Councils of Shire of Coorow and Shire of Carnamah were contacted during the assessment process to discuss the potential visual impacts and/or areas of concern.

4.3 Methodology

4.3.1 Desktop Study

A desktop study was undertaken to obtain relevant publically available data on visual impact and landscapes at a national, regional and local level for the study area. This included a comprehensive review of GIS data sets and an aerial photography based identification of potential sensitivity receptor locations, later ground truthed by field teams.

The following data sets were reviewed for the LVIA:

- aerial photography;
- topographical data;
- hillshade (Shuttle Radar Topography Mission Shaded Relief);
- road networks (Geoscience Australia 2007);
- existing rail networks (Geoscience Australia 2007);
- cadastre (DERM 2011);
- watercourses (Geoscience Australia 2007);
- protected areas (DERM 2011);
- nature refuges (DERM 2010);
- local government areas;
- Interim Biogeographic Regionalisation for Australia Version 6.1 regions and subregions (SEWPAC 2005);
- information from local planning authorities

4.3.2 Site Survey

A site survey was undertaken by two landscape architects to verify the desktop study, allow characterisation of the landscape, identify sensitive receptors and observe how receptors might view the landscape. The site visit was conducted in February 2012 during conditions of overcast weather with medium distance visibility.

During the site survey, the landscape architects traversed the study area (refer below to 4.3.3 for definition of the study area) to gain representative views of the site (Figure 1) upon which the wind farm is proposed from both publicly accessible and private (where permission was granted) viewpoints. At each location a photographic record of landscape features, key views and receptors obtained along with coordinates, bearings, field notes and sketches.

4.3.3 Establishment of the Landscape and Visual Baseline

Defining the Visual Catchment

A worst case indicative visual catchment within which the Proposal may be seen, has been defined based on the investigation area. This has been determined through a desktop study examining aerial photographs and topographic maps where landform and land cover (screening) were considered in tandem. Also taking into consideration was the potential maximum visibility for this type of development. For LVIA, the visual catchment becomes the study area which for this assessment has been set at 25 km, based upon previous studies of a similar nature and relevant guidelines for windfarm assessment.

This preliminary visual catchment is then used to identify sensitive receptors with potential views of the Proposal.

Zone of Theoretical Visibility (ZTV)

More detailed assessment of potential visibility within the study area (zones of theoretical visibility) are then calculated using topographical data. A zone of theoretical visibility is the area around a designated point in the landscape from which that point is visible. It is calculated using elevation data such as a Digital Elevation Model and does not take account of buildings or vegetation screening, therefore representing a worst case.

The zones of theoretical visibility were generated for a 25 km radius from the proposed turbines at Warradarge and are based on 10 m contour intervals and with an observer eye height of 1.7 metres.

For the cumulative impact a ZTV of 25 km radius from each wind farm was generated in order to capture any potential visibility between Warradarge and Badgingarra Wind Farm (proposed).

4.3.4 Description of Existing Conditions

The description of existing landscape and visual environment establishes a baseline against which the Proposal is assessed.

Defining Landscape Character Units (LCU)

Landscape character (Figure 4) considers common landscape types (defined by typical features and characteristics) and highlights any principal landscape features. A description of the landscape character differentiates between subjective assessments and objective description and is provided from both within the study area, and from the wider landscape.

The factors that have been considered in categorising the landscape character areas include landform, vegetation and intensity and character of land. The categorising was informed through a review of the information assembled in the desktop study described in section 4.3.1 and the site survey described in section 4.3.2. The assessment also included a comprehensive review of the Interim Biogeographic Regionalisation for Australia regions and subregions (DEH 2005). This national data set which classifies the land surface of Australia was derived by using specialist ecological knowledge and the assessment of climate, geomorphology, landform, lithology, and characteristic flora and fauna (DEH 2005). These attributes are common to some of the attributes used to define landscape character.

Selection of Receptor Viewpoints

Representative publicly accessible viewpoints have been identified in a range of locations. These have been recorded and photographed. Photographs of viewpoints within Section 5 represent a range of typical views possible from that locality to the Proposal. Viewpoints are selected in order to:

- represent views of particular landscape and /or visual features of importance, and;
- represent views from key visual receptors who spend extended amounts of time and other locations from which fixed or transient views would be possible, but where the time of stay is shorter. These include residents, road, rail and recreational receptors.

4.4 Assessment Guidelines

The methodology for the LVIA has been set out to respond to particular project requirements and constraints including scale and nature of the Proposal.

Whilst there is no general (legislated) guidance on the assessment of landscape and visual effects produced by an independent body specific to Australia, there is documentation specific to best practice visual assessment of windfarms. Therefore, in addition to the references set out in Section 3 above, this assessment draws on the *Guidelines for Landscape and Visual Impact Assessment, Second Edition, (2002)* published by The Landscape Institute and the Institute for Environmental Management and Assessment (IEMA) in the UK.

Terminology, assessment methods and nomenclature have also been derived from *Visual Landscape Planning in Western Australia*, produced by the Western Australian Planning Commission (2007) and the Forest Practice Board of Tasmania's, *A Manual for Forest Landscape Management (2006)*.

4.5 Impact Assessment (Landscape)

Landscape is defined as features (such as vegetation, built elements, topography, etc.) either within the proposal site or on land adjacent. The features of the landscape are considered as an integral part of the landscape and visual context of the route and important contributors to the overall character of the environment.

Assessment of changes to the landscape includes identification of:

- the nature of the change, that is the degree of contrast, or integration of, any new features with existing features;
- context and quality of the views including the extent to which the Proposal will be visible in the wider landscape (with consideration of the presence of intervening vegetation or features);

- the scale or degree of change i.e. obvious / imperceptible with respect to loss or addition of features;
- the nature of the impact (adverse or beneficial).

4.5.1 Landscape sensitivity

Landscape sensitivity is described in Table 1. The relative capacity of the landscape to accommodate changes of the type proposed that would occur as a direct result of the Proposal has been defined in Table 2.

Table 1 Landscape sensitivity

Landscape sensitivity	Definition
High	Landscapes of international designation that are highly valued, particularly near or distinctive and susceptible to small change
Medium	Landscape of regional designation that are valued more locally and tolerant of moderate levels of change
Low	Landscapes of local designation that are more commonplace and potentially tolerant of noticeable change or are undergoing substantial development, such that their character is one of change.

Table 2 Landscape capacity to accommodate change

Landscape capacity	Definition
Low potential capacity	The landscape has high sensitivity to the type of development proposed which could have a detrimental effect on the landscape character or value. Mitigation measure unlikely to reduce the impacts of the change.
Medium potential capacity	The landscape has medium sensitivity to the type of development proposed. Any change caused by the proposed development would be unlikely to have a significant adverse effect on the landscape character or value that could not be mitigated against.
High potential capacity	The landscape will have low sensitivity to this type of development and few constraints imposed by landscape elements. Development of this type is very unlikely to have an adverse effect on the landscapes character. Mitigation measures will be effective in neutralising adverse effects and / or may improve the landscape character.

4.5.2 Landscape impacts

For the purposes of this assessment the definitions in Table 3 have also been used to describe visual impact.

Table 3 Assessment of Visual Impact

Landscape Impact	Definition
Large	A substantial / obvious change to the landscape due to total loss of, or change to, elements, features or characteristics of the landscape. Would cause a landscape to be permanently changed.
Moderate	Discernible changes in the landscape due to partial loss of, or change to the elements, features or characteristics of the landscape. May be partly mitigated. The change would be out of scale with the landscape, and at odds with the local pattern and landform and will leave an impact on the landscape.
Small	Minor loss or alteration to one or more key landscape elements, features, or characteristics, or the introduction of elements that may be visible but may not be uncharacteristic within the existing landscape.
Negligible	Almost imperceptible or no change in the view as there is little or no loss of / or change to the elements, features or characteristics of the landscape.

4.6 Impact Assessment (Visual)

People are mobile and therefore could potentially experience views of the Proposal from many different locations. In order to undertake an assessment of visual impacts, a series of key viewing locations have been selected to represent the points from which the Proposal is likely to be viewed by the greatest number of visual receptors and from where the most sensitive visual receptors are likely to perceive the Proposal.

Proposal impacts can be evaluated on the basis of a combination of two factors that inform the level of significance of impact:

- visual modification;
- visual sensitivity.

Both are defined in sections 4.5.2 and 4.6.3 respectively, and their use in identifying severity of the impacts outlined.

4.6.1 Photomontages

A series of seven viewing locations were selected for the production of photomontage images. These photomontages were used to represent the views available from the selected locations following the completion of the Proposal.

All photographic images were captured using a 50 millimetre (mm) fixed focal length lens on a 35 mm format (digital equivalent) camera at a camera height of 1.7 m as recommended in the IEMA guidelines (IEMA 2002).

The software that has been utilised for modelling and rendering the photomontages was Autodesk 3D Studio Max. In order to achieve an accurate photomontage of the structure and surrounding landscape, 10 m contours were used to model the surrounding landform.

Once the 3D model encapsulating both the landscape and new Proposal elements was created, a virtual camera was placed in the software at the same location that the photographs have been taken from. The film (35 mm), focal lens (50 mm) and height (1.7 m) of the virtual camera matches the real camera utilised to take the photos.

The photos of the site were used in 3D Studio Max as a background to accurately match the 3D model with the Proposal elements to the perspective of the photos.

From the camera view, rendered images of the Proposal were produced to match the daylight exposure of the photographs. The rendered images were imported into Adobe Photoshop for post-production editing and collation of the photomontages. The final result is the 3D model of the Proposal shown in the correct 3D location in the photographs. The final images were produced to a high resolution, suitable for printing.

The 3D model included the proposed 100 turbines and 20 pylons.. As discussed in section 2.2 the final height of the pylons has not been finalised but they will be between 50 m – 63 m in height. A lightly constructed height of 50 m was used to illustrate the pylons in the photomontages. Visibility in the resultant photomontages of these elements is dependent upon topography (i.e. not all elements modelled will be visible from every location).

4.6.2 Visual impacts

Visual impacts relate to the changes that arise in composition of available views as a result of changes to the existing landscape, to people's responses to these changes, and to the overall impacts with respect to visual amenity:

- magnitude of change in the view (i.e. loss/addition of features that change the view's composition) and integration of changes within the existing view (form, mass, height, colour and texture);
- effectiveness of proposed mitigation.

4.6.3 Visual Sensitivity

Visual sensitivity refers to visual receptors and their sensitivity to their visual environment. Visual sensitivity is defined as the perception of viewers to the proposals.

For the purposes of this assessment, key visual receptors comprise residents, users of transport routes (road and rail) as well as users of public recreation and all have differing sensitivities to their visual environment. Generally, sensitivity is derived from a combination of factors including:

- receptors' interest in the visual environment i.e. high, medium or low interest in their everyday visual environment, and the duration of the effect;
- receptors' duration and viewing opportunity i.e. prolonged, regular viewing opportunities;
- number of viewers and their distance / angle of view from the source of the effect, extent of screening / filtering of the view, where relevant.

For the purposes of this assessment, the terminology set out in Table 4 has been used to describe visual sensitivity.

Table 4 Visual sensitivity definitions

Sensitivity	Definition
High	Occupiers of residential properties with long viewing periods, within close proximity to the proposed development. Communities that place value upon the landscape and enjoyment of views of their landscape setting.
Medium	Outdoor workers who have a key focus on their work who may also have intermittent views of the Proposal area. Viewers at outdoor recreation areas located within close proximity but where viewing periods are limited. Occupiers of residential properties with long viewing periods, at a distance from or screened / filtered views of the Proposal area.
Low	Road users in motor vehicles, trains or on transport routes that are passing through the study area and have short term / transient views. Viewers indoor at their place of work, or similar.
Neutral	Viewers from locations where there is screening by vegetation or structures where only occasional views are available and viewing times are short.

4.6.4 Duration of impact

Duration of impact has been defined for the purposes of this assessment as outlined in Table 5.

Table 5 Duration of impacts

Category	Duration
Temporary	Impacts lasting one year or less
Short term	Impacts lasting one to seven years
Medium term	Impacts lasting seven to 15 years
Long term	Impacts lasting 15 to 60 years
Permanent	Impacts lasting over 60 years

4.6.5 Impact type

The definition type of impact as used in this assessment has been outlined in Table 6.

Table 6 Quality of the impact

Quality category	Description
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Neutral	A neutral impact will neither enhance nor detract from the landscape character or view
Positive	A positive impact will improve or enhance the landscape character or view
Negative	A negative impact will reduce or have an adverse effect on the existing landscape character or view

4.6.6 Significance of Impact

The significance (or severity) of impact has been assessed according to the method described below.

Only impacts of major or high significance in the context of this assessment have been considered. These impacts will require further refinement through mitigation or scheme design.

The definition used to identify significance of impacts for this assessment has been outlined in Table 7.

Table 7 Significance of impact

		Landscape impact/Visual modification			
		Large	Moderate	Small	Negligible
Visual sensitivity	High	Major significance	High significance	Moderate significance	Minor significance
	Medium	High significance	Moderate significance	Minor significance	Not significant
	Low	Moderate significance	Minor significance	Not significant	Not significant
	Negligible	Minor significance	Not significant	Not significant	Not significant

4.7 Cumulative Impacts

Cumulative impacts, or cumulative visibility of turbines, in the landscape considers the effect of other wind farm developments within the vicinity of the study area, which may be undertaken at the same time, or at a different time. Such works may result in major activity at those locations, with the possibility of resulting temporary and/or permanent cumulative landscape and visual impacts.

Guidance utilised for this assessment is derived from „Cumulative Effect of Windfarms’ (Version 2) published by Scottish Natural Heritage.

Due to the undulating landscape surrounding the application site and a number of highpoints reducing the long-distance visibility within the wider area, it was considered that a study area of 25 km would be sufficient to address the cumulative visual impact.

4.8 Mitigation

Appropriate mitigation measures are an integral part of the scheme design to achieve best fit within the landscape. Preliminary evaluation of the layout has been guided by the need to avoid or reduce potential adverse effects on landscape character and visual receptors.

Environmental constraints and opportunities have been taken into consideration during the scheme's development. This iterative approach assists in avoiding or minimising potential negative effects of the scheme while also helping to identify opportunities for enhancement.

Strategies for impact mitigation include:

- Avoid - Avoid developments in sensitive or prominent landscapes, and avoid insensitive or visually intrusive designs. Prevention of adverse effects at source.
- Minimise – Reduction of adverse effects that cannot be eliminated by avoidance. The significance of adverse impacts is lessened. Seeks to limit the exposure of the receptor. Reduce the visual intrusiveness of the design and reduce the visibility of the Proposal (e.g. by installing screening between the location(s) of likely receptors and the source of the impact). It may serve to improve the adverse conditions by carrying out further works which seek to restore the environment e.g. increased planting of trees/shrubs to offset unavoidable loss of vegetation.
- Offset - The provision of alternative or compensatory measures where appropriate and feasible (e.g. offset planting either on or off site).

If it is not possible or practical to mitigate an impact (e.g. felling mature trees), this is described as a residual impact.

4.9 Limitations

There are a number of assumptions and limitations associated with this assessment, as follows:

- There is no guidance on the assessment of landscape and visual impacts specific to Australia. However, the industry typically refers to Guidance for Landscape and Visual Impact Assessment (2002) published jointly by The Landscape Institute and the Institute for Environmental Management and Assessment (UK).
- The assessment process aims to be objective and describe any changes factually. Potential changes as a result of the Proposal have been defined, however the significance of these changes requires qualitative (subjective) judgements to be made. The conclusions to this assessment therefore combine objective measurement and professional interpretation. This assessment has attempted to be objective, however it is recognised that visual assessment can be highly subjective and individuals are likely to associate different visual experiences to the study area.
- The assessment is based on the information provided to GHD at the time of writing.
- Baseline conditions were assessed in the field in February 2012.

4.10 Assumptions

A number of assumptions have been made for this assessment, as outlined below.

4.10.1 Construction Activities

During construction and commissioning there would be a number of works that would cause temporary disruption to the area, impacting upon visual amenity and landscape character. The significance of such impacts would depend on the nature and programme of construction activities, and the proximity of resources/receptors to the works.

At the time of writing this report, it has not been possible to determine the exact method of construction and range of equipment that the contractor would use.

For the purpose of this report, general assumptions have been made in order to appraise the impact of the construction works upon landscape resources and visual amenity. Essentially, the scheme would impact upon the same areas as those affected by the operational phase of the scheme. However, the nature and scale of the impact would be different in the sense that construction activities are likely to result in a greater area of disturbance.

Assumptions have been outlined below.

Overview and Program

As outlined in Section 2.2 above, the construction program is likely to be commissioned in three stages, with an approximate 2 year gap between the commissioning of each.

Site Office and Compound Area

- The compound area will be located between one of the site entrances and the turbines, as determined by the civil contractor.
- Two site entrances will be located off the Garabaldi Willis Road via existing farm tracks.
- Temporary transportable buildings to be erected and utilised as offices, from which the construction operations will be managed with final number and layout determined upon selection of the civil works contractor.
- The compound area will be approximately 100 x 100 m in area.
- All fencing and buildings will be removed at construction completion, with any hardstand areas for the temporary storage of equipment and vehicles to be retained until decommissioning.
- Temporary security fencing & signage is to be erected for the construction phase only.
- The compound is for the siting of offices, storage of equipment, material and for the parking of construction vehicles.
- Security lighting will be infrared triggered.
- Amenity facilities are to be provided within the site compound as mobile, self-contained facilities.

Site Access & Access tracks

- Plant and equipment will be delivered via the local road network.
- Site access tracks are to be both new and utilise existing tracks and are to be gravel.
- At the conclusion of construction, access tracks will remain to provide access for maintenance vehicles.
- Dust control measures would be undertaken.

Temporary Concrete Batching Plant

- A batching plant will be located within proximity of the construction compound. The plant is to be decommissioned at the end of construction.
- Details regarding siting, design, construction and operation would be confirmed upon appointment of civil contractor.

- Dust control measures would be undertaken.

Site Preparation Works / Hard Stand Area

- Land will be cropped and levelled only if required due to steep slopes for the assembly and erection of the turbine elements.
- Any hard stand areas will be constructed with the same material as for the site access roads and retained after construction to facilitate future maintenance, repair or replacement of turbine parts.

Guyed anemometer masts

Three masts are to be constructed. This may comprise the use of two existing masts and erection of one new mast.

Overhead Power Lines

Overhead power lines will be constructed between the proposed substation and the newly constructed line crossing Rose Thomson Road.

Turbine and Foundations Establishment

- Excavation material will be locally stockpiled (1 of topsoil and 1 of subsurface material) and sited to avoid vegetation clearance.
- A proportion of the excavated subsoil and top soil will be backfilled and compacted.
- Construction of each foundation would take approximately one to two weeks, with upto several months after this to turbine erection.

Delivery and Erection of Wind Turbines

- Delivery will occur via existing local roads on extended articulated vehicles (towers), and/or heavy duty articulated trucks (e.g. nacelle – gearbox and generator, blades).
- The hard stand area adjacent to each wind turbine will be used for assembly purposes.
- Components will be lifted from the truck onto foundations by a large mobile crane.
- Erection may take two to three days.

Cabling

- Underground cabling will be installed between the substation and four or five turbines in a string.
- The cables will be routed using a direct excavator and marked with an underground tape.
- Topsoil will be reinstated over the trench.

Working Hours and Duration

Generally, anticipated working hours will be during daylight hours only.

Traffic Movements

During the construction process there will be a range of vehicles moving around and to/from the site, every day at all times, principally including:

- Employee movement to and from the site each day during foundation construction
- Delivery of raw materials

- Delivery of turbines etc
- Movement of internal site traffic (e.g. concrete trucks between batching plant and turbine sites).

Plant and Equipment

Significant plant and equipment required during the proposed work is likely to include: cranes, trucks (long and wide loads), electricity generators, graders, rollers, water carts, drilling rigs, excavators, front end loaders, etc.

Operation and Maintenance

Regular maintenance will occur around once every two weeks.

Decommissioning and Rehabilitation

Above ground wind turbine elements will be removed, with tracks remaining in place.

5. Existing values

5.1 Introduction

The Proposal is located within the local government areas of Shire of Coorow and Shire of Carnamah. This is a predominantly rural area with some protected areas such as Alexander Morrison and Tathra National Park as well as South Eneabba, Wotto and Coomallo Nature Reserves.

The following section provides an overview of the existing landform, land use and vegetation in the area surrounding the Proposal. These features all contribute to the landscape and visual character of the area.

5.2 Landscape character units

As there are a variety of land uses and typologies in close proximity to the project, the study area has been divided into LCUs to identify those areas that share common landscape features and visual characteristics. Whilst in reality the landscape and views surrounding the Proposal vary continuously by way of land use, orientation and degree of visual exposure, this categorisation allows a number of general descriptions to be applied to these landscape types and as discussed above subdivides the landscape into areas of differing sensitivity on which the Proposal would have differing impacts.

The elements that contribute to the identification of LCUs include landform, vegetation, water form, land use, significant features and views of the area.

The LCUs recognised for this assessment are:

LCU 1 – Lower Western Edge and Plateau of the Gingin Scarp

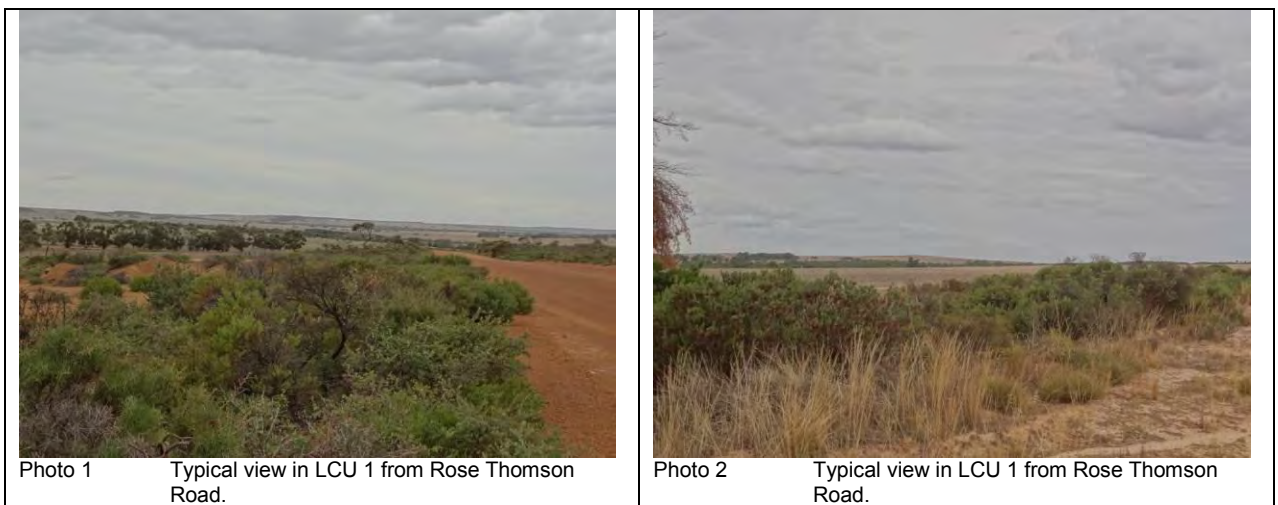
LCU 2 – Higher Valleys of the Western Gingin Plateau;

LCU 3 – Natural Areas;

The LCUs are shown in Appendix A Figure 4 and described below.

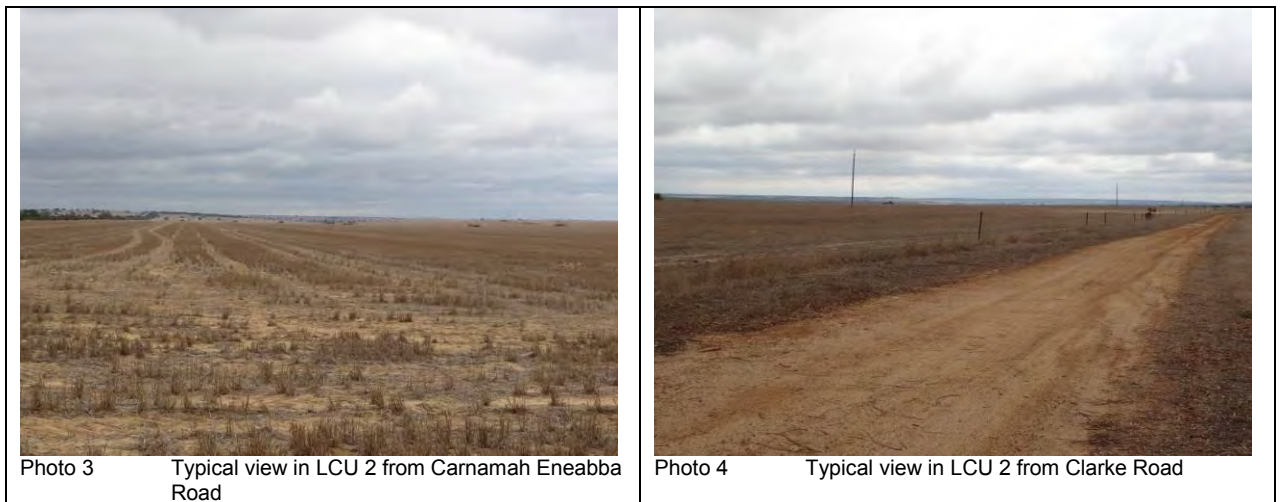
5.2.1 LCU 1 – Lower Western Edge and Plateau of the Gingin Scarp

This occurs to the west of the study area. It is west of Tathra and Alexander Morrison National Parks to the leading edge of the scarp in the west. The landscape is a gently rolling and largely cleared upland farming landscape rising to high points of 280 metres. Its elevation and openness give a feeling of „wide-open’ landscape with wide views extending for very long distances to the south and west in particular. The extensive openness of the landscape dwarfs the individual and the specific landscape features within it. Nevertheless, farm houses, sheds and power lines are visible from closer quarters. The only population centre within the study area is Eneabba and it is located to the northeast of this LCU. There is an active heavy mineral mine located just south of Eneabba.



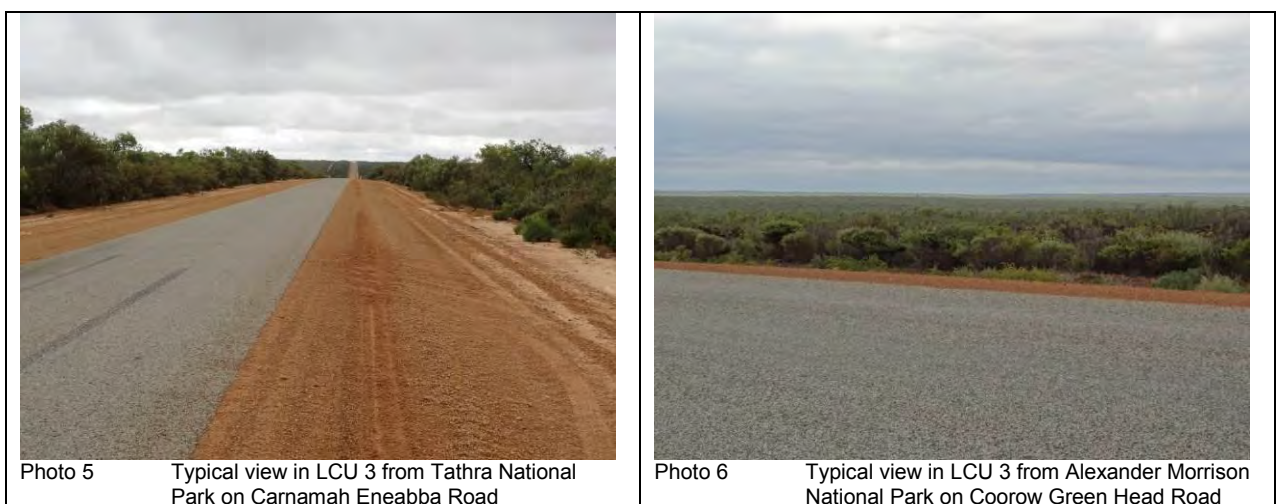
5.2.2 LCU2 – Upper Western Gingin Plateau

This LCU occurs to the east of the study area. This is a varied landscape with changes in relief with hill tops and ridges over 300 metres. A ridge runs in a north south alignment between Rose Thomson and Garibaldi Wallis Road. It is a flat topped plateau with heights over 340 metres. The landscape offers long open views primarily in a north south orientation. The predominant land use in the area is agricultural with large open fields of crops which include wheat, barley and other crops. There are large areas of commercial almond plantation to the north east. The population with the area is primarily of homesteads located on large farms.



5.2.3 LCU3 - Nature Reserve and National Park

Although these comprise an important part of the landscapes identified above, the reserves and national parks deserve separate identification owing to very strong visual characteristics of the natural vegetation cover. They form a pronounced visual separation between visual elements/landscape units to the east and west rising to points of highest elevation at approximately 280 metres. These areas are an extremely biodiverse and iconographic natural landscape element in the area. Tathra and Alexander Morrison National Parks (NP) are located to the north and south of the study area respectively. There are 3 Nature Reserves (NR) with the study area: Wotto NR to the north, Eneabba NR to the east and Coomallo NR to the south.



5.3 Sensitive receptors

People are mobile and therefore could potentially experience views of the Proposal from many different locations. In order to undertake an assessment of visual impacts, a series of key view locations have been selected to represent the points from which the Proposal is likely to be viewed by the greatest number of visual receptors and /or from where the most sensitive visual receptors are likely to perceive the Proposal.

Representative sensitive receptor locations have been indicated in Appendix A Figure 3 and have been described in Section 5.3.

The viewing locations for which the visual impact of the proposal has been assessed are outlined below:

- View location 1 – Eneabba
- View location 2 – Tootbardi Road
- View location 3 – Chatfield Road
- View location 4 – Garibaldi Willis Road
- View location 5 – Tathra National Park
- View location 6 – Rose Thomson Road
- View location 7 – Warradarge

5.3.1 View location 1 – Eneabba



Photo 7 View location 1 - view southeast Darling Street and Morgan Street, Eneabba



Photo 8 View location 1 - view southeast from Eziway shop, King Street, Eneabba

Table 8 View location 1 - visual context

Landscape/ visual element	Baseline description
Location	▶ At the corner of Darling Street and Morgan Street in Eneabba.
Landform / significant features	▶ Topography is generally flat with the land gently rising in elevation to the east of the town.
Vegetation	▶ To the south and east the vegetation is dense thickets of low scrubby plants.
Water	▶ There are no rivers or creeks in the immediate area.
Land use and infrastructure	▶ Eneabba has a population of approximately 260 (based on the 2001 census). It is a small rural town with the primary employment coming from the mineral sands mine located to the south. The Dongara Eneabba freight Railway is located to the north of the town and terminates at the mine. Brand Highway which has a north south alignment is located to the west of the town.
Visual context	<ul style="list-style-type: none">▶ Views are generally dictated by the topography and presence of local vegetation. Vistas range from a short to long distance and are screened/filtered in some directions.▶ Views in this area are primarily composed of large areas of low vegetation with cleared agricultural farm land in some views.▶ Views are experienced by residents, road users and tourists on the wildflower drives.

5.3.2 View location 2 – Tootbardi Road



Photo 9 View location 2 - view north northeast from Tootbardi Road

Table 9 View location 2 – visual context

Landscape/ visual element	Baseline description
Location	<ul style="list-style-type: none"> Unpaved road running northeast from Brand highway to Coorow Green Head Road.
Landform / significant features	<ul style="list-style-type: none"> Topography is gently rolling with the road running along the top of a ridge line at approximately 250 metres. This view location is located on a high point on the road at approximately 274 metres.
Vegetation	<ul style="list-style-type: none"> Primarily cleared agricultural tillage land, with some patches of natural vegetation. Alexander Morrison NP is visible in the distance to the northeast.
Water	<ul style="list-style-type: none"> There are no drainage lines in the immediate vicinity of the view location. There are however some drainage lines with riparian zone and degraded non-wooded drainage lines that run from the ridgeline to the north and south. There are also some small farm dams used for agricultural purposes.
Land use and infrastructure	<ul style="list-style-type: none"> Primarily cleared agricultural pasture with scattered pockets of taller vegetation. Sparse distribution of homestead.
Visual context	<ul style="list-style-type: none"> Views are generally dictated by the topography and presence of local vegetation. Vistas are long open to the distance. Views in this area are primarily composed of agricultural land and associated activities/infrastructure, and natural areas of protected vegetation in the national park. Views of the thick smooth carpet of vegetation in Alexander Morrison NP to the southeast. There are some residential properties in the vicinity of this location that would experience similar views. Views are experienced by road users, agricultural workers, tourists on the wildflower drives and residents of the homestead within the area.

5.3.3 View location 3 – Chatfield Road



Photo 10 View location 3 - view southwest from Chatfield Road

Table 10 View location 3 – visual context

Landscape/ visual element	Baseline description
Location	<ul style="list-style-type: none"> Unpaved road with a north south orientation. It connects to Carnamah Eneabba Road in the north joining Clarke and Willmott Road in the south.
Landform / significant features	<ul style="list-style-type: none"> Topography is gently undulating. This view location is located on a raised plateau at approximately height of 283 metres.
Vegetation	<ul style="list-style-type: none"> Primarily cleared agricultural tillage land, with some patches of natural vegetation.
Water	<ul style="list-style-type: none"> There are no creeks or water lines in the area other than small farm dams used for agricultural purposes.
Land use and infrastructure	<ul style="list-style-type: none"> Primarily cleared agricultural pasture with scattered pockets of taller vegetation. Sparse distribution of homestead.
Visual context	<ul style="list-style-type: none"> Views are generally dictated by the topography and presence of local vegetation. Vistas are medium in distance with views restricted along some parts of the road due to roadside vegetation. Views in this area are primarily composed of agricultural land and associated activities/infrastructure, and natural areas of protected vegetation in the national park. There are some residential properties in the vicinity of this location that would experience similar views. Views are experienced by road users, agricultural workers, tourists on the wildflower drives and residents of the homestead within the area.

5.3.4 View location 4 – Garibaldi Willis Road



Photo 11 View location 4 - view south/southeast from Garibaldi Willis Road

Table 11 View location 4 – visual context

Landscape/ visual element	Baseline description
Location	<ul style="list-style-type: none"> Unpaved road with a north south orientation. It connects to Carnamah Eneabba Road in the north Coorow Green Head Road in the south.
Landform / significant features	<ul style="list-style-type: none"> This view location is located on the eastern edge of raised ridgeline plateau at approximately height of 300 metres. Topography is gently undulating with a valley to the northeast.
Vegetation	<ul style="list-style-type: none"> Primarily cleared agricultural tillage land to the south and east, with some patches of natural vegetation. To the west of this location is a dense thicket of low scrubby vegetation.
Water	<ul style="list-style-type: none"> There are no creeks or water lines in the area other than small farm dams used for agricultural purposes.
Land use and infrastructure	<ul style="list-style-type: none"> Primarily cleared agricultural pasture with scattered pockets of taller vegetation Uncleared land with dense thickets of low scrubby vegetation, Sparse distribution of homestead.
Visual context	<ul style="list-style-type: none"> Views are generally dictated by the topography and presence of local vegetation. Vistas are medium to long in distance. Views are restricted along some parts of the road due to thick roadside vegetation. Views in this area are primarily composed of agricultural land and associated activities/infrastructure, and natural areas of vegetation. There are some residential properties in the vicinity of this location that would experience similar views. Views are experienced by road users, tourists on the wildflower drives, agricultural workers, and residents of the homestead within the area.

5.3.5 View location 5 – Tathra National Park



Photo 12 View location 5 - view south/southwest from Carnamah Eneabba Road /Garibaldi Rd at Tathra National Park

Table 12 View location 5 – visual context

Landscape/ visual element	Baseline description
Location	<ul style="list-style-type: none"> ▸ Junction of the paved Carnamah Eneabba Road and the unpaved Garibaldi Willis Road. The National Park is in two sections. The larger is to the north of Carnamah Eneabba Road with the smaller section to the south, just west of Garibaldi Willis Road.
Landform / significant features	<ul style="list-style-type: none"> ▸ This view location is located on the northern side of a ridgeline at approximately height of 300 metres. Topography is rolling and undulating in nature.
Vegetation	<ul style="list-style-type: none"> ▸ Primarily a dense thicket of low scrubby vegetation that is of national importance due to its biodiversity.
Water	<ul style="list-style-type: none"> ▸ There are no creeks or waterlines in the area.
Land use and infrastructure	<ul style="list-style-type: none"> ▸ Primarily protected areas of native vegetation, ▸ Sparse distribution of homestead in the surrounding area
Visual context	<ul style="list-style-type: none"> ▸ Views are generally dictated by the topography and presence of local vegetation. Vistas are medium to short in distance. Views are restricted due a rise in topography to the south as well as the vegetation. ▸ Views in this area are primarily composed of natural areas of vegetation. ▸ Views are experienced by road and recreational users

5.3.6 View location 6 – Rose Thomson Road



Photo 13 View location 6 - view southeast from Rose Thomson Road

Table 13 View location 6 – visual context

Landscape/ visual element	Baseline description
Location	<ul style="list-style-type: none"> Unpaved road with a north south orientation. It connects to Carnamah Eneabba Road in the north Coorow Green Head Road in the south.
Landform / significant features	<ul style="list-style-type: none"> This view location is located on a low ridge at approximately height of 235 metres. Topography is gently undulating with a valley to the east.
Vegetation	<ul style="list-style-type: none"> Primarily cleared agricultural tillage land, with some patches of natural vegetation. Thick band of road side vegetation.
Water	<ul style="list-style-type: none"> There is a river valley to the east running in a north south direction. The river has many small tributaries flowing onto it from the surrounding area.
Land use and infrastructure	<ul style="list-style-type: none"> Primarily cleared agricultural pasture with scattered pockets of taller vegetation Uncleared dense thickets of low scrubby roadside vegetation, Sparse distribution of homestead.
Visual context	<ul style="list-style-type: none"> Views are generally dictated by the topography and presence of local vegetation. Vistas are medium to long in distance. Views are restricted along some parts of the road due to thick roadside vegetation. Views in this area are primarily composed of agricultural land and associated activities/infrastructure, and natural areas of vegetation. There are some residential properties in the vicinity of this location that would experience similar views. Views are experienced by road users, agricultural workers, tourists on the wildflower drives and residents of the homestead within the area.

5.3.7 View location 7 – Warradarge



Photo 14 View location 7 - view northeast from Halfway Road House and camping facility

Table 14 View location 7 – visual context

Landscape/ visual element	Baseline description
Location	<ul style="list-style-type: none"> Located just off the Brand highway at the junction with Coorow-Green Road. This area consists of the Halfway Mill Roadhouse, the Bush Fire Brigade Station and meeting room. There is also a small area of a caravan park beside the roadhouse.
Landform / significant features	<ul style="list-style-type: none"> This view location is located in the lower region of the study area at approximately height of 171 metres. It is situated in a creek valley. The topography is undulating with higher areas to the east.
Vegetation	<ul style="list-style-type: none"> Primarily cleared agricultural tillage land to the east and north, with some patches of natural vegetation. To the west of this location the vegetation is a dense thicket of low scrubby vegetation.
Water	<ul style="list-style-type: none"> Drainage lines with riparian zone and degraded non-wooded drainage lines that run from the ridgeline to the north and south.
Land use and infrastructure	<ul style="list-style-type: none"> Primarily cleared agricultural pasture with scattered pockets of taller vegetation. Petrol Station with associated infrastructure and services. Bush Fire Brigade Station
Visual context	<ul style="list-style-type: none"> Views are generally dictated by the topography and presence of local vegetation. Vistas are medium distance. Views are restricted in some parts due

Landscape/ visual element	Baseline description
	<p>to thick roadside vegetation.</p> <ul style="list-style-type: none"> ▸ Views in this area are primarily composed of agricultural land and associated activities/infrastructure, and natural areas of vegetation. ▸ Views are experienced by road users, tourists on the wildflower drives, agricultural workers, customers and employees of the roadhouse and users of the caravan park facility. ▸ Users of the Bush Fire Brigade Station community meeting room.

6. Impact Assessment

6.1 Introduction

The potential visual impacts are considered within the context of the sensitivity of the surrounding visual environment and the potential for viewing of the areas that have had changes to their visual outlook due to site works and operational requirements. The assessment of potential visual impacts as a result of the proposal focuses on the visibility of both the construction and operation phases.

The key visible components of the proposal that may give rise to landscape and visual effects during the **construction** phase during daylight hours would include:

- Site compound (site offices, amenity facilities, equipment storage, fencing, signage).
- Construction vehicle and employee movements (on site).
- Construction workers travelling to and from work.
- Temporary road closures and/or diversions and associated signage
- Unsealed access tracks.
- Concrete batching plant.
- Delivery and erection of plant and equipment.
- Crane and erection of turbines and overhead power line
- Excavation works and foundation establishment (both turbines and overhead power lines).
- Site and some vegetation clearance.
- Soil stockpiling.

Whilst wind turbines and overhead power lines are likely to be the most visible component of the proposal, other visible ancillary structures during the **operation** phase during daylight hours may include:

- An internal network of unsealed access roads.
- Maintenance operations, vehicle and employee movements.
- Three guyed anemometer masts.
- Electrical substation.

The landscape and visual impacts as seen from the viewing locations as described in Section 5 above have been assessed for both construction and operational phases in the following sections. As discussed in Section 5 above, these viewing locations are representative of the potential landscape and visual issues within the 25 km study area.

This report is not a summary of every potential landscape and visual impact associated with the construction and operation of the proposal, but a representation of the various effects that may arise at different publically accessible locations. Generally, these will be short term, phased impacts during the construction phase of the proposal. These impacts will reduce in significance over time in the operational phase as new elements become part of the existing view.

Viewing locations assessed include (Refer Appendix A, Figure 3 and Appendix B Photomontages):

- View location 1 - Eneabba
- View location 2 – Tootbardi Road
- View location 3 – Chatfield Road
- View location 4 – Garibaldi Willis Road
- View location 5 – Tathra National Park
- View location 6 – Rose Thomson Road
- View location 7 – Warradarge

General mitigation recommendations for landscape and visual management have also been discussed in Section 7 below, in response to the impact assessment.

View location 1 – Eneabba (refer Appendix A, Figure 3 and Appendix B, photomontage location 1)

Visible	Construction
Proposal Elements	<ul style="list-style-type: none"> • Haulage vehicles moving materials/equipment/plant to and from the site on trucks via the local road network and any associated airborne dust. • Temporary road closures and/or diversions and associated signage. • Construction workers travelling to and from work. • Top of crane and erection of turbines and overhead power lines. <p>Operation</p> <ul style="list-style-type: none"> • Wind turbines. • Maintenance vehicles accessing the site via the local road network and any associated airborne dust.
Landscape and Visual Impacts - Construction Phase	<p>Due to the distance from the construction site (approximately 22 km), residential receptors, tourists and road users would generally experience short term and distant views of the erection of the turbines.</p> <p>The key impact from this viewing location would be indirect via the introduction of new scenes of large transport vehicles utilising the local road network causing disruption to the existing amenity. These effects would be short term, phased and adverse, and viewed within the context of the existing road and freight rail network/movements, as a result of dust and visual intrusion caused by:</p> <ul style="list-style-type: none"> • Haulage vehicles moving materials/equipment/plant to and from the site. • Construction workers travelling to and from work. • Temporary Road closures and/or diversions and associated signage. <p>The construction works would also have an adverse effect on the setting of the „wildflower drives’ resulting in reduced amenity due to dust and visual</p>

intrusion.

Effects would be experienced from residential properties with long viewing opportunities, by tourists on „wildflower drives’ with an interest in their environment and by road users passing through. However, views would be transient and short term in nature.

The area viewed from location 1 is described in Section 5 above as LCU 1. It has a *low sensitivity* due to the largely modified (largely cleared farming landscape) nature, and a *medium potential capacity* to absorb change due to its scale (i.e. extensive openness, low vegetation, generally flat topography large tracts of agricultural land). Overall the proposal is assessed as having a **negligible landscape impact** on this view location due to distance from the site and generally flat topography. The proposal is assessed as having a neutral impact as it will neither enhance nor detract from the landscape character and view in this area.

The visual amenity of receptors would be indirectly and adversely affected primarily due to the increased presence of oversized construction vehicles, and construction activities viewed at a distance. Receptors are assessed as having a **medium visual sensitivity** due to residence’s long viewing periods at a distance from the construction site.

Using the matrix (Table 7) the predicted construction period impacts have been assessed as short term and **not significant**.

Landscape and
Visual Impacts -
Operation Phase

Generally speaking turbines will not be visible from this location. There may be potential for filtered distant (22 km) views from some locations in Eneabba for residents and tourists.

Existing low foreground vegetation would act to filter/intervene between the viewer and the turbines.

Impacts would reduce over time as the above ground elements become part of the view.

The proposal is assessed as having a neutral impact as it will neither enhance nor detract from the landscape character and view in this area.

It is therefore assessed as having a **negligible landscape impact** and **medium visual sensitivity** during operation.

The predicted operational impacts as a direct result of this proposal have been assessed as long term and **not significant**.

View location 2 – Tootbardi Road (refer Appendix A, Figure 3 and Appendix B, photomontage location 2)

<p>Visible Proposal Elements</p>	<p>Construction</p> <ul style="list-style-type: none"> • Haulage vehicles moving materials/equipment/plant to and from the site on trucks via the local road network and any associated airborne dust. • Temporary road closures and/or diversions and associated signage. • Construction workers travelling to and from work. • Top of crane and erection of turbines and overhead power lines. <p>Operation</p> <ul style="list-style-type: none"> • Wind turbines. • Overhead power lines.
<p>Landscape and Visual Impacts - Construction Phase</p>	<p>Due to the distance from the construction site (approximately 17 km), residential receptors, tourists, road users and agricultural workers would generally experience short term and distant views of the erection of the turbines and overhead power lines.</p> <p>The key impact from this viewing location would be indirect via the introduction of new scenes of large transport vehicles utilising the local road network causing disruption to the existing amenity. These effects would be short term, phased and adverse, but viewed within the context of the existing road and freight rail network/movements in the local area, and agricultural cropping (i.e. generates dust) as a result of dust and visual intrusion caused by:</p> <ul style="list-style-type: none"> • Haulage vehicles moving materials/equipment/plant to and from the site, and between different construction areas on site. • Construction workers travelling to and from work, and moving between different areas of the site. • Temporary road closures and/or diversions and associated signage. <p>The construction works would also have an adverse effect on the setting of the „wildflower drives’ and conservation areas national parks and would result in reduced amenity due to dust and visual intrusion.</p> <p>Effects would be experienced from residential properties with long viewing opportunities, however although this viewpoint is elevated topographically, views of the site would be distant, foreground vegetation/patterned broad acre cropping. Tourists on „wildflower drives’ with an interest in their environment and by road users passing through would have transient and short term in nature. Agricultural workers with a focus on their work would have intermittent views, in part filtered by foreground vegetation.</p> <p>The area viewed from location 2 is described in Section 5 above as LCU 2. It has a <i>low sensitivity</i> due to the largely modified (cleared farming landscape)</p>

	<p>nature, and a <i>medium potential capacity</i> to absorb change due to its scale (i.e. extensive openness, low vegetation, changes in topographical relief, large tracts of agricultural land). Overall the proposal is assessed as having a moderate landscape impact primarily due to the introduction of tall vertical elements into the existing setting. The proposal is assessed as having a negative impact as it will reduce and have an adverse effect on the existing landscape character and view</p> <p>The visual amenity of receptors would be indirectly and adversely affected primarily due to the increased presence of oversize construction vehicles, and construction activities viewed from a distance. Receptors are assessed as having a medium visual sensitivity due to residence's long viewing periods at a distance from the construction site.</p> <p>Using the matrix (Table 7) the predicted construction period impacts have been assessed as short term and of moderate significance.</p>
<p>Landscape and Visual Impacts - Operation Phase</p>	<p>Key impacts during operation would be the addition of overhead power lines and turbines reaching over the skyline, visible from a distance, and the infrequent use of the local road network by maintenance vehicles accessing the site.</p> <p>Due to the viewing distance (17 km) from the site, when viewed together, all turbines form an irregular group with varying spacing between. The overlapping and differing extent of visibility of each turbine causes some visual confusion. Additionally, the turbines will appear to be spread out and disappear behind the varying topographical relief. The visibility of the turbines also will vary greatly, depending on the weather conditions, as they are seen against the sky.</p> <p>Existing low foreground vegetation, varying topographical relief, wind breaks, would create act to intervene between the viewer and the turbines.</p> <p>The turbines will not form a dominant focus for views from this location, in part due to distance from the site and intervening vegetation. The scale and character of the landscape is not overly compromised, as the character is that of a highly modified landscape and therefore is more capable of visually absorbing developments such as wind turbines than more "untouched" or "pristine" types of landscape. As such, landscape sensitivity and capacity to absorb change would remain the same as that described above in construction phase.</p> <p>The proposals would have a long term adverse effect on the setting of the „wildflower drives' and conservation areas national parks and would result in reduced amenity due to visual intrusion.</p> <p>The proposed substation will not be visible in this view.</p> <p>Key receptors would be residents with long viewing periods, road users passing through with transient views, tourists on the „wildflower drives' with a focus on their environment and agricultural workers with a focus on their</p>

activity.

Impacts would reduce over time as the above ground elements become part of the view.

The proposal is assessed as having a negative impact as it will reduce and have an adverse effect on the existing landscape character and view.

It is therefore assessed as having a **small landscape impact** and **medium visual sensitivity** during operation.

The predicted operational period impacts as a direct result of this proposal have been assessed as long term and of **minor significance**.

View location 3 – Chatfield Road (refer Appendix A, Figure 3 and Appendix B, photomontage location 3)

Visible	Construction
Proposal Elements	<ul style="list-style-type: none">• Medium distance views of haulage vehicles moving materials/equipment/plant to and from the site on trucks via the local road network and any associated airborne dust.• Temporary road closures and/or diversions and associated signage.• Construction workers travelling to and from work.• Delivery and erection of turbines, and anemometer mast.• Crane and large construction vehicles moving about the site.• Construction compound and concrete batching plant. Operation <ul style="list-style-type: none">• Wind turbines.• Anemometer masts.• Large maintenance vehicles accessing the site via the local road network and any associated airborne dust.
Landscape and Visual Impacts - Construction Phase	<p>Although still at some distance from the construction site (approximately 10 km), residential receptors, road users, tourists and agricultural workers would experience direct impacts. Disruption to the existing amenity would comprise distant views of large construction elements only including the erection of the turbines, the construction compound, batching plant and large vehicle movements and associated dust both on site and by large transport vehicles utilising the local road network.</p> <p>Impacts would be short term, phased and adverse, but viewed within the context of the existing road network/movements and agricultural activities (e.g. cropping generating dust) in the local area, as a result of dust and visual</p>

intrusion caused by:

- Haulage vehicles moving materials/equipment/plant to and from the site, and between different construction areas on site.
- Construction workers travelling to and from work, and moving between different areas of the site.
- Temporary road closures and/or diversions and associated signage.
- General construction activities, particularly at the site entry, compound and batching plant off Garibaldi Willis Road and during the erection of turbines to the north-eastern corner of the site.

The construction works would also have an adverse effect on the setting of the „wildflower drives’ resulting in reduced amenity due to dust and visual intrusion.

Effects would be experienced from residential properties with long viewing opportunities, however although this viewpoint is elevated topographically, views of the site would be distant and in part screened by roadside vegetation and foreground vegetation/patterned broad acre cropping. Tourists on „wildflower drives’ with an interest in their environment and road users passing through would have views that are transient and short term in nature. Agricultural workers with a focus on their work would have intermittent views, in part filtered by foreground vegetation.

The area viewed from location 3 is described in Section 5 above as LCU 2. It has a *low sensitivity* due to the largely modified (cleared farming landscape) nature, and a *medium potential capacity* to absorb change due to its scale (i.e. extensive openness, low vegetation, changes in topographical relief, large tracts of agricultural land). Overall the proposal is assessed as having a **moderate landscape impact** primarily due to the introduction of tall vertical elements, construction compound and batching plant into the existing setting. The proposal is assessed as having a negative impact as it will reduce and have an adverse effect on the existing landscape character and view

The visual amenity of receptors would be indirectly and adversely affected primarily due to the increased presence of oversize construction vehicles, and construction activities viewed from a distance. Receptors are assessed as having a **medium visual sensitivity** due to residence’s long viewing periods at a distance from the construction site.

Using the matrix (Table 7) the predicted construction period impacts have been assessed as short term and of **moderate significance**.

Landscape and
Visual Impacts -
Operation Phase

Key impacts during operation would be the addition of turbines reaching over the skyline, visible from a distance, and the infrequent use of the local road network by maintenance vehicles accessing the site.

Due to the viewing distance (10 km) from the site, when viewed together, all turbines form an irregular group with varying spacing between. The

overlapping and differing extent of visibility of each turbine causes some visual confusion. Additionally, the turbines will appear to be spread out and disappear behind the varying topographical relief in the southern site extents. The visibility of the turbines also will vary greatly, depending on the weather conditions, as they are seen against the sky.

Existing low foreground and roadside vegetation and varying topographical relief would act to filter/intervene between the viewer and the turbines.

The proposals would have a long term adverse effect on the setting of the „wildflower drives’ and would result in reduced amenity due to visual intrusion.

The turbines will form a focus in some views from this location, in part due to distance from the site and intervening vegetation. The scale and character of the landscape is not overly compromised, as the character is that of a highly modified landscape and therefore is more capable of visually absorbing developments such as wind turbines than more “untouched” or “pristine” types of landscape. As such, landscape sensitivity and capacity to absorb change would remain the same as that described above in construction phase.

The proposed substation will not be visible in this view.

Key receptors would be residents with long viewing periods, road users passing through with transient views, tourists on the „wildflower drives’ with a focus on their environment and agricultural workers with a focus on their activity.

Impacts would reduce over time as the above ground elements become part of the view.

The proposal is assessed as having a negative impact as it will reduce and have an adverse effect on the existing landscape character and view

It is therefore assessed as having a **moderate landscape impact** and **medium visual sensitivity** during operation.

The predicted operational period impacts as a direct result of this proposal have been assessed as long term and of **moderate significance**.

View location 4 – Garibaldi Willis Road (refer Appendix A, Figure 3 and Appendix B, photomontage location 4)

<p>Visible Proposal Elements</p>	<p>Construction</p> <ul style="list-style-type: none"> • Construction vehicles and workers accessing the site via the local road network, any associated airborne dust. • Access roads from Garibaldi Willis road and throughout the site. • Delivery and erection of turbines, overhead power lines and anemometer mast. • Crane and large construction vehicles moving about the site. • Construction compound and concrete batching plant and associated infrastructure/elements. • General construction activities (e.g. excavating, soil stock piles) and workers on site. <p>Operation</p> <ul style="list-style-type: none"> • Wind turbines. • Anemometer masts. • Access roads. • Substation. • Maintenance vehicles accessing the site via the local road network and on site, any associated airborne dust.
<p>Landscape and Visual Impacts - Construction Phase</p>	<p>Close views (approximately 4 km) of direct impacts would be afforded by residential receptors, road users, tourists and agricultural workers.</p> <p>Disruption to the existing amenity/visual intrusion would result from views of all construction activities (including delivery and erection).</p> <p>Impacts would be short term, phased and adverse.</p> <p>The construction works would also have an adverse effect on the setting of the „wildflower drives’ resulting in reduced amenity due to dust and visual intrusion.</p> <p>Effects would be experienced from residential properties with long viewing opportunities, but in part screened or filtered by roadside vegetation and some foreground vegetation. Tourists on „wildflower drives’ with an interest in their environment and road users passing through would have views that are transient and short term in nature. Agricultural workers with a focus on their work would have intermittent views, in part filtered by foreground vegetation.</p> <p>The area viewed from location 4 is described in section 5 above as LCU 2. It has a <i>low sensitivity</i> due to the largely modified (cleared farming landscape) nature, and a <i>medium potential capacity</i> to absorb change due to its scale (i.e. extensive openness, low vegetation, changes in topographical relief,</p>

	<p>large tracts of agricultural land). Overall the proposal is assessed as having a large landscape impact primarily due to the introduction of tall vertical elements, construction compound, anemometer masts and batching plant into the existing setting. The proposal is assessed as having a negative impact as it will reduce and have an adverse effect on the existing landscape character and view</p> <p>The visual amenity of receptors would be directly and adversely affected primarily due to the presence of construction activities and new built form. Receptors are assessed as having a high visual sensitivity due to residence's long viewing periods viewed from a close distance to the construction site.</p> <p>Using the matrix (Table 7) the predicted construction period impacts have been assessed as short term and of major significance.</p>
<p>Landscape and Visual Impacts - Operation Phase</p>	<p>Key impacts during operation would be the addition of turbines (some turbines will be fully visible), a substation, unsealed access roads and the infrequent use of the local road network by maintenance vehicles accessing the site.</p> <p>This view represents the potential visual impact on a number of views along the Garibaldi Willis Road, when approaching the proposed site from the north or south, many within 5 km of the site.</p> <p>Most turbines will be fully visible. Generally, the turbines would be seen as a cohesive group spaced out at regular distances and have a visual relationship with the topography, resulting in visual clarity. However, seven turbines to the north-east corner of the site, when viewed from this direction, display increasing gaps between turbines, distort the cohesiveness of the group further west and do not relate to the existing topography.</p> <p>Generally, however, the overlapping and differing extent of visibility of each turbine causes some visual confusion. Additionally, the turbines will appear to be spread out and reduce in scale behind the varying topographical relief to the northern site extents. The visibility of the turbines also will vary, depending on the weather conditions, as they are seen against the sky.</p> <p>Due to the close proximity of the views, and large scale of the proposals, screening is not possible.</p> <p>The proposals would have a long term adverse effect on the setting of the „wildflower drives’ and would result in reduced amenity due to visual intrusion.</p> <p>The turbines will be the largest elements in this landscape. They will be a dominant focus for views in this direction. However, the scale and character of the landscape is not overly compromised. This landscape has been shaped by humans, which is evident from the agricultural cropping, geometrical shapes of the paddock boundaries and existing road network. This type of landscape is more capable of visually absorbing developments such as wind turbines than more “untouched” or “pristine” types of landscape. As such, landscape sensitivity and capacity to absorb change would remain the same</p>

as that described above in construction phase.

Key receptors being residents with long viewing periods, road users passing through with close but transient views, tourists on the „wildflower drives’ with a focus on their environment, maintenance workers on site and agricultural workers with a focus on their activity.

Impacts would reduce over time as the above ground elements become part of the view.

The proposal is assessed as having a negative impact as it will reduce and have an adverse effect on the existing landscape character and view

It is therefore assessed as having a **large landscape and medium visual sensitivity** during operation.

The predicted operational period impacts as a direct result of this proposal have been assessed as long term and of **high significance**.

View location 5 – Tathra National Park (refer Appendix A, Figure 3 and Appendix B, photomontage location 5)

<p>Visible Proposal Elements</p>	<p>Construction</p> <ul style="list-style-type: none"> • Haulage vehicles moving materials/equipment/plant to and from the site on trucks via the local road network and any associated airborne dust. • Temporary road closures and/or diversions and associated signage. • Construction workers travelling to and from work. • Top of crane and erection of turbines and overhead power lines. <p>Operation</p> <ul style="list-style-type: none"> • Wind turbines. • Maintenance vehicles accessing the site from the local road network.
<p>Landscape and Visual Impacts - Construction Phase</p>	<p>Due to the distance from the construction site (approximately 14 km), recreational and road users experience short term and distant views of the erection of the turbines.</p> <p>The key impact from this viewing location would be indirect via the introduction of new scenes of large transport vehicles utilising the local road network causing disruption to the existing amenity. These effects would be short term, phased and adverse, but viewed within the context of the existing road network/movements in the local area generated as a result of dust and visual intrusion caused by:</p> <ul style="list-style-type: none"> • Haulage vehicles moving materials/equipment/plant to and from the site, and between different construction areas on site. • Construction workers travelling to and from work, and moving between different areas of the site. • Temporary road closures and/or diversions and associated signage. <p>The construction works would also have an adverse effect on the setting of the „wildflower drives’ and recreational experience of the Tathra National Park to its margins resulting in reduced amenity due to dust and visual intrusion.</p> <p>Views to the site itself will be restricted due to distance, undulating topography including a rise in topography south of the view location and presence of dense thicket vegetation in the foreground of the southern section of the Tathra National Park.</p> <p>Tourists on „wildflower drives’ with an interest in their environment and by road users passing through would have transient and short term in nature.</p> <p>The area viewed from location 5 is described in Section 5 above as LCU 3. It has a <i>medium sensitivity</i> due to their rarity within the region, iconic nature, value locally and contribution to the landscape through the contrast of natural vegetation cover and adjacent land uses. As such, this LCU has a <i>low potential capacity</i> to absorb change. Overall, during the construction phase it</p>

	<p>is assessed as having a moderate landscape impact primarily due to vehicular movements. The proposal is assessed as having a negative impact as it will reduce and have an adverse effect on the existing landscape character and view</p> <p>The visual amenity of receptors would be indirectly and adversely affected primarily due to the increased presence of oversize construction vehicles, and construction activities viewed from a distance. Receptors are assessed as having a medium visual sensitivity primarily due to recreation users' interest in their local environment.</p> <p>Using the matrix (Table 7) the predicted construction period impacts have been assessed as short term and of moderate significance.</p>
<p>Landscape and Visual Impacts - Operation Phase</p>	<p>The key impacts during operation would be the addition of turbines reaching over the skyline, which may be visible from this viewing location, and the infrequent use of the local road network by maintenance vehicles accessing the site.</p> <p>Due to the viewing distance (14 km) from the site, when viewed together, all turbines will form an irregular group with varying spacing between. The overlapping and differing extent of visibility of each turbine will cause some visual confusion. Additionally, the turbines will disappear behind the varying topographical relief. The visibility of the turbines also will vary greatly, depending on the weather conditions, as they are seen against the sky.</p> <p>The turbines will not form a dominant focus within views from this location due to distance, existing dense foreground vegetation and the topographical relief rising to the south which would act to filter/intervene views between the user and the turbine. However, the proposals would have a long term adverse effect on the setting to the „wildflower drives' and the Tathra National Park, resulting in reduced amenity due to visual intrusion.</p> <p>The scale of the landscape will not be overly compromised. However, the unique character as a „natural areas' of LCU 3 is less capable of visually absorbing developments such as wind turbines than more modified landscapes such as adjacent agricultural land. As such, landscape sensitivity and capacity to absorb change would remain the same as that described above in construction phase.</p> <p>The proposed substation will not be visible in this view.</p> <p>Key receptors would be road users passing through with transient views and recreation users on the „wildflower drives'/utilising the Tathra National Park with a focus on the natural environment.</p> <p>Impacts would reduce over time as the above ground elements become part of the view.</p> <p>The proposal is assessed as having a negative impact as it will reduce and have an adverse effect on the existing landscape character and view</p>

It is therefore assessed as having a **moderate landscape impact** and **low visual sensitivity** during operation.

The predicted operational period impacts as a direct result of this proposal have been assessed as long term and of **minor significance**.

View location 6 – Rose Thomson Road (refer Appendix A, Figure 3 and Appendix B, photomontage location 6)

Visible	Construction
Proposal Elements	<ul style="list-style-type: none">• Haulage vehicles moving materials/equipment/plant to and from the site on trucks via the local road network and any associated airborne dust.• Temporary road closures and/or diversions and associated signage.• Construction workers travelling to and from work.• Crane and large construction vehicles moving about the site.• Construction compound and concrete batching plant and associated infrastructure/elements.• Access roads throughout the site.• General construction activities (e.g. excavating, soil stock piles) and workers on site. Operation <ul style="list-style-type: none">• Wind turbines.• Overhead power lines.• Anemometer masts.• Access roads.• Substation.• Maintenance vehicles accessing the site via the local road network and on site, any associated airborne dust.
Landscape and Visual Impacts - Construction Phase	<p>Medium distance views (approximately 9 km to nearest turbines and 850 m to the nearest overhead power line pylon) of direct impacts would be afforded by residential receptors, road users, tourists and agricultural workers.</p> <p>Disruption to the existing amenity/visual intrusion would result from views of all construction activities (including delivery and erection).</p> <p>Impacts would be short term, phased and adverse.</p> <p>The construction works would also have an adverse effect on the setting of the „wildflower drives’ resulting in reduced amenity due to dust and visual intrusion.</p> <p>Effects would be experienced from residential properties with long viewing</p>

	<p>opportunities, but in part screened or filtered by roadside vegetation and some foreground vegetation. Tourists on „wildflower drives’ with an interest in their environment and road users passing through would have views that are close, transient and short term in nature. Agricultural workers with a focus on their work would have intermittent views, in part filtered by foreground vegetation.</p> <p>The area viewed from location 6 is described in Section 5 above as LCU 1. It has a <i>low sensitivity</i> due to the largely modified (largely cleared farming landscape) nature, and a <i>medium potential capacity</i> to absorb change due to its scale (i.e. extensive openness, low vegetation, generally flat topography large tracts of agricultural land). Overall it is assessed as having a moderate landscape impact primarily due to the introduction of turbines and overhead power lines into the existing setting. The proposal is assessed as having a negative impact as it will reduce and have an adverse effect on the existing landscape character and view</p> <p>The visual amenity of receptors would be directly and adversely affected primarily due to the presence of construction activities and new built form. Receptors are assessed as having a high visual sensitivity due to residence’s long viewing periods viewed from a close distance to the construction site.</p> <p>Using the matrix (Table 7) the predicted construction period impacts have been assessed as short term and of high significance.</p>
<p>Landscape and Visual Impacts - Operation Phase</p>	<p>Key impacts during operation would be the addition of overhead power lines and turbines, a substation and unsealed access roads and maintenance vehicles on site.</p> <p>This view represents the potential visual impact on a number of views along the Rose Thomson Road, when approaching the proposed site from the north or south, many within 5 km of the site.</p> <p>Generally, the overhead power lines/pylons and turbines will be fully visible. The foreground view will be dominated by the overhead powerline pylons with the turbines in the background (but still highly visible). Generally, the overlapping and differing extent of visibility of each turbine and pylon will cause some visual confusion. Additionally, the turbines will appear to be spread out and reduce in scale behind the varying topographical relief to the southern site extents. The visibility of the turbines and pylons will also vary, depending on the weather conditions, as they are seen against the sky.</p> <p>The overhead powerlines to the north west corner of the site, when viewed from this direction will display regular but wide gaps between pylons, and to some extent will distort the cohesiveness of the combined group of turbines and pylons together. However, the overhead powerlines will be viewed within the context of existing similar infrastructure (330 kV adjacent powerline running in a general north-south direction) in the local area.</p> <p>Due to the medium distance proximity of the views, and large scale of the</p>

proposals, screening is not possible.

The proposals would have a long term adverse effect on the setting of the „wildflower drives’ and would result in reduced amenity due to visual intrusion.

The turbines and pylons will be the largest elements in this landscape. They will be a dominant focus for views in this direction. However, the scale and character of the landscape will not be overly compromised. This landscape has been shaped by humans, which is evident from the agricultural cropping, geometrical shapes of the paddock boundaries, existing road network and power infrastructure. This type of landscape is more capable of visually absorbing developments such as wind turbines than more “untouched” or “pristine” types of landscape. As such, landscape sensitivity and capacity to absorb change would remain the same as that described above in construction phase.

The proposed substation may be visible in this view but will have minimal visual impact due to the presence of intervening vegetation, and the existing and proposed pylons in the foreground and the substation’s distance from the view location.

Key receptors would be residents with long viewing periods, road users passing through with close but transient views, tourists on the „wildflower drives’ with a focus on their environment, maintenance workers on site and agricultural workers with a focus on their activity.

Impacts would reduce over time as the above ground elements become part of the view.

The proposal is assessed as having a negative impact as it will reduce and have an adverse effect on the existing landscape character and view

It is therefore assessed as having a **moderate landscape impact** and **medium visual sensitivity** during operation.

The predicted operational period impacts as a direct result of this proposal have been assessed as long term and of **moderate significance**.

View location 7 – Warradarge (refer Appendix A, Figure 3 and Appendix B, photomontage location 7)

Visible	<p>Construction</p> <ul style="list-style-type: none"> • Haulage vehicles moving materials/equipment/plant to and from the site on trucks via the local road network and any associated airborne dust. • Temporary road closures and/or diversions and associated signage. • Construction workers travelling to and from work. <p>Operation</p> <ul style="list-style-type: none"> • Maintenance vehicles accessing the site via the local road network and any associated airborne dust.
Landscape and Visual Impacts - Construction Phase	<p>View location 7 is approximately 15 km from the construction site and located within a creek valley with higher topography and screening vegetation to the east. Tourists, road users, customers and employees of the roadhouse and caravan park, and Bush Fire Brigade Station would generally only experience indirect impacts via the introduction of new scenes of large transport vehicles utilising the local road network, causing disruption to the existing amenity. The construction site itself would not be seen. Impacts would be short term, phased and adverse, and viewed within the context of the existing road and freight rail network/movements, as a result of dust and visual intrusion caused by:</p> <ul style="list-style-type: none"> • Haulage vehicles moving materials/equipment/plant to and from the site, and between different construction areas on site. • Construction workers travelling to and from work, and moving between different areas of the site. • Temporary road closures and/or diversions and associated signage. <p>The construction works would also have an adverse effect on the setting of the „wildflower drives’ resulting in reduced amenity due to dust and visual intrusion.</p> <p>The area viewed from location 7 is described in Section 5 above as LCU 1. It has a <i>low sensitivity</i> due to the largely modified (largely cleared farming landscape) nature, and a <i>medium potential capacity</i> to absorb change due to its scale (i.e. extensive openness, low vegetation, generally flat topography large tracts of agricultural land). Overall it is assessed as having a small landscape impact primarily due to construction traffic movements. The proposal is assessed as having a neutral impact as it will neither enhance nor detract from the landscape character and view in this area.</p> <p>The visual amenity of receptors would be indirectly and adversely affected primarily due to the increased presence of oversize construction vehicles. However, these impacts would be viewed in the context of the existing Brand Highway. Receptors are assessed as having a low visual sensitivity due to</p>

	<p>residence's long viewing periods at a distance from the construction site.</p> <p>Using the matrix (Table 7) the predicted construction period impacts have been assessed as short term and not significant.</p>
Landscape and Visual Impacts - Operation Phase	<p>The proposal site will not be visible from this location during operation.</p> <p>It is therefore assessed as having a negligible landscape impact and neutral visual sensitivity during operation.</p> <p>The proposal is assessed as having a neutral impact as it will neither enhance nor detract from the landscape character and view in this area.</p> <p>As there are no predicted operational period impacts from this view location the proposal has been assessed as long term and of not significant.</p>

6.2 Cumulative Impacts

There are two known wind farms (one proposed and one operational) potentially within viewing distance of the proposed Warradarge Wind Farm site (Appendix A, Figure 7). These are anticipated to comprise:

- Badgingarra Wind Farm, proposed, 65 turbines and is approximately 39 km south of Warradarge Wind Farm, and;
- Emu Downs Wind Farm, operational, consisting of 48 turbines and is approximately 54 km south of Warradarge Wind Farm.

A ZTV has been generated to determine potential locations where these wind farms may have visibility that overlaps.

Due to distance there is no overlap of potential visibility between Emu Downs Wind Farm and Warradarge Wind Farm. The cumulative impact is therefore considered to be negligible between Warradarge Wind Farm and Emu Downs Wind Farm.

The ZTV (Appendix A, Figure 7) indicates the visibility of the proposed 100 turbines at Warradarge Wind Farm and the proposed 65 turbines at Badgingarra Wind Farm that may be visible from any point in the surrounding area. There is one potential small area from where both proposals may be potentially visible. This zone is at a distance of between 20 – 25 km from both wind farms in the vicinity of Tootbardi Road. While there is potential visibility of both wind farms in this zone, there is limited crossover where both would be visible from the same location. This is due to the presence of a ridge line to the south of Tootbardi Road which is visible on Figure 2 and has an approximate height of 260 – 290 m AHD. To the north of the ridge primarily only Warradarge Wind Farm would be potentially visible in limited areas and to the south of the ridge only Badgingarra Wind Farm would be potentially visible in limited areas.

The cumulative impact is therefore considered to be negligible between Warradarge Wind Farm and Badgingarra Wind Farm as the potential for intervisibility between the wind farms would be extremely restricted by the local topography.

7. Mitigation

The management of landscape and visual adverse impacts is to be addressed according to the hierarchy of avoidance, reduction and remedy throughout an iterative design process, construction and operation phases.

7.1 Construction

General mitigation measures would reduce and manage adverse impacts of construction work upon landscape and visual amenity may include:

- Any existing trees and vegetation to be retained should be protected prior to construction commencement.
- Temporary hoardings, barriers, traffic management and signage would be removed when no longer required.
- Work on site would be restricted to agreed working daytime working hours wherever possible.
- Lighting of compounds and works sites would be restricted to agreed working hours and that which are necessary for security.
- Contractors' compounds would be located away from residential areas/residences wherever possible.
- Roads providing access to site compounds and works areas would be maintained free of dust and mud as far as reasonably practicable.
- Upon completion of construction, all remaining spoil and construction materials would be re-used on site or removed to a suitable location.

7.2 Operation

General mitigation strategies have been proposed below, given that the siting layout and design are yet to be finalised at the time of writing this report. Such measures have been observed through reference to similar proposals and research.

Wind turbines are by their nature highly visible elements and cannot be easily screened. Their function dictates that they are located on exposed sites. In this case, it is difficult to utilise the generally flat to undulating topography of the site to screen the development from sensitive viewpoints.

Mitigation measures were considered at the initial stages of planning for the layout and design of the turbines.

General Principles

The principle objectives for the layout should include:

- A wind farm possesses visual relationships between each turbine, in addition to the landscape as a collective group. This relationship must appear clear and simple in order for a development to seem rational and visually unified.
- Minimisation of visual confusion.

- Turbines and the landscape need to form a coherent unit, achieve balance and avoid visual confusion.
- Consider physical, social and experiential and visual characteristics of the surrounding landscape.
- The location and design of a wind farm should relate to the key characteristics of the landscape.
- Where possible the size of wind turbines should relate to the scale of the surrounding landscape, as well as to the design of the wind farm group, so that they do not appear intimidating.
- The spacing of turbines should be relatively regular.
- Permanent built elements (e.g. substation) are to be fenced in with materials that are not visually dominant and screened if possible with indigenous planting to the perimeter.

The size of the wind farm is confined and the arrangement of the turbines is to be related to the landform and is to avoid existing native vegetation wherever possible. Whilst the turbines have a presence within the immediate principal visual zone, the scale of the development should not destroy the spatial relationships of the landscape.

Design of Site Access Roads

- The overall length of road required to access the turbines during construction and maintenance should be minimised.
- Avoidance of significant cut should be achieved by following the site contours rather than crossing the contours.
- Excavated material removed during the road construction would be temporarily stockpiled and used to regrade the edges of the road to minimise scarring, where possible.

Siting, Design and Layout of Construction Compound, Substation and Anemometer Masts

- The construction compound will be located to the north eastern area and the substation will be located to the north west of the site in order to be less visible from sensitive viewpoints.
- Security fencing around the perimeter of the compound should not be visually dominant .
- The anemometer masts should be located within the wind farm site. The support structure should ideally comprise a metal lattice framework to decrease visibility from viewpoints close to the site. In distant views the mast will be imperceptible.

Colour

The turbines in the majority of views would be seen against the sky. It is proposed to paint them a matt pale grey as this colour acknowledges the man made and sculptural image of wind turbines. The quality of grey also means that, whatever the weather conditions or nature of the surrounding landscape characteristics, the turbines would not aesthetically clash in colour.

Taking into consideration the weather conditions of the site, a darker colour other than pale grey, would make the turbines appear dirty and industrial in character. They would also be more visible against the sky.

Decommissioning and Restoration

The impacts of the decommissioning phase are likely to be equal or less than of the construction phase.

8. Summary and Conclusions

The assessment in this report is based on the maximum potential intensity of development for the wind farm proposal which is at 100 turbines and at a tip height of 152 m. This impact assessment is therefore the maximum potential impacts available within the wind farm envelope as shown on Figure 1. At the time of writing the finalised location, number and height of turbines have not been decided. There may be a reduction in the impacts if the finalised layout of proposal included a reduced height or a lesser number of turbines.

Key views of the proposed wind farm, will occur from within the 25 km study area (refer to Appendix A, Figure 5 and Figure 6). The visual impact of the wind farm on this area is illustrated in seven photomontages (Appendix B). These have been assessed to range from not significant to major in significance during construction phase and were assessed to range from not significant to high in significance for the operational phase. There will open views towards the site from numerous stretches of road. Generally, due to the low nature of the roadside and intervening vegetation, and generally flat to undulating topography, views will be filtered in some locations.

Viewpoints 4 (within 5 km) and 6 (within 10 km) to the south-east and north-west of the proposed wind farm generally indicate that these areas will experience the greatest change into views. This is due to the close distance from the site, the low nature of intervening vegetation and flat to undulating topography. There will be some areas with open views. Impacts on views will occur from both public roads and private residences.

Viewpoints 5 and 7, approximately 15 km to the north and south from the site, will have restricted or no middle distance views due to intervening vegetation and topography. Photomontages (Appendix B) indicate the low visual impact at these locations. However, it is anticipated that the majority of middle distance views (Appendix A, Figure 3, view locations 2 and 3 and Appendix B, photomontages), will experience filtered views with some areas of open view. Generally, due to the distance from the site and intervening vegetation and agricultural practices, visual intrusion upon residential, road user and tourist receptors will be reduced.

Generally, due to distance, local topography and intervening vegetation, the visual impact on areas further than 25 km from the site will be minor.

Generally, the proposed wind farm will have a large impact upon landscape character primarily within 5 km of the site, including the site itself. From 5 km to 10 km and 10 km to 25 km in distance from the site, and beyond, due to the reducing visibility of the wind turbines, intervening vegetation and variation in topography there would be reduced impact on the landscape character.

The dominant land use of the study area is agricultural grazing with scattered private housing. Wildflower tourist drives occur on all roads surrounding the site, with pockets of nature reserves in places. Generally, human activities have shaped this landscape. Wind turbines indicate human impact, as do the geometric outlines of paddock boundaries, cropping and tree plantations. The land is used intensively and the wind exploitation is an activity that does not conflict with the prominent land uses.

The number of wind turbines and overhead power lines, and their strong vertical form will dominate the landscape when viewing from a close distance. However, generally the site layout in combination with the existing land use, results in a clear and cohesive image, which will be aesthetically acceptable. The

only variation to this will be in the north east corner of the site where turbines are more spread out, less cohesive and appear as large, individual elements that create a larger impact when viewed from the eastern side of the study area in a north or south direction.

Table 15 Summary of Impacts

View Location	Project Phase	Visual Sensitivity	Landscape Impact	Significance of Impact
1 – Eneabba	Construction	<i>Medium</i>	<i>Negligible</i>	Not significant
	Operation	<i>Medium</i>	<i>Negligible</i>	Not significant
2 – Tootbardi Road	Construction	<i>Medium</i>	<i>Moderate</i>	Moderate
	Operation	<i>Medium</i>	<i>Small</i>	Minor
3 – Chatfield Road	Construction	<i>Medium</i>	<i>Moderate</i>	Moderate
	Operation	<i>Medium</i>	<i>Moderate</i>	Moderate
4 – Garibaldi Willis Road	Construction	<i>High</i>	<i>Large</i>	Major
	Operation	<i>Medium</i>	<i>Large</i>	High
5 – Tathra National Park	Construction	<i>Medium</i>	<i>Moderate</i>	Moderate
	Operation	<i>Low</i>	<i>Moderate</i>	Minor
6 – Rose Thomson Road	Construction	<i>High</i>	<i>Moderate</i>	High
	Operation	<i>Medium</i>	<i>Moderate</i>	Moderate
7- Warradarge	Construction	<i>Low</i>	<i>Small</i>	Not significant
	Operation	<i>Neutral</i>	<i>Negligible</i>	Not significant

9. References

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Appendix A

Maps

Figure 1 Location Map

Figure 2 Topography

Figure 3 Photomontages Locations

Figure 4 Landscape Character Map

Figure 5 Zone of Theoretical Visibility - 100m Hub Height

Figure 6 Zone of Theoretical Visibility - 152m Tip Height

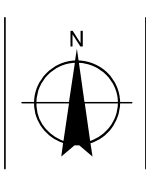
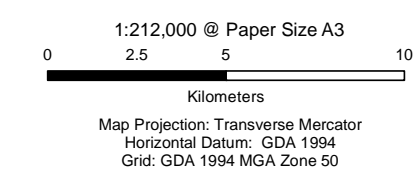
Figure 7 Cumulative Impact - Tip Height

Figure 1 Location Map



- LEGEND
- Proposed Turbine Locations
 - Proposed Wind Farm Site Boundary
 - Proposed Substation
 - Proposed Transmission Line

- Furthest extent of study Area: 25 km from proposed turbines
- Transmission Line Corridor
- Wind Farm Envelope

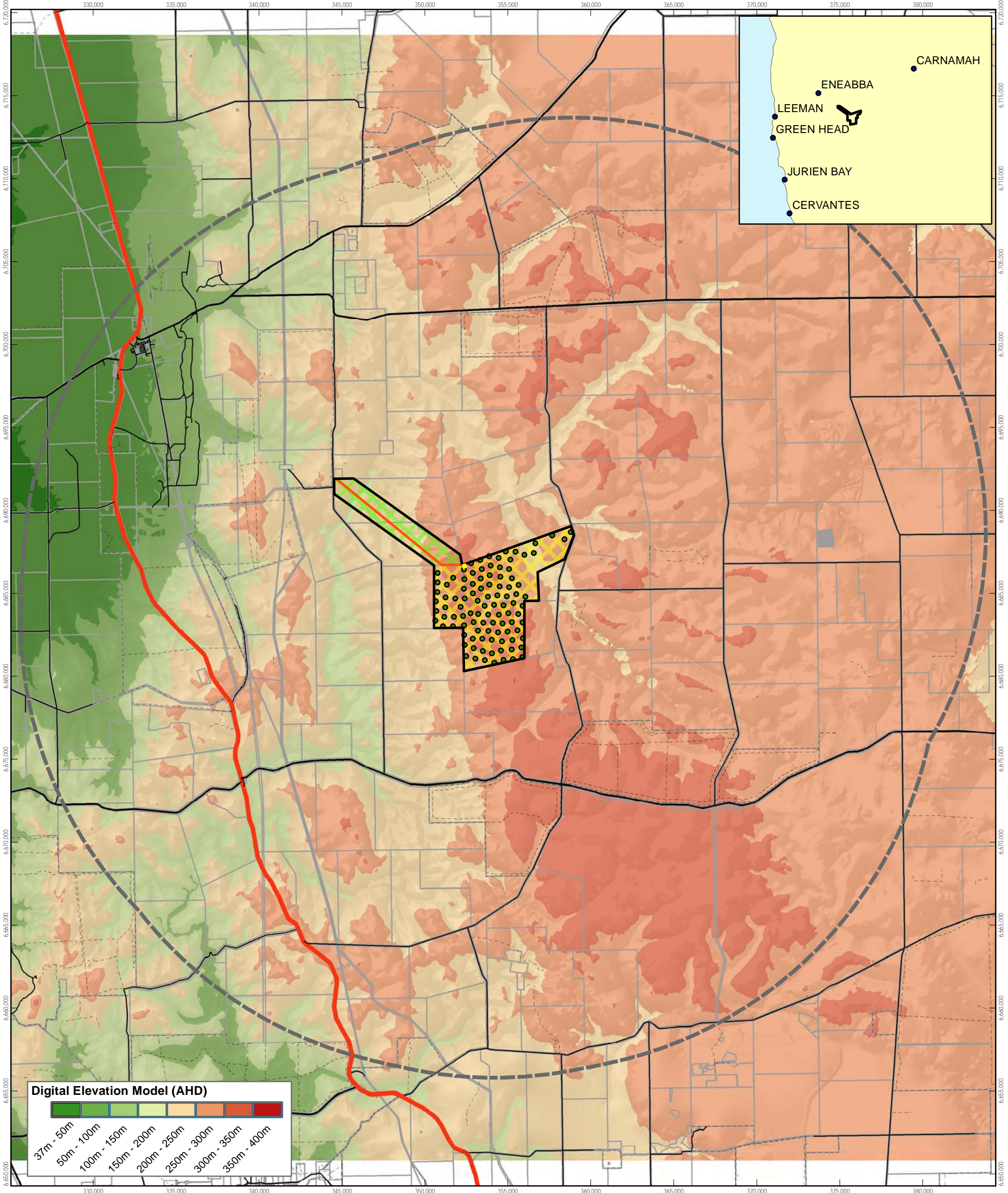


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Warradarge Wind Farm

Job Number 61-27826
Revision D
Date 11 Apr 2012

Location Map Landscape and Visual Impact Assessment Figure 1

Figure 2 Topography



LEGEND

- Proposed Turbine Locations
- Proposed Wind Farm Site Boundary
- Proposed Substation
- Proposed Transmission Line

Roads

- State Highway
- Main
- Minor

- Track
- Lot Boundaries
- Furthest extent of study Area: 25 km from proposed turbines

- Transmission Line Corridor
- Wind Farm Envelope

1:212,000 @ Paper Size A3

0 2.5 5 10 Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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Warradarge Wind Farm

Topography
Landscape and Visual Impact Assessment

Job Number 61-27826
Revision C
Date 11 Apr 2012

Figure 2

Figure 3 Photomontages Locations

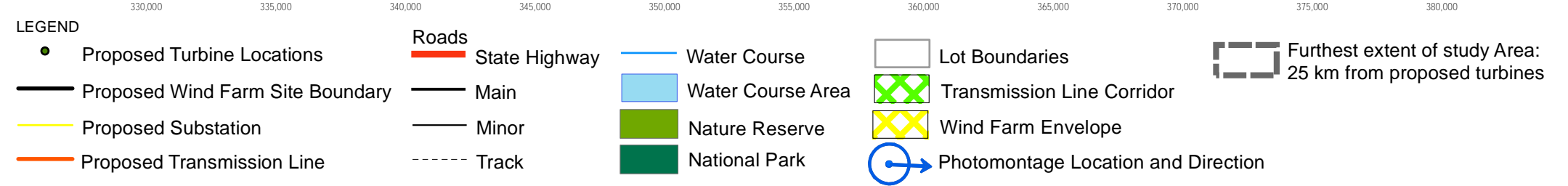
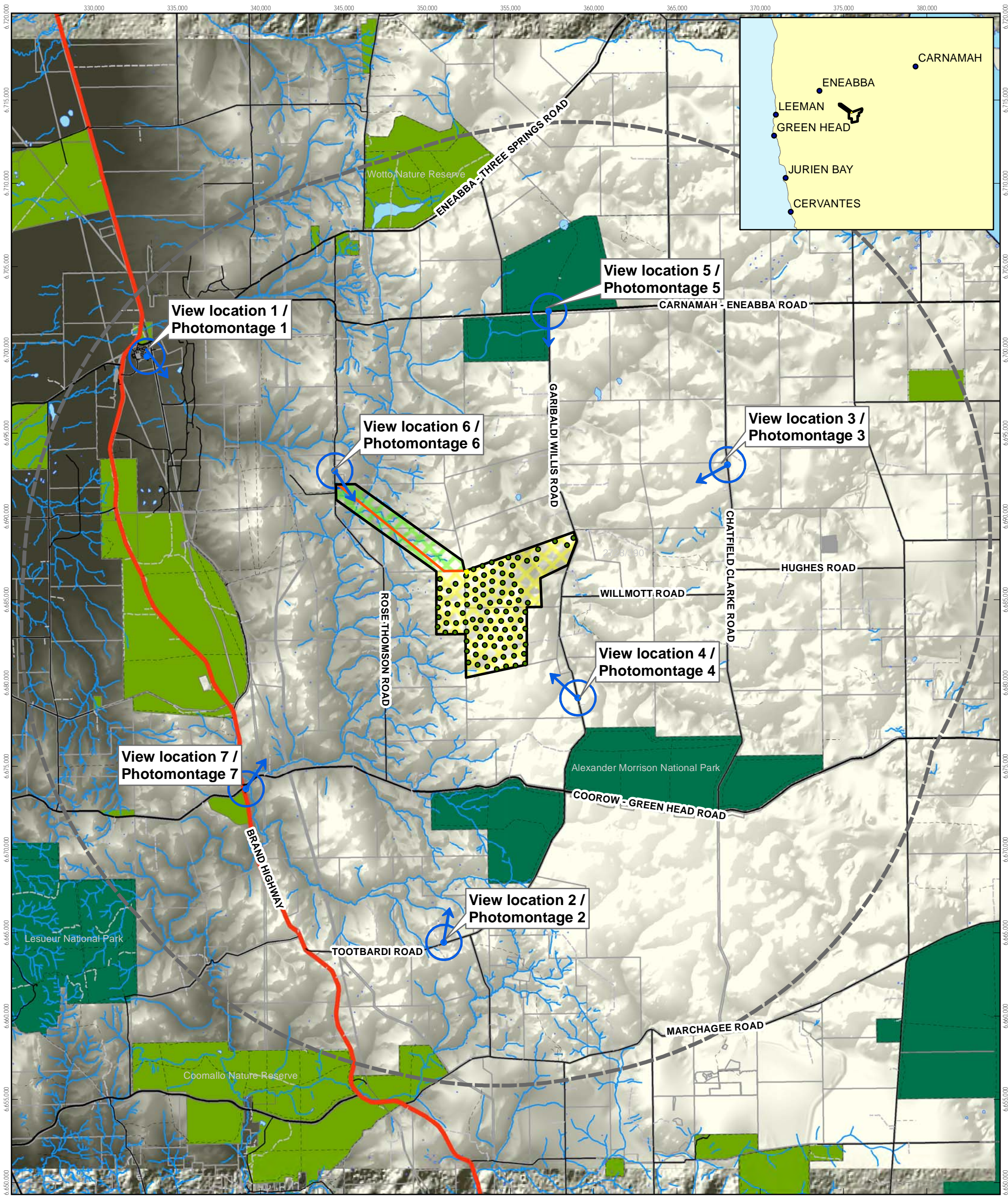
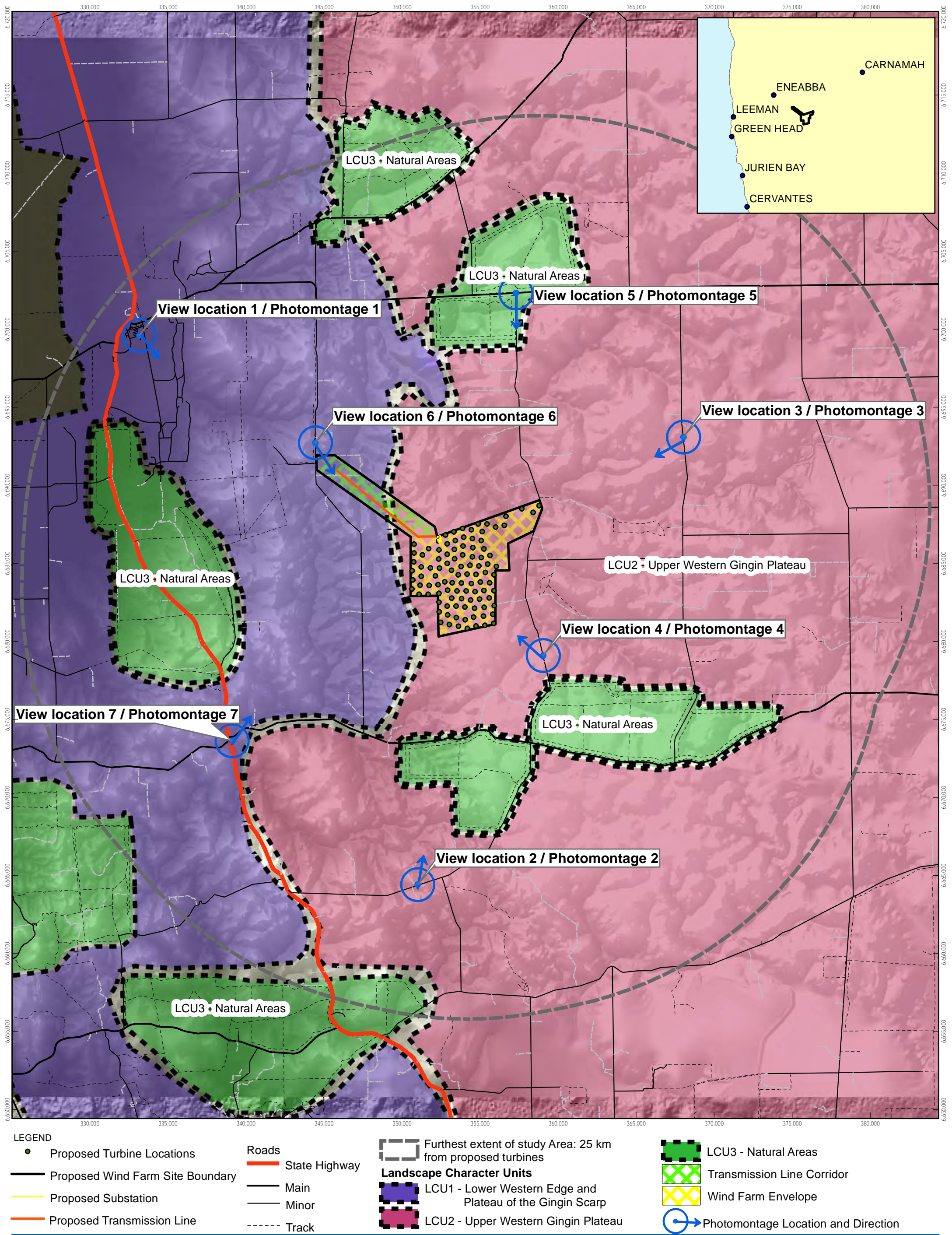


Figure 4 Landscape Character Map



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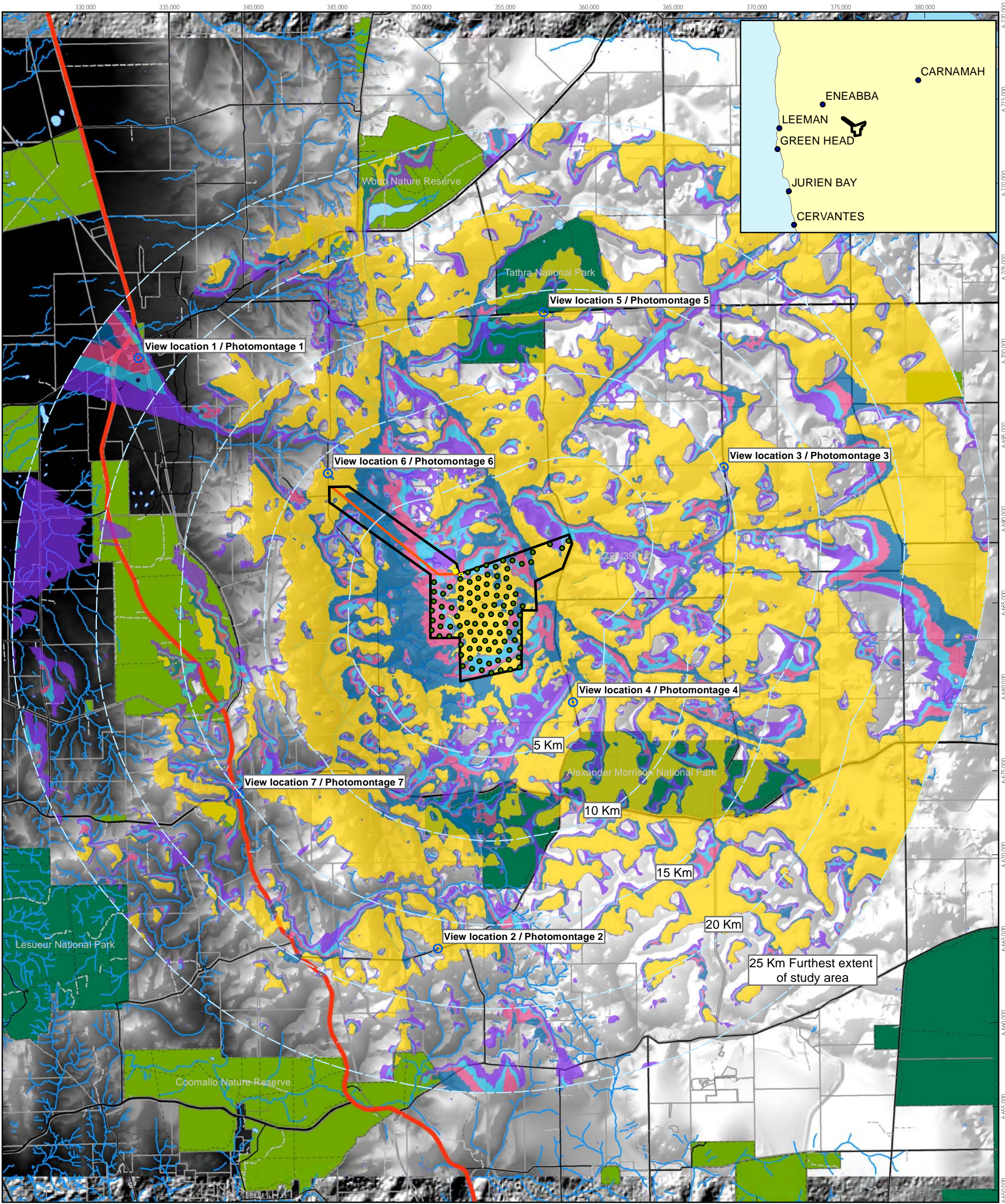
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Data source: Verve Energy; 20120130_VV-3430909v1_turbine_Location/Proposed Turbine Location/03-02-2012; Warradarge Plan for Distribution GHD JC V2/Site Boundary, Substation/Proposed Transmission Line/01-02-2012.

GHD: Landscape Character Areas/02-2012 - Landgate, Cadaster/2012, Roads/2012, Contours/10m/2012, DEC: Managed Land and Water/DEC07, GA: NatMap Geodata Topo 250K Series3 - Populated Places - 20060713. Created by:farrell

Figure 5 Zone of Theoretical Visibility - 100m Hub Height



LEGEND

- Proposed Turbine Locations
- Proposed Wind Farm Site Boundary
- Proposed Substation
- Proposed Transmission Line

Roads

- State Highway
- Main
- Minor
- Track
- Water Course

Number of Turbines Visible

- 0 - 20 Turbines
- 20 - 40 Turbines
- 40 - 60 Turbines
- 60 - 80 Turbines
- 80 - 100 Turbines

Other Features

- Water Course Area
- Nature Reserve
- National Park
- Lot Boundaries

This Zone of Theoretical Visibility illustrates the number of turbines that would be visible from any point in the surrounding area. This is based on the potential maximum visibility of the 100 turbines at the proposed Warradarge Windfarm. This visibility is based on 10 m contour intervals, an observer eye height of 1.7 m and a hub height of 100 m for the turbines. This analysis does not take into account vegetation or existing built form and is representative only.

212,000 @ Paper Size A3

0 2.5 5 10

Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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Verve Energy
Warradarge Windfarm

**Zone of Theoretical Visibility
100m Hub Height**

Job Number 61-27826
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Figure 5

Figure 6 Zone of Theoretical Visibility - 152m Tip Height

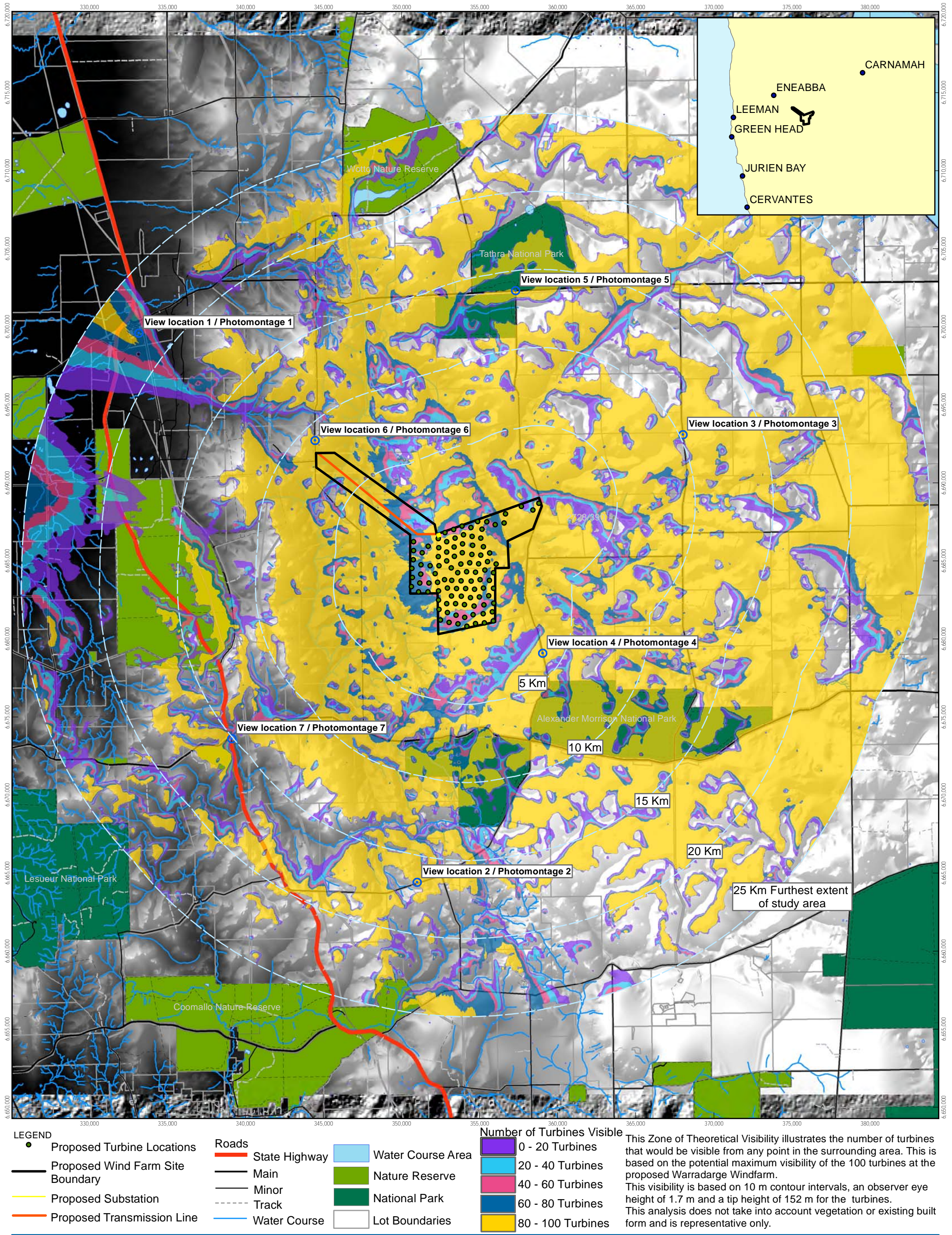
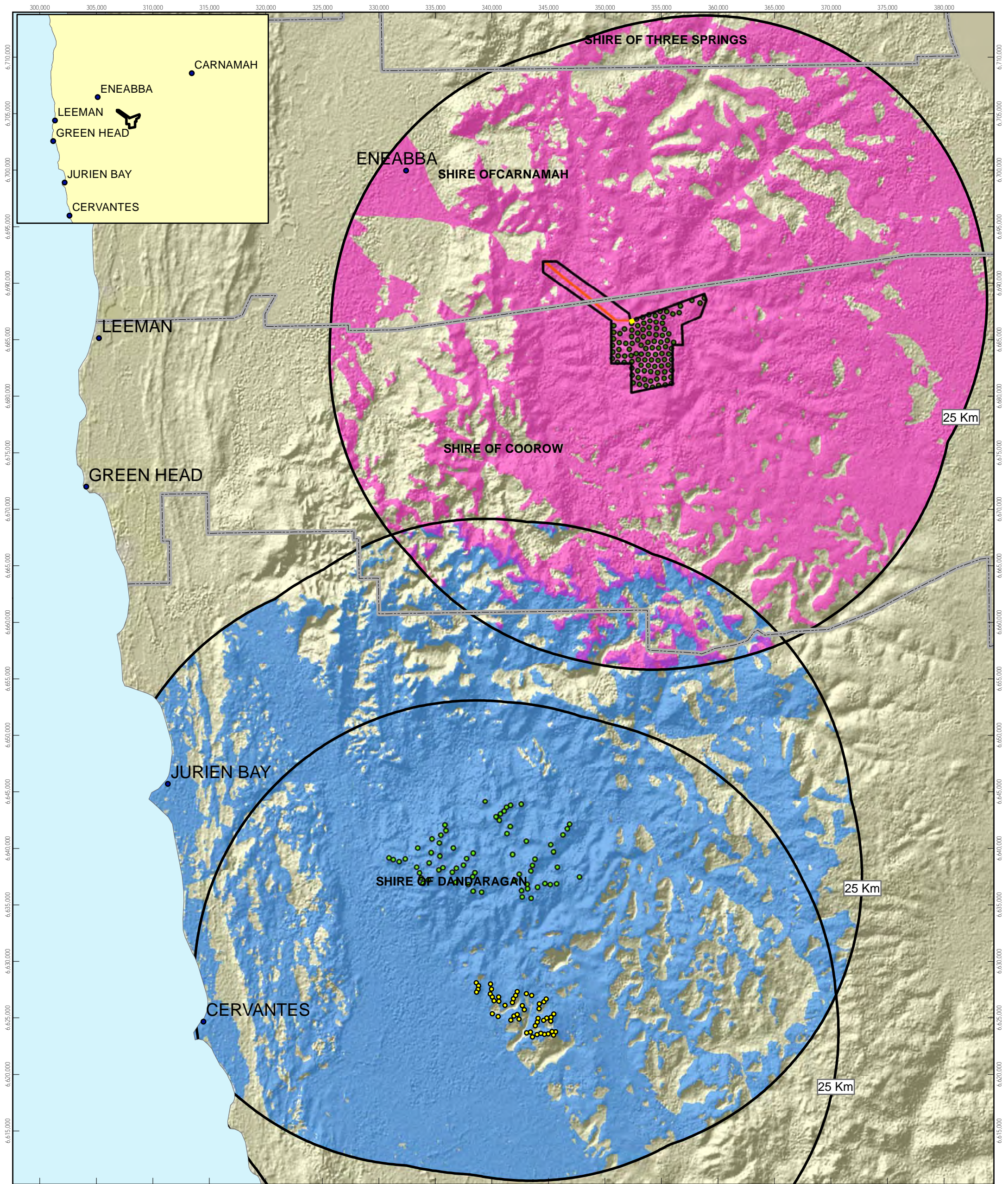


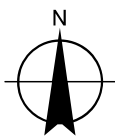
Figure 7 Cumulative Impact - Tip Height



- LEGEND**
- Furthest extent of cumulative impact study area: 25 Km from Turbines
 - Local Government Areas
 - Emu Downs Windfarm**
 - Constructed Turbine Locations
 - Proposed Badgingarra Windfarm**
 - Proposed Turbine Locations
 - Zone of Theoretical Visibility
 - Proposed Warradarge Windfarm**
 - Proposed Turbine Locations
 - Zone of Theoretical Visibility
 - Proposed Wind Farm Site Boundary
 - Proposed Substation
 - Proposed Transmission Line
 - Zone of Theoretical Visibility

This Zone of Theoretical Visibility illustrates the potential visibility of the 100 turbines at the proposed Warradarge Windfarm and the 65 turbines at Badgingarra Windfarm that may be visible from any point in the surrounding area. This visibility is based on 10 m contour intervals, an observer eye height of 1.7 m. A tip height of 152 m for Warradarge Windfarm and 121 m for Badgingarra Windfarm were use for the assessment. This analysis does not take into account vegetation or existing built form and is representative only.

310,000 @ Paper Size A3
0 3.75 7.5 15
Kilometers
Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50



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Warradarge Windfarm

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Cumulative Impact - Tip Height Landscape and Visual Impact Assessment Figure 7

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Data source: Verve Energy: 20120130_VV-3430909v1_turbine_Location/Proposed Turbine Location /03-02-2012, Warradarge Plan for Distribution GHD JC V2/Site Boundary, Substation, Proposed Transmission Line/01-02-2012.

GHD: Emu & Badgingarra Windfarm Locations/Badgingarra Wind Farm Landscape and Visual Impact Study, REpower, Final Report/2008. ESRI: SRTM Hill Shade Relief/2009. Landgate: Local Government Areas/2012. GA: NatMap Geodata Topo 250K Series3 - Populated Places - 20060713. Created by: ifarrell

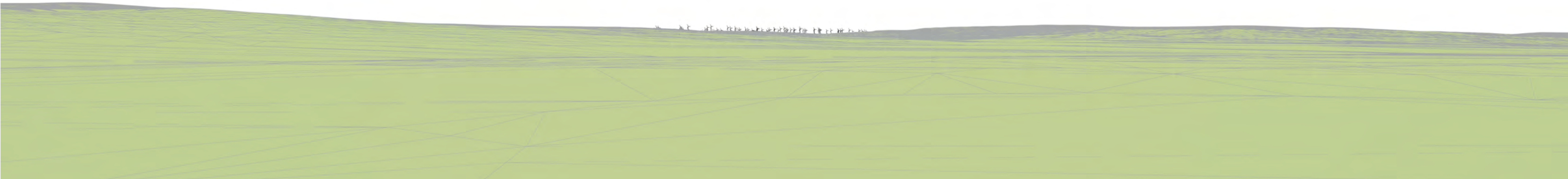
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Appendix B

Photomontages



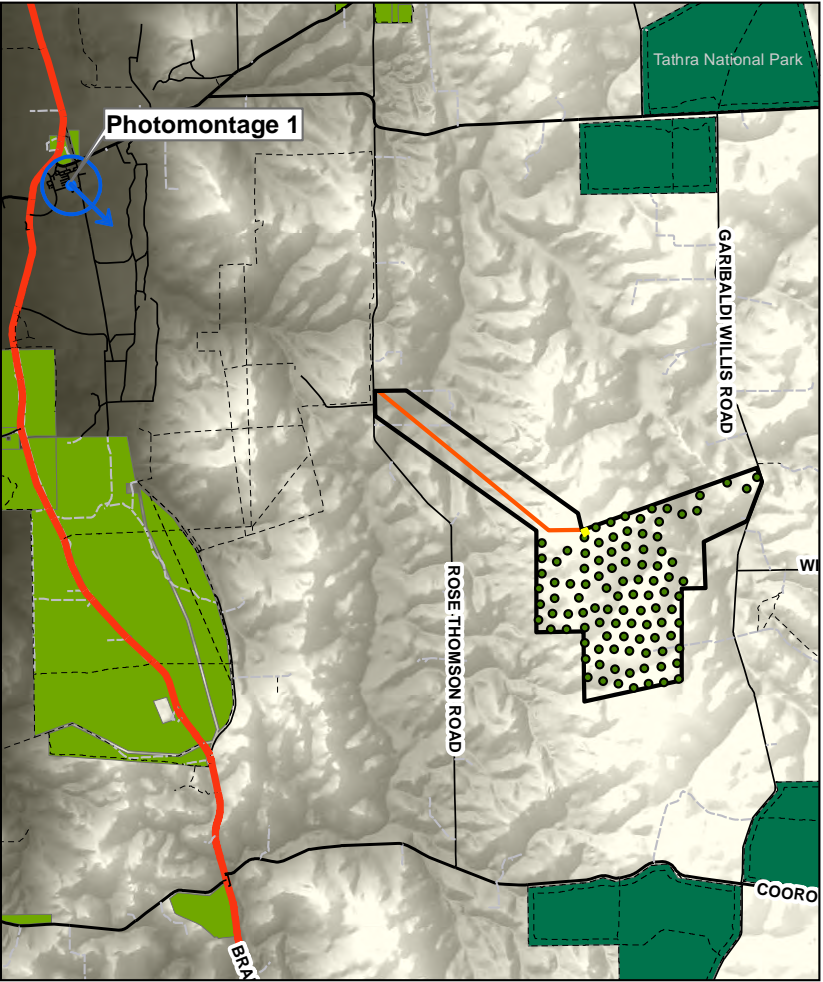
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3D model camera view




Photomontage



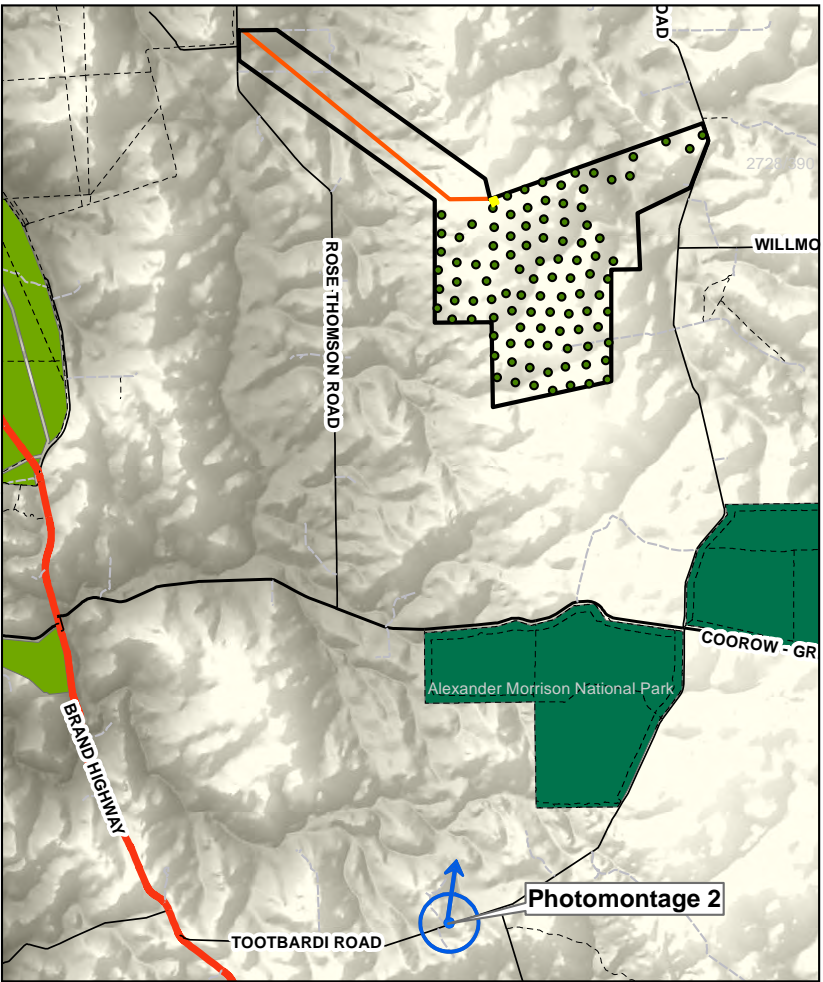
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Horizontal field of view: 124°
Vertical field of view: 55 °
Hub height of turbines: 100m
Blade length of turbines: 52m
Approximate distance to nearest turbine: 22113m
Recommended viewing distance: 425 mm

Final Issue

Client Verve Energy					
ProjectWarradarge Wind Farm					
Title Photomontage					
Location 01					
Original Size					
A2 Drawing No: 61-27826-SK001				Rev: D	
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D	Final Issue amended	AL	MC	SG	20.03.12
C	Final Issue	AL	MC	SG	19.03.12
B	Issue for Information	AL	MC	SG	02.03.12
A	Issue for Information	AL	MC	SG	29.02.12
No	Revision	Note: * indicates signatures on original issue of drawing or last revision of drawing		Drawn	Job Manager Project Director Date
 CLIENTS PEOPLE PERFORMANCE		Drawn		A. Lorenzon Designer Verve Energy	
		Drafting Check		M. Coyle Design Verve Energy	
		Approved (Project Director)			
		Date			
		DO NOT SCALE			
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Photo



Viewpoint Location: 350999.18 E 6664421.03 N
(UTM WG S84 Zone 50)
Elevation of camera: 261.73 m
Orientation of view: 12.25°
Horizontal field of view: 124°
Vertical field of view: 55 °
Hub height of turbines: 100m
Blade length of turbines: 52m
Approximate distance to nearest turbine: 16783m
Recommended viewing distance: 425 mm



3D model camera view



Photomontage

Final Issue

Client Verve Energy

ProjectWarradarge Wind Farm

Title Photomontage

Location 02


Original Size

A2

Drawing No: 61-27826-SK002

Rev: D

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A	Issue for Information	AL	MC	SG	29.02.12		
No	Revision	Note: * indicates signatures on original issue of drawing or last revision of drawing		Drawn	Job Manager	Project Director	Date

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Drawn	A.Lorenzon	Designed	Verve Energy
Drafting Check	M. Coyle	Design Check	Verve Energy
Approved (Project Director)			
Date			
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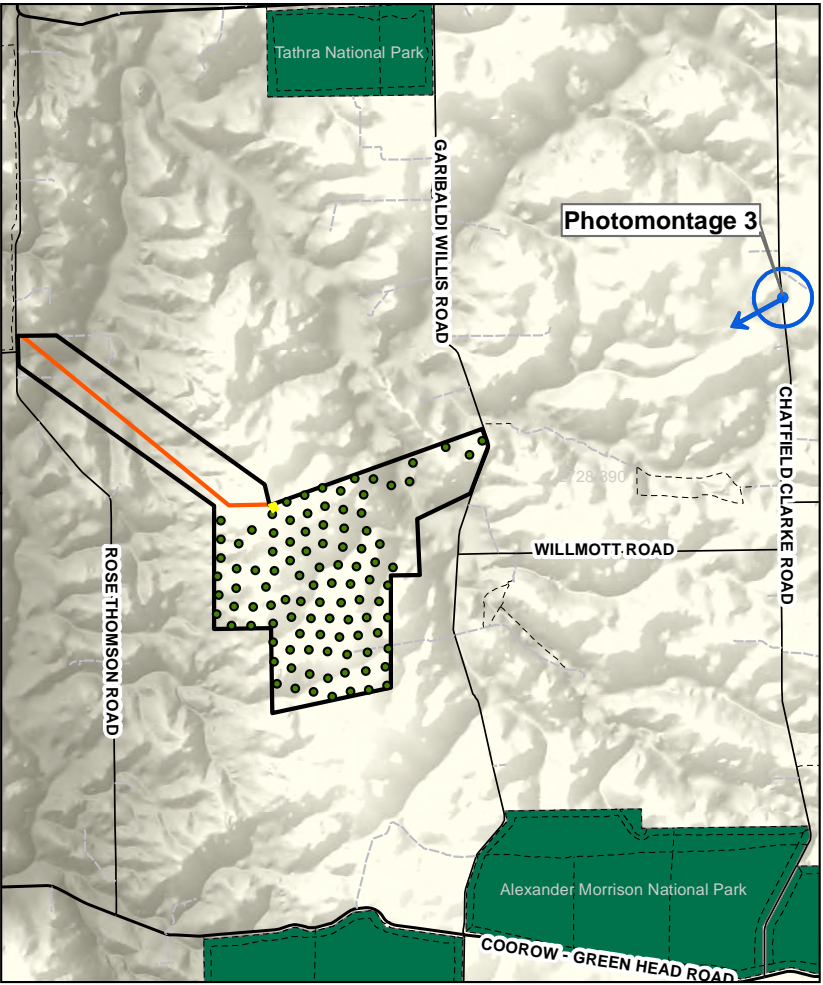
Photo



3D model camera view



Photomontage



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Elevation of camera: 288.39 m
Orientation of view: 231.25°
Horizontal field of view: 124°
Vertical field of view: 55 °
Hub height of turbines: 100m
Blade length of turbines: 52m
Approximate distance to nearest turbine: 10225m
Recommended viewing distance: 425 mm

Final Issue

Client Verve Energy

ProjectWarradarge Wind Farm

Title Photomontage

Location 03


Original Size

A2

Drawing No: 61-27826-SK003

Rev: D

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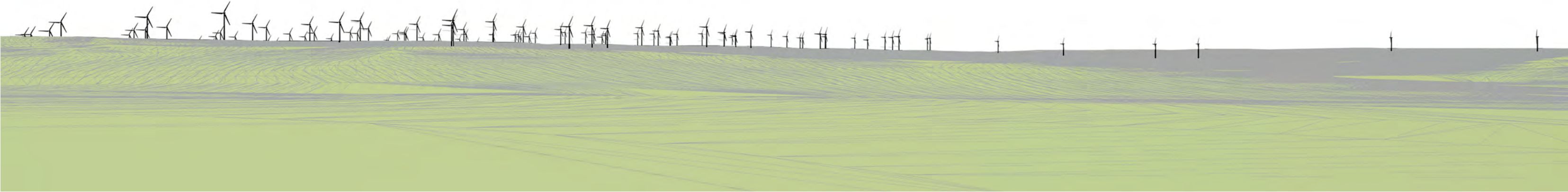
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Drafting Check	M. Coyle	Design Check	Verve Energy
Approved (Project Director)			
Date			
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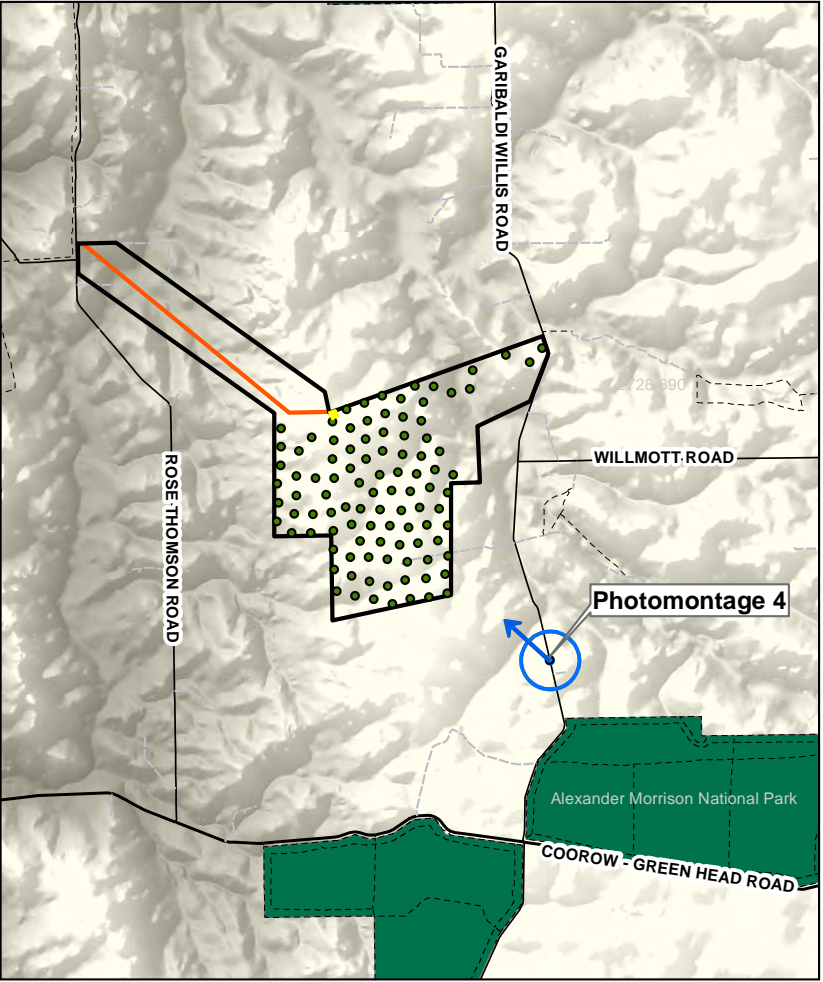
Photo



3D model camera view




Photomontage



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Orientation of view: 312°
Horizontal field of view: 124°
Vertical field of view: 55 °
Hub height of turbines: 100m
Blade length of turbines: 52m
Approximate distance to nearest turbine: 3750m
Recommended viewing distance: 425 mm

Final Issue

Client Verve Energy ProjectWarradarge Wind Farm					
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A	Issue for Information	AL	MC	SG	29.02.12
No	Revision	Note: * indicates signatures on original issue of drawing or last revision of drawing		Drawn	Job Manager Project Director Date
 CLIENTS PEOPLE PERFORMANCE		Drawn		A.Lorenzon DesignerVerve Energy	
		Drafting Check		M. Coyle DesignVerve Energy	
		Approved (Project Director)			
		Date			
Level 8, 180 Lonsdale Street, Melbourne VIC 3000 Australia T 61 3 8687 8000 F 61 3 8687 8111 E melmail@ghd.com.au W www.ghd.com		DO NOT SCALE		This Drawing must not be used for Construction unless signed as Approved	



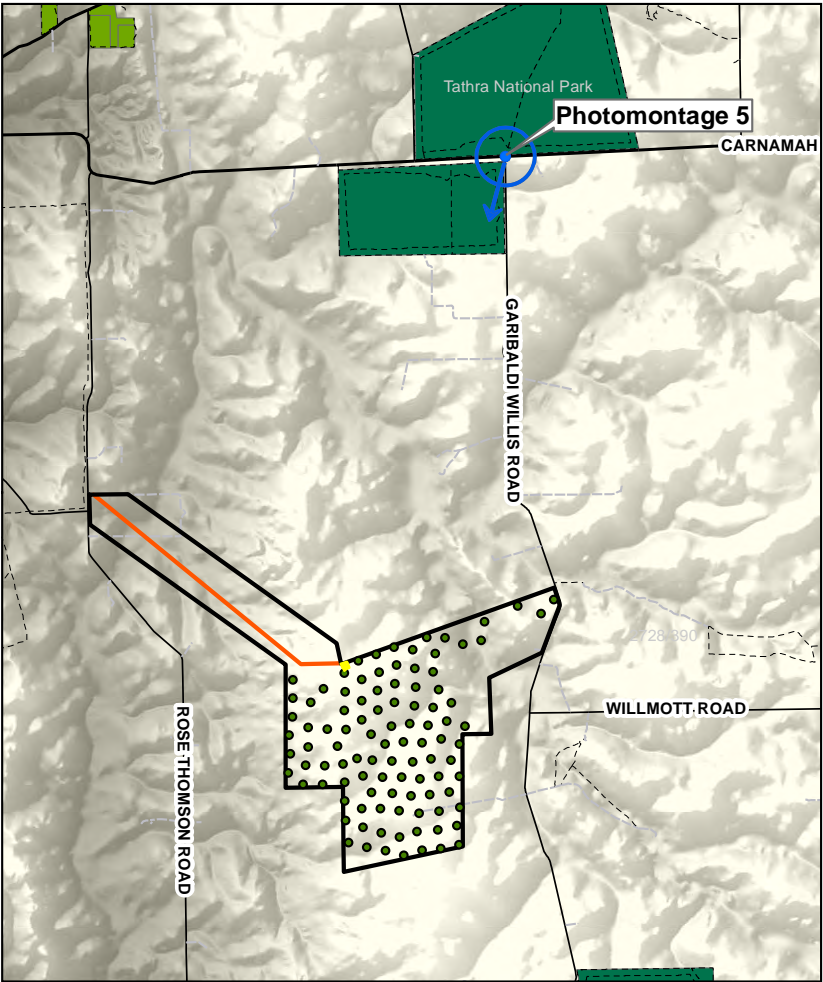
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3D model camera view



Photomontage



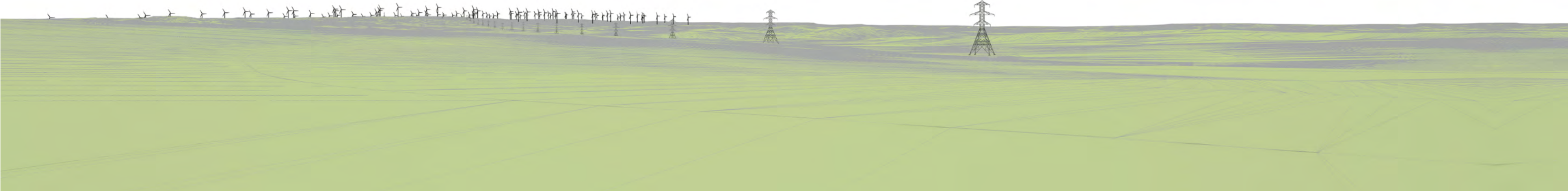
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Vertical field of view: 55 °
Hub height of turbines: 100m
Blade length of turbines: 52m
Approximate distance to nearest turbine: 13685m
Recommended viewing distance: 425 mm

Final Issue

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A	Issue for Information	AL	MC	SG	29.02.12
No	Revision	Note: * indicates signatures on original issue of drawing or last revision of drawing		Drawn	Date
Drawn		A.Lorenzon		Designed	Verve Energy
Drafting Check		M. Coyle		Design Check	Verve Energy
Approved (Project Director)		Date		DO NOT SCALE	
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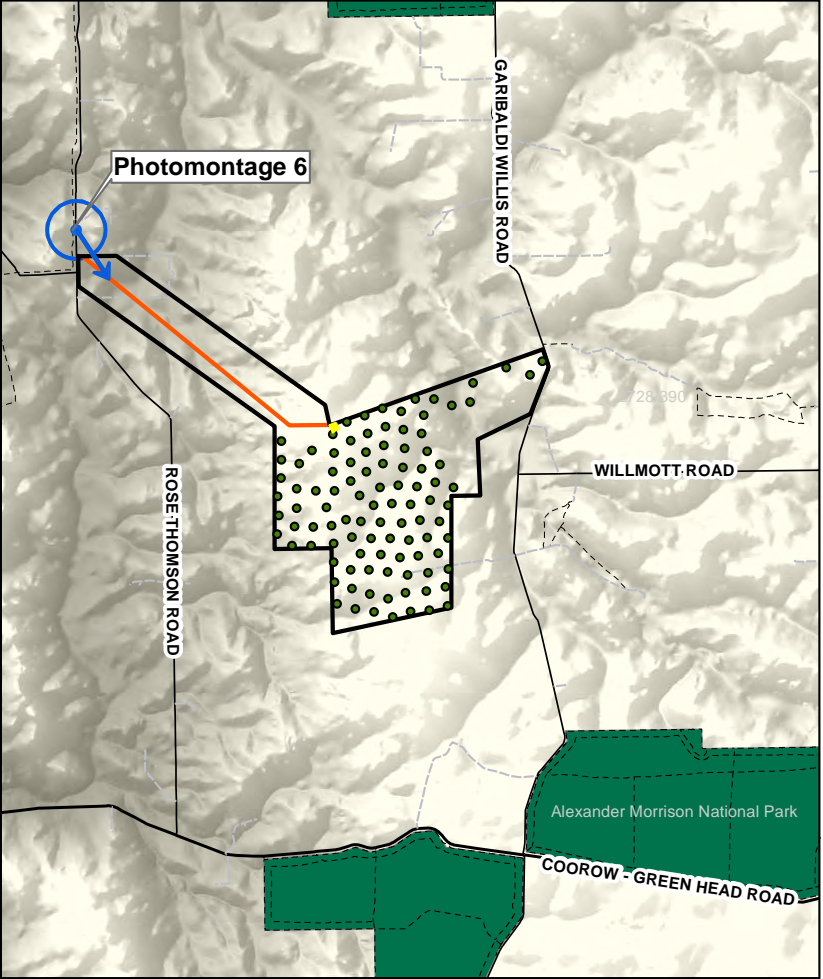
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3D model camera view



Photomontage



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Vertical field of view: 55 °
Hub height of turbines: 100m
Blade length of turbines: 52m
Approximate distance to nearest turbine: 9050m
Recommended viewing distance: 425 mm

VIEW LOCATION

Final Issue

Client Verve Energy

ProjectWarradarge Wind Farm

Title Photomontage

Location 06


Original Size

A2

Drawing No: 61-27826-SK006

Rev: D

E	Final Issue amended	AL	MC	SG	22.03.12		
D	Final Issue amended	AL	MC	SG	20.03.12		
C	Final Issue	AL	MC	SG	19.03.12		
B	Issue for Information	AL	MC	SG	02.03.12		
A	Issue for Information	AL	MC	SG	29.02.12		
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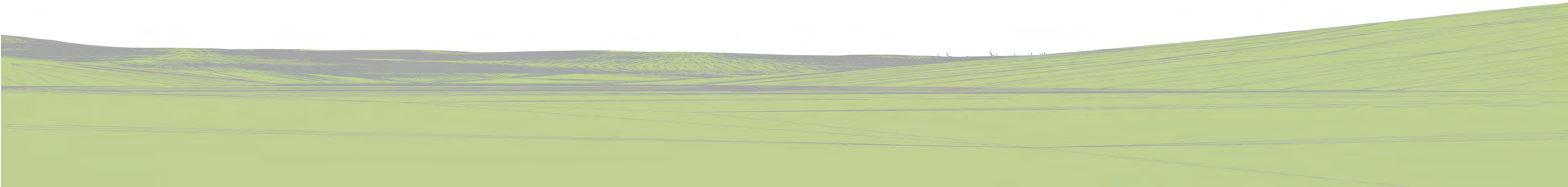
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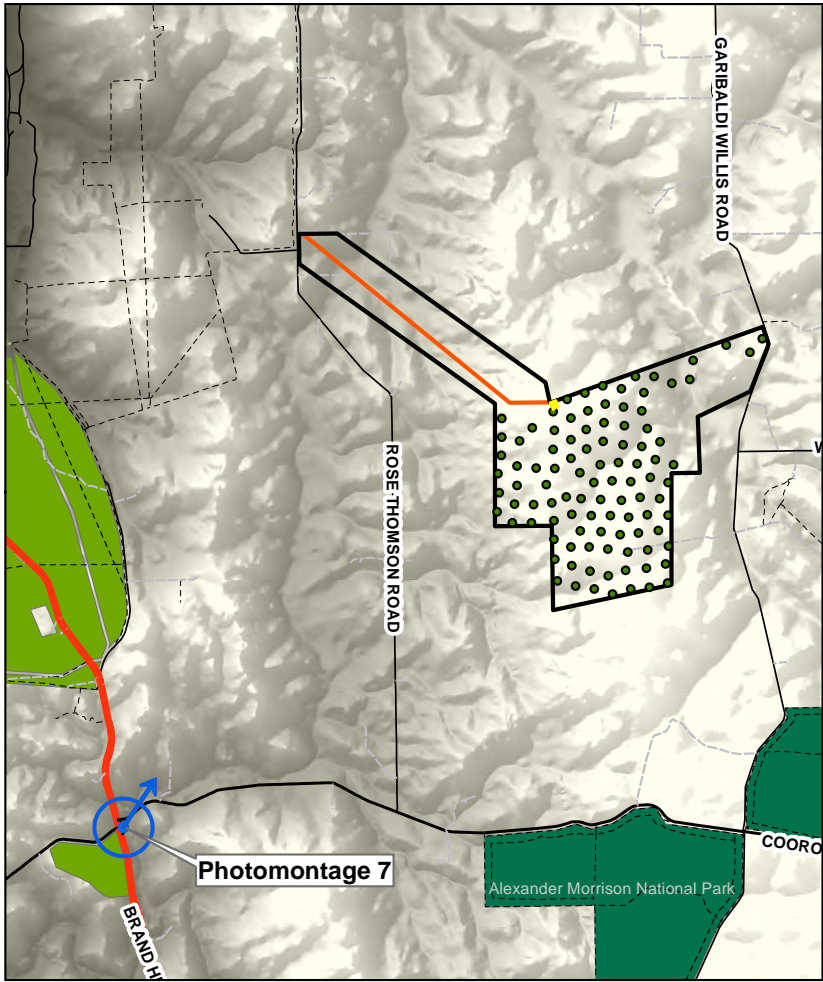
Photo



3D model camera view



Photomontage



Viewpoint Location: 339115 E 6673629 N
(UTM WG S84 Zone 50)
Elevation of camera: 172 m
Orientation of view: 34°
Horizontal field of view: 70°
Vertical field of view: 55 °
Hub height of turbines: 100m
Blade length of turbines: 52m
Approximate distance to nearest turbine: 15311m
Recommended viewing distance: 425 mm

VIEW LOCATION

Final Issue

Client Verve Energy

ProjectWarradarge Wind Farm

Title Photomontage

Location 07


Original Size

A2

Drawing No: 61-27826-SK007

Rev: D

E	Final Issue amended	AL	MC	SG	22.03.12			
D	Final Issue amended	AL	MC	SG	20.03.12			
C	Final Issue	AL	MC	SG	19.03.12			
B	Issue for Information	AL	MC	SG	02.03.12			
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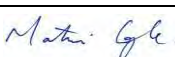

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Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
A	Laura Farrell	Kate Milburn		Martin Coyle		29/2/12
B	Laura Farrell/Kate Milburn	Martin Coyle		Scott Graham		22/3/12
C	Laura Farrell/Kate Milburn	Martin Coyle		Scott Graham		30/3/12
D	Laura Farrell	Martin Coyle		Scott Graham		18/4/12

Draft Environmental Management Plan

General site management (including waste disposal)

1.1.1 The objective of general site management is to ensure that the site works are generally well managed with regards to potential environmental impacts. The following measures will be put in place:

1.1.2 Disposal of refuse is to be in accordance with the Shire of Coorow and Carnamah by-laws. No refuse is to be deposited within the site. All personal refuse is to be carried and disposed of off site.

1.1.3 All personnel are prohibited from bringing pets, traps, firearms or other projectile weapons into the site.

1.1.4 Speed limits are to be limited to a maximum of 40 km/hr while in the site and according to ground conditions and posted speed limits on other roads.

1.1.5 All vehicles are to use existing roads and access tracks as far as practically possible.

1.1.6 Works are only to occur in the areas shown on detailed site drawings submitted to the contractor. No disturbance outside of these designated areas will be allowed.

1.1.7 The site will be left in a clean and tidy condition at the end of each working day.

1.1.8 Contractual clauses will be implemented with sub-contractors to ensure compliance and impose penalties if necessary.

Construction noise management

1.1.9 The primary risk of noise pollution is during project construction activities. To minimise the impact of construction noise, a noise mitigation plan will be implemented:

- Site activities are to begin no earlier than 7am and where possible are to cease by 7pm Monday to Saturday and 9am to 7pm Sundays and Public Holidays to limit noise impacts.
- Vehicles and equipment are to be properly maintained so as to minimise their noise.

Weed hygiene

1.1.10 Weeds can impede agricultural production, compete with and displace native vegetation, become a visual blight on the landscape and increase fire hazards. Weeds are classed as either “declared” or “pest plants” by regulations and require specific actions to be taken. Transport corridors such as roads are a means of spreading weeds, either by road construction and maintenance activity or by actions of road users.

1.1.11 *Echium plantagineum* (Paterson's Curse) is a "declared" plant and has been found within the site and is a declared plant P1 and P4 in Proposal Area. Should any infested area be identified, the plant must be managed in such a way that prevents the spread of seed or plant parts within and from the property on or in livestock, fodder, grain, vehicles and/or machinery. Treat to destroy and prevent seed set all plants within 50m of any road or other element of the wind farm.

Flora and fauna

1.1.12 Impacts on flora in the site are to be managed and minimised through the implementation weed hygiene, clearing controls, topsoil management, rehabilitation and fire management.

1.1.13 Local fauna that may inhabit the area will be protected through the implementation of general site management.

1.1.14 The following measures will be implemented specifically in respect of flora and fauna:

- Firearms, pets and feral fauna will not be permitted on the site.
- Uncontrolled burning will be prohibited on the site at all times.
- Disturbance to native vegetation outside of the site to be minimised at all times.
- Clearing outside the site will be strictly prohibited.

Groundwater

1.1.15 Construction activities have the potential to contaminate the ground water through the use of the fuel, oil and other potential contaminants required for construction.

1.1.16 Hydrocarbon contamination is the greatest risk on site given that fuel, oil and other potential contaminants will be required for various activities. As such, all likely contaminants will require appropriate storage and handling procedures to ensure that groundwater contamination does not occur. All Contractors/site personnel are to adopt the following protocol during the works with regards to this issue:

1.1.17 The following measures will be implemented specifically in respect of groundwater:

- Storage of contaminants such as fuel, oil, and other chemicals is to be done off site (preference) or restricted to designated areas. As a minimum, this should comprise a bunded compound, lined with geotextile or other suitable impervious material and/or utilise double skinned tanks.
- Suitable clean-up materials must be retained at these storage areas and with all vehicles where a possibility of leakage may occur. Personnel are to be adequately trained in clean-up procedures.
- All substantial spills greater than 5L are to be reported immediately to the Site Manager.

- In the event of a spill, clean up, including excavation of contaminated soil if required, is to be affected immediately, with the contaminated material removed within a maximum of 2 hours. Removed contaminated material is to be disposed of in a suitable location. Any contaminated soils from substantial spills are to be collected and may be stored in a mobile bund for disposal.
- Portable plant is to be fitted with internal containment to ensure fuel leaks are contained and prevented from leaking into the ground. Plant is to be inspected regularly for signs of fuel or oil leaks; any leaks are to be rectified immediately.
- The refuelling of mobile plant and other equipment within the site shall be manned during refuelling.
- The Site Manager is to maintain a record of any spillages that occur and subsequent actions taken.

1.1.18 The principle potential risk of ground water contamination from the installed wind turbines is through oil-based liquids. The wind turbine proposed does not require significant quantities of oil-based liquids in their operation or maintenance, limited to the oil required to lubricate moving parts in the nacelle of the wind turbine. Any oil leak during operation would be detected by the control system and a maintenance crew contacted and any oil leak would remain sealed within the wind turbine.

1.1.19 The electrical interconnection of the wind turbines may require pad-mounted transformers which will contain insulating liquid. This type of transformer is sealed and in widespread use throughout Western Power's SWIS. From Western Power and Verve Energys' experience with these types of transformers, significant leaks from a transformer is rare and in nearly all cases where a leak is experienced, the leak is limited to seepage from the transformer bushings. It is proposed to inspect the wind turbines and transformers for any signs of leakage during the routine maintenance program for the wind farm.

Topsoil management and rehabilitation

1.1.20 Any areas that have been disturbed during project construction activities, that are not required for ongoing maintenance, will be rehabilitated by the re-establishment of topsoil adequate for continuing agricultural activities.

1.1.21 Drainage and storm water disposal from the access and service roads and hardstands will be managed to minimise erosion potential. Service roads will be designed with minimum cut and fill to avoid erosion from stormwater run-off, with verge sections subject to erosion potential treated with rock and channel drainage.

1.1.22 The management of cleared vegetation, topsoil and overburden during site activities is important in ensuring that the disturbance area recovers as completely as possible. Topsoil management is to follow the plan below:

- Topsoil is to be recovered to a depth of 150 mm and formed into separate temporary stockpiles or windrows. Topsoil stockpiles are not

to exceed approximately 1.5 m in height to minimise loss of seed viability and microbial activity.

- Any compacted or disturbed area requiring rehabilitation will be deep-ripped to a depth of 150mm to facilitate root and water penetration, and recovered with stored topsoil. This topsoil must then be stabilised using an appropriate means to prevent wind and water erosion.
- If erosion problems have developed as a result of temporary constructions, then appropriate remedial measures are to be implemented to protect against further erosion such as the use of mulch or vegetation or geo-matting.
- At the completion of the works, the Site Manager is to carry out an assessment of the topsoil management actions and identify any additional requirements.
- In the event that un-authorised vegetation disturbance occurs, penalties will apply and rehabilitation will be required.

Dust suppression

1.1.23 Throughout the construction phase, some amount of dust will be generated by moving vehicles and construction plant along unsealed public roads and internal access roads.

1.1.24 Dust suppression will be carried out on the internal access roads and unsealed public roads as required during the drier months of the year to control any excessive generation of dust. To ensure that dust generation is adequately controlled:

Where necessary, ensure unstable construction areas and other point sources are regularly wetted down during construction activities.

Stabilise the surface of any large areas that will be exposed for significant periods. Ensure that applied water for soil wet-down does not generate runoff from any stockpile.

Monitor and review dust management strategies if excessive dust starts to be generated.

Community relations and visitor safety

1.1.25 The proposed Warradarge Wind Farm is to be located entirely within private land. As a result, access to the wind farm site by the general public during construction and operation will be restricted. This is also to maintain security of the private landowner's property, livestock and personal possessions, and to protect the owner from public liability risk. Should any medium sized meetings or presentations with local people be needed to be held offsite the fire brigade meeting room in Warradarge is a close potential location.

1.1.26 During construction, the wind farm is expected to generate local interest during construction. It is envisaged that there may also be media interest.

1.1.27 Verve Energy has developed a Stakeholder list during the feasibility study and will continue to keep people informed of the project during construction.

1.1.28 Measures to manage public safety include:

- Public entry to the site will be strongly discouraged during construction due to the potential safety risks. Measures including safety signage, fencing around the compound and access gates will be implemented.
- All visitors will be required to report to the site office. If visitors are allowed to enter the site, they will need to be inducted to the OHSE plan prior to entering the site, wear personal protective equipment (PPE) and be accompanied at all times.
- Site workers will be inducted to the OHSE plans, which will include measures to ensure that members of the public are not put at risk by construction activities.
- All media interest will be directed to the Site Manager or delegate.

1.1.29 During operation

1.1.30 During operation, public access will continue to be restricted during the operation of the wind farm for the following reasons:

- The wind farm is on private property. The landowners will continue to use the property for agricultural purposes and hence it is not desirable to have public access.
- The presence of high voltage equipment.
- Hazards for members of the public when maintenance is being carried out on wind turbines. Maintenance will occur regularly throughout the year, as maintenance is carried out on a rotational basis.

Aboriginal and Archaeological heritage

1.1.31 Verve Energy has considered the considered the Cultural Heritage Due Diligence (DIA, 2011) guidelines 2011 and has undertaken a risk assessment following these guidelines.

1.1.32 Verve Energy has consulted the Department of Indigenous Affairs (DIA) database and determined that no aboriginal artefacts or aboriginal sites have been recorded the site and heritage surveys are recorded. The likelihood of aboriginal heritage impact is Rare. This combined with a Major land activity due to land excavation, results in a Moderate risk to aboriginal heritage. Therefore no additional surveys or consultation is undertaken in advance of construction.

1.1.33 Verve Energy and its Contractors will meet their obligations under the Aboriginal Heritage Act (1972-1980), and this will form part of the Environmental Management Plan, a draft of which is detailed in Annex 11.

1.1.34 If any personnel identify any material suspected to be of aboriginal or archaeological significance during site activities, works will be suspended immediately near any suspected material and the Site Manager informed. The Site Manager will contact the Department of Indigenous Affairs and will

suspend any further work that could disturb the suspected material until advice from an appropriately qualified consultant or the Department of Indigenous Affairs has been received.

Fire Management

1.1.35 Due to the proposed wind farm site being located in a vegetated farming area, the potential for bushfire in the drier months is a risk. A Bushfire Prevention and Management Plan will be prepared. The plan will include notification of the local bushfire control officer prior to construction. Advice from FESA will be sought as to appropriate further requirements.

1.1.36 To ensure that the risks of fire are minimised during construction site activities and that adequate fire response equipment is available in the event of a fire, the following steps will be implemented:

- No fires to be lit at any time within the works area.
- Contact the Warradarge Fire Brigade prior to carrying out any construction activities involving naked flames.
- Prior to carrying out any construction activities involving naked flames, determine what the current fire danger level is for the area. No naked flames on very high or extreme fire danger days.
- In the event of an uncontrolled fire, call Fire and Emergency Services (000) immediately.
- In the event of any fire, notification must be made immediately to the Site Manager.
- Plant to be made available to assist with fire control in the event of fire.



ENVIRONMENTAL POLICY

Verve Energy strives for environmental excellence as the cornerstone of sustainability.

Scope

Verve Energy is a Western Australian Government owned electricity generating corporation with power stations at a number of sites throughout Western Australia. This policy applies to all Verve Energy sites and business activities.

Our Policy Statement

Verve Energy recognises the value of the environment to the community and future generations. We will work towards sustainable development by the responsible production of electricity.

Our environmental objectives

Verve Energy will:

- assess and manage the environmental risks associated with our business activities;
- instil a sense of environmental awareness and responsibility in our people;
- protect the natural and cultural environment in all our operations in a socially responsible manner;
- embrace the principles of waste minimisation and pollution prevention;
- continuously improve our environmental performance by setting objectives and targets, assessing our achievements and evaluating the effectiveness of our environmental management system;
- meet all legal obligations and industry agreements and demand the same standards of compliance from our contractors and suppliers;
- publicly report environmental performance;
- adopt measures to reduce greenhouse gas emissions intensity as part of business decisions;
- be a leader in renewable energy project development and deployment;
- communicate with and involve all employees, contractors and interested people on environmental issues in an open, transparent and timely manner.

Our environmental responsibilities

Environmental leadership and adherence to this policy is the responsibility of all employees of Verve Energy and its contractors. The development and implementation of environmental policy is the responsibility of Executive Management.



Shirley In't Veld
Managing Director
Verve Energy
June 2011



SAFETY AND HEALTH POLICY



VERVE ENERGY

Verve Energy is the leading electricity producer in Western Australia. Verve Energy owns and operates an extensive and diverse portfolio of power stations and renewable energy systems.

POLICY STATEMENT

Safety and Health is a core value for Verve Energy, and is central to everything we do. We set ourselves high standards in safety and health, and continuously improve our performance to achieve our goal of zero harm.

POLICY OBJECTIVES

To achieve our goal we:

- Identify hazards with the potential for exposure, injury or illness, ensuring that appropriate controls are implemented;
- Establish, monitor and review objectives and targets that will drive continued improvement in our safety and health performance;
- As a minimum, identify and fulfil all safety and health statutory and other obligations, and company standards;
- Develop, implement and provide training for safe systems of work and safe working practices;
- Encourage open and honest dialogue about safety issues and behaviour in a non-hierarchical and non-threatening way;
- Ensure that systems are in place to report, record, investigate and analyse all incidents;
- Provide rehabilitation assistance to encourage a safe and timely return to work;
- Encourage and support employees in elected safety and health positions;
- Audit and review our Safety and Health Management Systems to ensure continuous improvement and that the systems remain relevant and effective to our business.

OUR HEALTH AND SAFETY RESPONSIBILITIES

- Our leaders are responsible and are held accountable to communicate the requirements of this Policy to all employees, contractors, and other interested parties, and to ensure the objectives of the Policy are met.
- Compliance with our Policy is the responsibility of every person working for, or on behalf of, Verve Energy, including contractors and visitors to our sites.

A handwritten signature in black ink, appearing to read "Jason Waters".

Jason Waters
CEO

May 2012





Warradarge Wind Farm Flora, Vegetation and Fauna Assessment



Prepared for Verve Energy

March 2012



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Document Quality Checking History

Version: 9	Peer review:	Rachel Warner
Version: 9	Director review:	Garth Humphreys
Version: 9	Format review:	Fiona Hedley

Approved for issue: Garth Humphreys

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Warradarge Flora, Vegetation and Fauna Assessment

Contents

1.0	Summary	9
1.1	Project Background	9
1.2	Flora and Vegetation	9
1.3	Fauna	10
2.0	Introduction	11
2.1	Project Background	11
2.2	Scope and Objectives of this Study	11
3.0	Methodology	13
3.1	Desktop Review	13
3.2	Field Survey	13
3.3	Flora Specimen Identification	15
3.4	Limitations of this Study	15
4.0	Regional Context	17
4.1	IBRA Bioregion and Subregion	17
4.2	Regional Vegetation Mapping Encompassing the Area	17
4.3	Geology and Soils	17
4.4	Conservation Reserves	18
4.5	Significant Communities Known from the Locality	18
4.6	Significant Flora Known from the Locality	19
5.0	Vegetation	21
5.1	Overview	21
5.2	Mapping Units	23
5.3	Vegetation Condition	41
5.4	Conservation Significance of the Vegetation Types	41
6.0	Flora	43
6.1	Overview	43
6.2	Dominant Taxa and Groups	43
6.3	Flora of Conservation Significance	43
6.4	Introduced Flora (Weeds)	53
7.0	Fauna	57
7.1	Overview	57
7.2	Fauna Habitats	57
7.3	Database Search Results	58
7.4	Potential Impacts to Fauna	63
8.0	Summary of Findings	67
9.0	Glossary and Acronyms	69
10.0	References	71

Appendix 1

Framework for Listing the Conservation Status of Species and Communities in Western Australia

Appendix 2

NatureMap Database Search Results- Flora

Appendix 3

NatureMap Database Search Results- Fauna

Appendix 4

EPBC Act 1999 Protected Matters Report

Appendix 5

Vegetation Structural Classification and Condition Ranking Scale

Appendix 6

Quadrat and Relevé Data

Appendix 7

Vegetation Mapping

Appendix 8

Vascular Flora List

Appendix 9

Locations of Flora of Conservation Significance

Appendix 10

List of Fauna Potentially Occurring in the Study Area

Tables

Table 3.1:	Summary of personnel and survey effort for Trip 1 and Trip 2.	13
Table 4.1:	Likelihood of conservation significant flora occurring within the study area.	19
Table 5.1:	Summary of mapping units and their area of extent within the Warradarge study area.	21
Table 6.1:	Number of native plant species in the dominant families and genera within the study area.	43
Table 6.2:	Locations of conservation significant flora and other flora of interest, and their corresponding vegetation units.	50
Table 6.3:	Introduced flora species (weeds) recorded from the study area (the prefix * denotes an introduced species).	53
Table 7.1:	Vegetation units representing typical <i>Calyptrorhynchus latirostris</i> foraging habitat and the extent and broad location within the study area.	58
Table 7.2:	Number of vertebrate fauna species potentially occurring in the study area.	58
Table 7.3:	Fauna species of conservation significance that may occur within the study area.	59

Figures

Figure 2.1: Location of the Warradarge Wind Farm study area and surrounding conservation reserves.	12
Figure 3.1: Monthly rainfall data from the Eneabba meteorological recording station (number 008225) for 2011 compared to the long-term average (1972-2011; data sourced from the WA Bureau of Meteorology).	14
Figure 6.1: Locations of Threatened and Priority flora species in the study area.	52

Plates

Plate 5.1: Vegetation unit M1.	24
Plate 5.2: Vegetation unit M2.	24
Plate 5.3: Vegetation unit M3 (left and right).	24
Plate 5.4: Vegetation unit D1.	25
Plate 5.5: Vegetation unit LP1.	26
Plate 5.6: Vegetation unit LP2.	26
Plate 5.7: Vegetation unit HP1 (left and right).	26
Plate 5.8: Vegetation unit HP2.	27
Plate 5.9: Vegetation unit HB1.	28
Plate 5.10: Vegetation unit HB2.	28
Plate 5.11: Vegetation unit HB3 (left and right).	29
Plate 5.12: Vegetation unit HB4.	30
Plate 5.13: Vegetation unit HB5 at site WWF12 (left) and on a mesa crest near site WWF08 (right).	30
Plate 5.14: Vegetation unit HB6.	31
Plate 5.15: Vegetation unit HX1.	32
Plate 5.16: Vegetation unit HX2 (left and right).	32
Plate 5.17: Vegetation unit HX3 (left and right).	33
Plate 5.18: Vegetation unit HM1 (left and right).	34
Plate 5.19: Vegetation unit HM2 (left and right).	34
Plate 5.20: Vegetation unit HM3.	35
Plate 5.21: Vegetation unit HM4.	36
Plate 5.22: Outcropping pink clay in vegetation unit HM4.	36
Plate 5.23: Vegetation unit PE1.	37
Plate 5.24: Vegetation unit PE2.	37
Plate 5.25: Vegetation unit PE3.	38
Plate 5.26: Vegetation unit PE4.	38
Plate 5.27: Vegetation unit PB1.	39
Plate 5.28: Vegetation unit PW1.	40
Plate 5.29: Vegetation unit PW2.	40
Plate 6.1: <i>Thelymitra stellata</i> (collected at 351519 mE, 6684244 mN)	44
Plate 7.1: Typical foraging habitat for Carnaby's Cockatoo (<i>Calyptrorhynchus latirostris</i>) in the study area (<i>Eucalyptus mallee</i> over <i>Banksia</i> spp. heath; HB1 (left) and HB2 (right)).	58

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1.0 Summary

1.1 Project Background

Verve Energy is proposing to construct a 250 MW wind farm facility at a site approximately 20 km southeast of Eneabba in the Mid West region of Western Australia. The project, referred to as the Warradarge Wind Farm is currently in the feasibility stage. The final layout of the project has yet to be finalised, but it is anticipated to include up to 100 wind turbines in existing cleared areas. A transmission line route and access tracks also form a part of the conceptual design.

The proposed Warradarge Wind Farm will be located on private farmland situated 19 km northeast of the Brand Highway and Coorow-Green Head Road intersection and is located in the Shires of Carnamah and Coorow. The study area is 3,650.9 ha in size and occurs on the open Wheatbelt Plateau Landscape, which is dominated by agricultural land use. Biota Environmental Sciences (Biota) was engaged by Verve Energy to complete a biological assessment of the proposed development area (hereafter "the study area").

1.2 Flora and Vegetation

Twenty-five intact vegetation units were identified within the study area and most were in Very Good to Excellent condition.

None of the vegetation types represent Priority Ecological Communities. Two of the vegetation types (HB5 and HX1) appear similar to the description that is available for the Lesueur-Coomallo Floristic Community (D1), which is listed as a Threatened Ecological Community. These units are considered to be of Very High conservation significance.

A large proportion of the study area (76%) comprised cleared land which has no conservation value as vegetation (unit M1). The units M2 and M3 were considered to be of low conservation value and together occupied 8.8% of the study area. The remainder of the vegetation was of High conservation significance. The Warradarge study area is situated in a locality that has been subject to extensive historical land clearing and fragmentation and conservation of native vegetation is of particular significance (EPA 2010).

A total of 406 plant species from 167 genera belonging to 55 families were recorded from the study area. This number would appear to be within the expected range for a study area of this size, taking into consideration that the region is characterised by high species richness and endemism. The suite of species and the dominant genera and plant families were largely typical of the region.

Four species listed as Threatened under the WA Wildlife Conservation Act 1950-1979 were recorded (*Acacia wilsonii*, *Banksia cataglypta*, *Eucalyptus pruiniramis*, and *Thelymitra stellata*). Two of these (*T. stellata* and *E. pruiniramis*) are also listed as Endangered under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999.

Twenty-two (22) species listed as Priority flora under the WA Wildlife Conservation Act 1950-1979 were recorded. These comprised one Priority 1 (*Grevillea stenogyne*), four Priority 2 (*Arnocrinum gracillimum*, *Baeckea* sp. Bunney Road (S. Patrick 4059), *Comesperma griffinii* and *Synaphea endothrix*), nine Priority 3 (*Allocasuarina grevilleoides*, *A. ramosissima*, *Austrostipa* sp. Cairn Hill (M.E. Trudgen 21176), *Banksia cypholoba*, *B. nobilis* subsp. *fragrans*, *B. splendida* subsp. *macrocarpa*, *Grevillea erinacea*, *Lepidobolus quadratus*, *Petrophile chrysantha* subsp. *Watheroo* (K.M. Allan 57)) and eight Priority 4 species (*Astroloma* sp. Cataby (E.A. Griffin 1022), *Banksia platycarpa*, *B. sclerophylla*, *Calytrix chrysantha*, *Conostephium magnum*, *Desmocladius elongatus*, *Hemiandra* sp. Watheroo (S. Hancocks 4) and *Hypolaena robusta*).

One previously undescribed species was identified (*Ptilotus* sp. nov.) and seven species were range extensions for the locality (*Cassytha glabella* forma *casuarinae*, *Comesperma virgatum*,

Gonocarpus cordiger, *Grevillea obliquistigma* subsp. *obliquistigma*, *Melaleuca nesophila*, *Schoenus breviculmis* and *Synaphea interioris*.

Twenty-one (21) species of introduced flora (weeds) were recorded from the study area, with grasses (family Poaceae) and daisies (family Asteraceae) most common. The majority were non-invasive species, however one individual of a Declared Plant, **Echium plantagineum*, was recorded.

1.3 Fauna

Five broad fauna habitats occur in the study area (modified vegetation, drainage areas, loam/clay plains, stony hills and slopes, and sandy plains and low hills). These are considered to be common and widespread within the Lesueur Sandplains subregion.

Database searches indicate that up to 187 native vertebrate fauna species may occur in the study area locality, comprising 133 bird species, 10 native mammals (seven non-volant, three volant), and 44 herpetofauna species (eight amphibians and 36 reptiles). Considering that only 15% of the study area contains intact remnant vegetation, the actual number occurring in the study area is likely to be a considerably lower subset of this total.

The desktop review identified 12 fauna species of conservation significance for the locality: three Schedule 1 species, five Schedule 3, one Priority 3, and three Priority 4 species. Seven are considered likely to occur as transitory visitors: *Calyptorhynchus latirostris* (Carnaby's Cockatoo), *Apus pacificus* (Fork-tailed Swift), *Ardea ibis* (Cattle Egret), *Haliaeetus leucogaster* (White-bellied Sea-Eagle), *Merops ornatus* (Rainbow Bee-eater), *Ardeotis australis* (Australian Bustard), and *Calamanthus campestris* subsp. *montanellus* (Rufous Fieldwren). Of these species, five are federally listed under the EPBC Act 1999 (Carnaby's Cockatoo, Fork-tailed Swift, Cattle Egret, White-bellied Sea-eagle and Rainbow Bee-eater). Only four species, *C. latirostris*, *A. ibis*, *M. ornatus* and *A. australis*, are considered likely to be periodic visitors to the study area.

Carnaby's Cockatoo is believed to be of most relevance to the proposed wind farm, as foraging habitat (vegetation dominated by a species-rich proteaceous heath) is present in the study area. The Storr-Johnstone Bird Data Bank indicates that this species has been recorded near the study area, with most observations comprising autumn-winter visitors. No roost sites, or potential roost sites, were observed during the field visit. If clearing of foraging habitat is kept to a minimum, the local and regional conservation status of this species is unlikely to be affected.

Impact to fauna may occasionally occur due to mortality arising from construction activities and clearing of vegetation. There is also a very low risk that individual avifauna mortalities may occur as a result of bird strikes with wind turbine blades. However, given the widespread distribution of these species and their ability to fly competently in all conditions, it is unlikely to affect population numbers at a local or regional scale.

2.0 Introduction

2.1 Project Background

Verve Energy is proposing to construct a 250 MW wind farm facility at a site approximately 20 km southeast of Eneabba in the Mid West region of Western Australia (WA; see Figure 2.1). The project, referred to as the Warradarge Wind Farm, is currently in the feasibility stage. The final layout of the project has yet to be finalised, but it is anticipated to include up to 100 wind turbines in existing cleared areas. A transmission line route and access tracks also form a part of the conceptual design.

The proposed Warradarge Wind Farm will be located on private farmland situated 19 km northeast of the Brand Highway and Coorow-Green Head Road intersection and is located in the Shires of Carnamah and Coorow. Biota Environmental Sciences (Biota) was engaged by Verve Energy to undertake a flora and fauna assessment of the proposed development site. The study area for this assessment is 3,650.9 ha in size and occurs on the open Wheatbelt Plateau Landscape, which is dominated by agricultural land use.

2.2 Scope and Objectives of this Study

This report describes the results from a flora and vegetation survey completed in the study area and a desktop assessment of vertebrate fauna values. The field survey was planned and implemented as far as practicable according to the Environmental Protection Authority (EPA) Position Statement No. 2 "Environmental Protection of Native Vegetation in Western Australia" (EPA 2000), Environmental Protection Authority (EPA) Position Statement No. 3 "Terrestrial Biological Surveys as an Element of Biodiversity Protection" (EPA 2002) and Guidance Statement No. 51 "Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia" (EPA 2004).

The scope and objectives of the study were to:

- document the suite of flora species occurring within the study area;
- identify any plant species of conservation significance occurring within the study area, including Threatened flora species listed under the Commonwealth Environment Protection and Biodiversity Conservation (EPBC) Act 1999 and Western Australian (WA) Wildlife Conservation Act 1950, and species classified as Priority flora by the Department of Environment and Conservation (DEC);
- describe and map the vegetation communities occurring within the study area;
- identify any vegetation communities of conservation significance (see Appendix 1) within the study area;
- assess the level of weed presence in the study area;
- identify and describe fauna habitats in the study area, based on vegetation types and landforms recorded;
- identify fauna species of conservation significance that may occur in the study area, including Threatened species listed under the Commonwealth EPBC Act 1999 and Schedule and Priority fauna listed under the WA Wildlife Conservation Act 1950-1979; and
- conduct a desktop assessment of potential impacts to fauna that may occur in the study area.

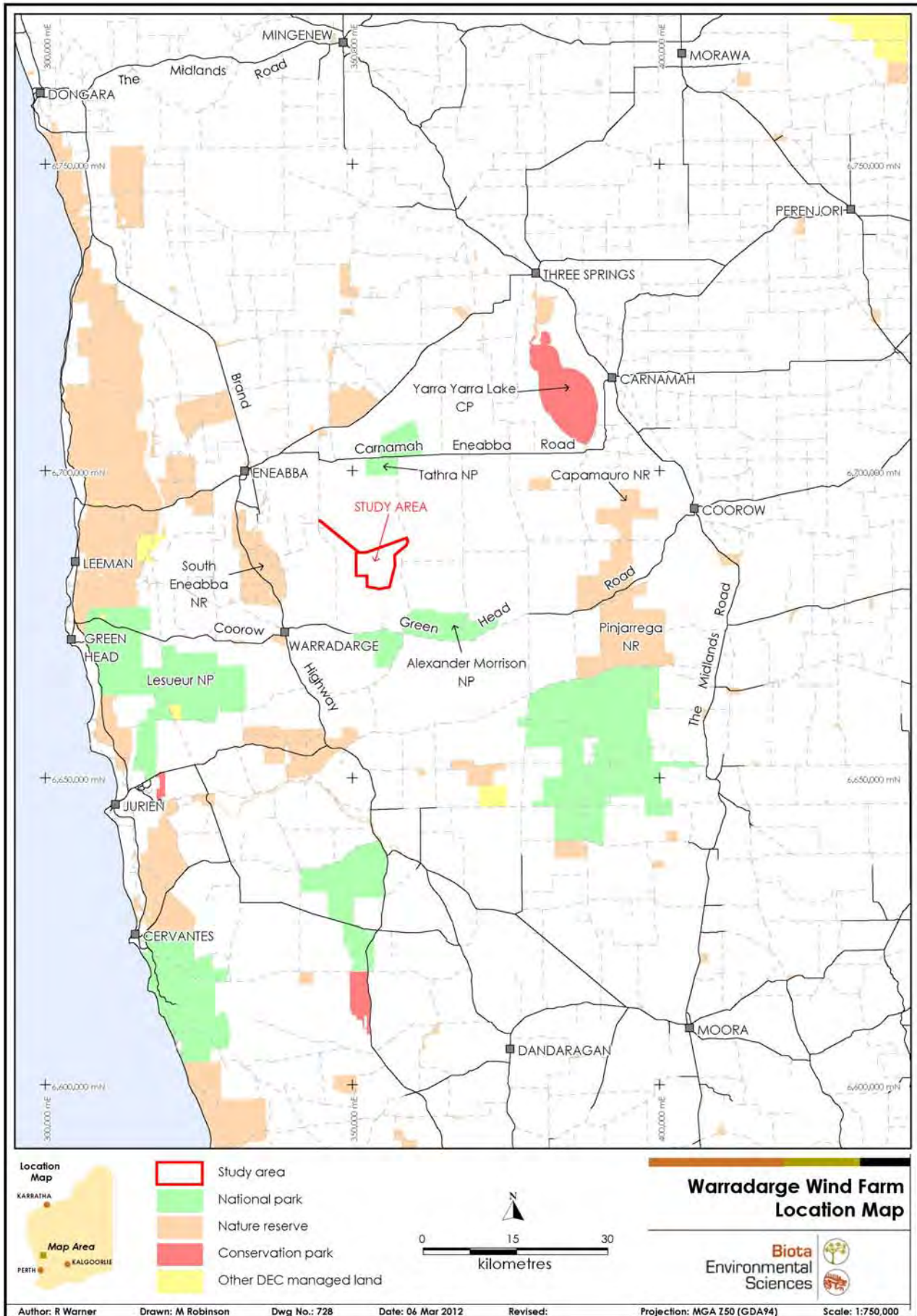


Figure 2.1: Location of the Warradarge Wind Farm study area and surrounding conservation reserves.

3.0 Methodology

3.1 Desktop Review

Database searches were conducted to identify flora and fauna species of conservation significance that had previously been recorded within or near the study area. This included species listed at State and Federal levels. The following databases were consulted:

- DEC's NatureMap¹;
- WA Herbarium rare flora; and
- Protected Matters Tool² (EPBC Act 1999).

Searches were conducted around a central coordinate within the study area (29° 57' 14" S and 115° 28' 27" E) with a 15 km and 30 km buffer applied for flora and fauna searches, respectively. The results of the database searches are provided in Appendix 2, 3 and 4.

The following reports from previous surveys completed in the locality were reviewed for context:

- Mumbida Wind Farm Flora and Vegetation Survey (Biota 2001);
- Proposed Mumbida Wind Farm - Vertebrate Fauna Desktop Review (Biota 2002b); and
- A Desktop Review for the Allanooka Wind Farm Development, near Geraldton (Biota 2011).

Specialist consultants (Ron and Christine Johnstone and T. Kirkby) conducted an internal database search of the Storr-Johnstone Bird Data Bank for records of Carnaby's Cockatoo (*Calyptorhynchus latirostris*) breeding and foraging sites in the Warradarge region. They also provided information and advice about this species.

3.2 Field Survey

3.2.1 Survey Personnel and Timing

Two separate trips were conducted for the vegetation and flora survey of the study area. Trip 1 took place between the 20th and 26th of October 2011 and Trip 2 was conducted between the 17th and 20th of November, 2011. A summary of timing, personnel and qualifications is provided in Table 3.1.

All personnel completed detailed floristic quadrats, description and mapping of individual vegetation types, and recorded species of interest on an opportunistic basis.

Table 3.1: Summary of personnel and survey effort for Trip 1 and Trip 2.

Trip	Dates	Personnel	Company and Title
Trip 1	October 20-26	Rachel Warner	Biota (Senior Botanist)
		Scott Werner	Biota (Graduate Biologist)
	October 22-26	Brian Morgan	Consultant Plant Biologist
Trip 2	November 17-20	Rachel Warner	Biota (Senior Botanist)
		Pierre-Louis De Kock	Biota (Botanist)

¹ <http://naturemap.dec.wa.gov.au> (accessed November 3rd 2011).

² <http://www.environment.gov.au/epbc/pmst/index> (accessed November 3rd 2011).

3.2.2 Survey Conditions

The study area is situated between the 450 and 500 mm isohyets with almost 90% of the rainfall in the region occurring between March and October (Stuart-Street 2007). Rainfall data were obtained from the Bureau of Meteorology for the nearby Eneabba meteorological recording station (number 008225). The surveys followed two months of above-average rainfall (September and October, see Figure 3.1) with 50 mm recorded, compared to the long-term average of 34.7 mm. The preceding winter rainfall monthly totals were, however, slightly below average with 74 mm recorded, compared to the long-term average of 90 mm. Conditions at the time of the survey were considered adequate for the collection of most annual and ephemeral species.

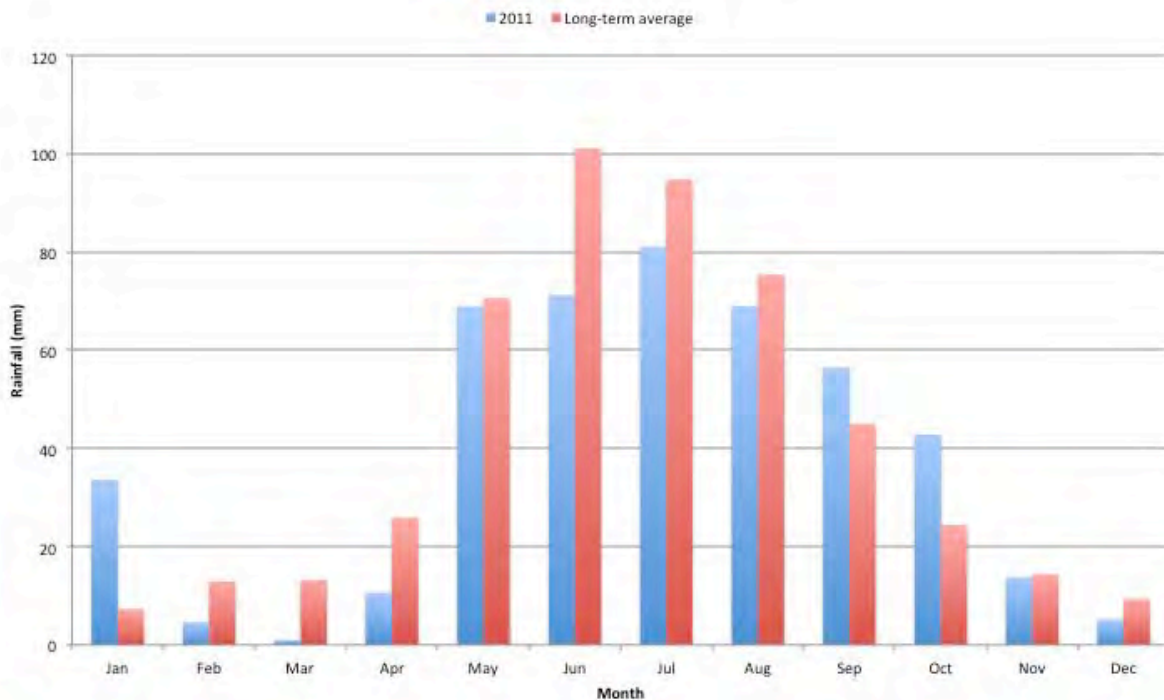


Figure 3.1: Monthly rainfall data from the Eneabba meteorological recording station (number 008225) for 2011 compared to the long-term average (1972-2011; data sourced from the WA Bureau of Meteorology).

3.2.3 Quadrat Sampling

Nineteen (19) quadrats were established within intact vegetation during the survey. Sites were selected to include the main vegetation and habitat types present within the study area and to obtain an even spatial spread. All quadrats established were 10 m x 10 m in size, which is recognised as providing an adequate sample of species presence for areas of high species diversity (George et al. 1979). This size is also used for botanical survey work in the temperate Swan Coastal Plain and lower southwest of WA (Gibson et al. 1994).

The following parameters were recorded for all quadrats:

1. Location: AMG coordinates recorded in WGS84 datum for each of the four corners of the quadrat [using a handheld Global Positioning System (GPS)];
2. Vegetation Description: A broad description based on the height and estimated cover of dominant species after the vegetation classification system presented in BushForever (Keighery 1994); see Appendix 5);
3. Habitat: A description of the landform and habitat;
4. Soil: A broad description of the soil type and stony surface mantle;
5. Disturbance details: Vegetation condition ranked according to the scale developed for BushForever [(Keighery 1994); see Appendix 5], taking into consideration evidence of grazing, physical disturbance, weed invasion and fire history; and

6. Percentage Foliar Cover and Height: For each species present, the cover and greatest height was estimated visually. Estimates were made to the nearest percentage and centimeter where possible.

Colour photographs of the vegetation were taken from the northwest corner of each quadrat, looking across to the diagonally opposite corner. A summary of all quadrat data is provided in Appendix 6. Quadrat locations are indicated on the vegetation mapping in Appendix 7.

3.2.4 Relevés and Mapping Notes

Thirteen (13) relevés and approximately 80 mapping notes were described during the survey. A relevé is an unbounded flora-sampling site whereas mapping notes are usually smaller in area and can sometimes be brief with only dominant species recorded. Mapping notes are taken primarily during foot traverses of the area with the objective of detecting boundaries and changes in vegetation types.

Opportunistic specimen collections were also taken to supplement the species list, as well as photographs and notes on landscape type and vegetation condition.

3.3 Flora Specimen Identification

Common species that were well known to the survey botanists were identified in the field. Voucher specimens of all other species were collected, pressed and dried in the field.

After returning to Perth, these collected specimens were then identified using flora keys, reference to appropriate publications and comparisons with reference collections held at Biota and the WA Herbarium. Mr Pierre-Louis de Kock, Ms Rachel Warner, Ms Rachel Butler, Ms Shadila Venkatasamy, Ms Ciaran Gibson and Ms Cassie Adams, all Biota botanists, identified most of the specimens. Specialist taxonomists from the WA Herbarium (Mr Michael Hislop, Ms Eleanor Bennett and Mr Rob Davis) were consulted for the specialist plant identifications.

3.4 Limitations of this Study

The study is considered to provide a good account of the flora, fauna and vegetation values of the Warradarge study area. However, the following limitations must be taken into account when reviewing and analysing the results.

- Systematic foot traverses were not possible through the entire study area and hence the vegetation mapping for some areas was extrapolated on the basis of the aerial photographic signature alone. Although the refined mapping presented in this report is considered to be a relatively sound model of the spatial representation of the vegetation types, some inaccuracy in delineation of the vegetation units could exist;
- The study area was not systematically searched for rare flora and weeds;
- The sampling was conducted in a single phase (over two trips). Although the field work was conducted at an appropriate time for detecting most ephemeral flora, some species would not have been present or identifiable at the time of survey. The species list should be taken as indicative rather than exhaustive;
- As most weeds were relatively widespread in the study area, specific locations of all weed species encountered were not taken and they have not been mapped. However, individual vegetation descriptions provide an indication of the level of weed density;
- No floristic analysis has been conducted using the quadrat data;
- No direct and systematic sampling of fauna was undertaken as part of the current study. The description of fauna habitats and the summary of species of conservation significance that may occur in the study area are based on a desktop review and opportunistic observations made during the flora and vegetation survey; and
- Fungi and non-vascular flora (e.g. mosses and liverworts) were not sampled.

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4.0 Regional Context

4.1 IBRA Bioregion and Subregion

The Interim Biogeographic Regionalisation for Australia (IBRA) recognises 85 bioregions and 403 subregions (Environment Australia 2000). The current study area lies within the Geraldton Sandplains bioregion and the Lesueur Sandplain subregion, which are described by May and McKenzie (2003) as:

- GS - Geraldton Sandplains: "... mainly proteaceous scrub-heaths, rich in endemics, on the sandy earths of an extensive, undulating, lateritic sandplain mantling Permian to Cretaceous strata. Extensive York Gum and Jam woodlands occur on outwash plains associated drainage".
- GS3 - Lesueur Sandplain: "... comprises coastal Aeolian and limestones, Jurassic siltstones and sandstones (often heavily laterised) of the central Perth Basin. There are extensive yellow sandplains in southeastern parts, where the subregion overlaps the western edge of the Pilbara Craton. Shrub-heaths rich in endemics occur on a mosaic of lateritic mesas, sandplains, coastal sands and limestones. "

These regions occur within the vicinity of two recognised Biodiversity Hotspots: the Geraldton to Shark Bay sand plains and Mount Lesueur- Eneabba. These hotspots have been recognised as places of high biodiversity at national and international standards (see <http://www.environment.gov.au/biodiversity/hotspots/national-hotspots.html>).

4.2 Regional Vegetation Mapping Encompassing the Area

Beard (1974) mapped the vegetation of the Geraldton Sandplains bioregion at a scale of 1:1,000,000. The vegetation of this area is mainly composed of proteaceous scrub-heaths rich in endemics occurring on a mosaic of lateritic mesas, sandplains, coastal sands and limestones. The study area intersects two of Beard's vegetation mapping units:

- Irwin 174: Shrublands; mixed heath (*Melaleuca*, *Acacia*, *Banksia*, *Allocasuarina*); and
- Irwin 210: Shrublands; scrub-heath on lateritic sandplain in the central Geraldton Sandplain Region.

The study area also lies within the Tathra Vegetation System in the West Midlands region of the Irwin Botanical District, further described by Beard (1976) as "... a diverse scrub heath [dominating] the extensive areas of sandplain of this system with taller emergents that include *Allocasuarina huegeliana*, *Eucalyptus todiana*, *Banksia attenuata*, *B. prionotes* and *B. menziesii*. Smaller thickets of *Melaleuca* (*M. uncinata*, *M. hamulosa*) can be found associated with swamp country at the base of breakaways".

Given the general nature of Beard's mapping, these mapping units are only broadly applicable to the vegetation types occurring within the study area (see Section 5.0).

4.3 Geology and Soils

The study area intersects both the Arrowsmith and Dandaragan Plateau soil landscape zones, described by Stuart-Street (2007) as:

- Arrowsmith: "Dissected lateritic sandplain with hills, breakaways and plateau and sandplain remnants. Sandy and gravelly soils formed in colluvium and weathered in-situ rock. Deep sands, Ironstone gravelly soils and Sandy duplex"; and
- Dandaragan Plateau: "Gently undulating plateau with areas of sandplain and some laterite on Cretaceous sediments. Soils are formed in colluvium and weathered rock. Deep sands with Ironstone gravelly soils and Loamy earths".

4.4 Conservation Reserves

The study area does not occur within any conservation reserves. However, many of the larger and intact areas of remnant vegetation in the locality have been classed as conservation reserves (see Figure 2.1). Four of these are in close proximity to the study area and are listed below, along with their approximate distance and direction from the study area:

- Alexander Morrison National Park (6 km to the south);
- Tathra National Park (11 km to the north);
- South Eneabba Nature Reserve (11 km to the west); and
- Capamauro Nature Reserve (35 km to the east).

In addition, the Lesueur National Park is approximately 23 km to the southwest of the study area. This reserve is recognised for its floristic richness, with many rare and endemic species (CALM 1995).

4.5 Significant Communities Known from the Locality

Vegetation communities of the highest conservation concern are listed as Threatened Ecological Communities (TECs) by the DEC. Some TECs for WA are also listed under the Commonwealth EPBC Act 1999. Other communities of conservation significance are listed as Priority Ecological Communities (PECs). While these latter communities do not have any legislative protection, it is best practice environmental management to avoid disturbance to these areas. The framework for ranking communities of conservation significance is presented in Appendix 1.

4.5.1 Threatened Ecological Communities

Two Threatened Ecological Communities (TECs) listed for the Geraldton Sandplains Bioregion occur near the study area (DEC 2010).

- Lesueur-Coomallo Floristic Community (D1) Critically Endangered; B) i), ii)
This community comprises a species-rich low heath, on moderately to well-drained lateritic gravels on lower slopes and low rises, dominated by *Allocasuarina microstachya* with *A. ramosissima*, *A. humilis*, *Baeckea grandiflora*, *Borya nitida*, *Calytrix flavescens*, *Calothamnus sanguineus*, *Conostylis androstemma*, *Cryptandra pungens*, *Dryandra armata*, *Gastrolobium polystachyum*, *Hakea auriculata*, *H. incrassata*, *H. aff. erinacea*, *Hibbertia hypericoides*, *Hypocalymma xanthopetalum*, *Melaleuca trichophylla*, *Petrophile chrysantha*, *Schoenus subflavus* and *Xanthorrhoea drummondii* (Hamilton-Brown 2002a); and
- Lesueur-Coomallo Floristic Community (A1.2) Endangered; B) ii)
Species-rich heath with emergent *Hakea obliqua* on sand over well-drained grey sand over pale yellow sand on lateritic uplands. Associated species include *Hakea obliqua*, *Beaufortia aff. elegans*, *Dasypogon bromeliifolius* and *Stirlingia latifolia* species, *Allocasuarina humilis*, *Calothamnus sanguineus*, *Hibbertia hypericoides*, *Hypocalymma xanthopetalum* and *Schoenus subflavus* (Hamilton-Brown 2002b).

There are no documented occurrences of these TECs in the Warradarge study area. The Lesueur-Coomallo Floristic Community A1.2 is currently known from one location in the Lesueur National Park (31 ha in size). The Lesueur-Coomallo Floristic Community D1 is known from one location (0.1 ha) from private freehold land, immediately south of the Lesueur National Park. The location of the Lesueur National Park is indicated on Figure 2.1.

4.5.2 Priority Ecological Communities

There are no known documented occurrences of PECs in the Warradarge study area. A number of PECs occur in the Geraldton Sandplains bioregion. They are described by the DEC (2011) as:

- Lesueur-Coomallo Floristic Community M2 (*Melaleuca preissiana* woodland) - Priority 1.
"Woodland dominated by *Melaleuca preissiana* along sandy drainage lines, with *Anigozanthos pulcherrimus*, *Chamaescilla corymbosa*, *Petrophile brevifolia* and *Xanthorrhoea reflexa*.";
- Lesueur-Coomallo Floristic Community DFGH - Priority 1.
"Mixed species-rich heath on lateritic gravel with *Hakea erinacea*, *Melaleuca platycalyx* and *Petrophile seminuda*: a fine scale mixture of four floristically-defined communities occurring on lateritic slopes."; and
- *Petrophile chrysantha* low heath on Lesueur dissected uplands - Priority 2.
"Low heath dominated by *Petrophile chrysantha* on Lesueur Dissected Uplands. Associated species include *Banksia armata* and *Hakea undulata*."

4.6 Significant Flora Known from the Locality

While all native flora are protected under the Wildlife Conservation Act 1950, a number of plant species are assigned an additional level of conservation significance based on the limited number of known populations and the perceived threats to these populations. Until recently, species of the highest conservation concern were listed as Declared Rare Flora (DRF); these are now listed as Threatened Flora (T) under the State listing prepared by the DEC (DEC 2010b). Species that appear to be rare or threatened, but where there is insufficient information on their conservation significance, are assigned to one of five Priority flora categories (Appendix 1).

Fifteen species currently listed as T at a State level (and Threatened under the EPBC Act 1999) and 46 listed as Priority Flora were identified from database searches for the study area and the immediate surrounds (Table 4.1; Appendix 2 and 4). The likelihood of each species occurring within the study area has been assessed based on current and historical database records as well as typical habitat and soil preference (Table 4.1).

Table 4.1: Likelihood of conservation significant flora occurring within the study area.

Species	Growth Form	Flowering Period	Likelihood of Occurrence
Threatened (status under the EPBC Act 1999)			
<i>Andersonia gracilis</i> (Endangered)	Shrub	Sep-Nov	Unlikely
<i>Banksia serratuloides</i> subsp. <i>perissa</i> (Vulnerable)	Shrub	Aug-Sept	Possible
<i>Darwinia chapmaniana</i> (Endangered)	Shrub	-	Possible
<i>Eucalyptus absita</i> (Endangered)	Mallee or Tree	Apr-Jul	Possible
<i>Eucalyptus balanites</i> (Endangered)	Mallee	Oct-Feb	Unlikely
<i>Eucalyptus impensa</i> (Endangered)	Mallee	Jun-Jul	Possible
<i>Eucalyptus johnsoniana</i> (Vulnerable)	Mallee	Sporadically	Possible
<i>Grevillea curviloba</i> subsp. <i>incurva</i> (Endangered)	Shrub	Aug-Sep	Highly Unlikely
<i>Hakea megalosperma</i> (Vulnerable)	Shrub	May-Jun	Likely
<i>Hemiandra gardneri</i> (Endangered)	Shrub	Aug-Oct	Likely
<i>Leucopogon obtectus</i> (Endangered)	Shrub	Aug-Oct	Possible
<i>Paracaleana dixonii</i> (Endangered)	Perennial Herb	Oct-Jan	Highly Unlikely
<i>Spirogardnera rubescens</i> (Endangered)	Shrub	Aug-Dec	Unlikely
<i>Thelymitra stellata</i> (Endangered)	Perennial Herb	Oct-Nov	Likely
<i>Verticordia albida</i> (Endangered)	Shrub	Nov-Jan	Possible
Priority 2			
<i>Baeckea</i> sp. Bunney Road (S. Patrick 4059)	Shrub	Oct-Mar	Likely
<i>Boronia scabra</i> subsp. <i>condensata</i>	Shrub	August	Highly Unlikely
<i>Caustis gigas</i>	Perennial Sedge	May	Possible
<i>Daviesia debilior</i> subsp. <i>debilior</i>	Shrub	May-Jul	Possible
<i>Lasiopetalum</i> sp. Badgingarra (E.A. Griffin 5278)	Shrub	-	Unlikely

Species	Growth Form	Flowering Period	Likelihood of Occurrence
<i>Loxocarya gigas</i>	Perennial Sedge	-	Likely
<i>Onychosepalum microcarpum</i>	Perennial Herb	Aug-Oct	Unlikely
<i>Petrophile clavata</i>	Shrub	September	Possible
Priority 3			
<i>Acacia epacantha</i>	Shrub	Jul- Aug	Likely
<i>Allocasuarina ramosissima</i>	Shrub	-	Likely
<i>Banksia cypholoba</i>	Shrub	August	Likely
<i>Banksia kippistiana</i> var. <i>paenepeccata</i>	Shrub	Oct-Nov	Possible
<i>Banksia nobilis</i> subsp. <i>fragrans</i>	Shrub	Jul-Sep	Possible
<i>Banksia pteridifolia</i> subsp. <i>vernalis</i>	Shrub	Sep-Oct	Highly Unlikely
<i>Banksia splendida</i> subsp. <i>macrocarpa</i>	Shrub	Jul-Aug	Likely
<i>Banksia subulata</i>	Shrub	September	Possible
<i>Daviesia pteroclada</i>	Shrub	Jul-Aug	Unlikely
<i>Drosera marchantii</i> subsp. <i>prophylla</i>	Perennial Herb	Jun-Jul	Possible
<i>Grevillea granulosa</i>	Shrub	Jul-Oct	Possible
<i>Hemiantra</i> sp. <i>Eneabba</i> (H. Demarz 3687)	Shrub	February	Possible
<i>Jacksonia anthoclada</i>	Shrub	April	Possible
<i>Jacksonia carduacea</i>	Shrub	Aug-Dec	Possible
<i>Lasiopetalum lineare</i>	Shrub	Aug-Nov	Possible
<i>Mesomelaena stygia</i> subsp. <i>deflexa</i>	Perennial Sedge	Mar-Oct	Unlikely
<i>Persoonia rudis</i>	Shrub	Sep-Jan	Likely
<i>Petrophile biternata</i>	Shrub	Aug-Oct	Likely
<i>Phlebocarya pilosissima</i> subsp. <i>pilosissima</i>	Perennial Herb	Aug-Oct	Possible
<i>Schoenus griffinianus</i>	Perennial Sedge	Sep-Oct	Unlikely
<i>Stylidium nonscandens</i>	Perennial Herb	Sep-Nov	Likely
<i>Synaphea aephyrsa</i>	Shrub	Jul-Oct	Likely
<i>Tetralochea angulata</i>	Subshrub	-	Likely
<i>Verticordia insignis</i> subsp. <i>eomagis</i>	Shrub	Aug-Nov	Possibly
<i>Verticordia muelleriana</i> subsp. <i>muelleriana</i>	Shrub	Sep-Jan	Possibly
<i>Verticordia rutilastra</i>	Shrub	Sep-Nov	Possibly
Priority 4			
<i>Banksia chamaephyton</i>	Shrub	Oct-Dec	Highly Unlikely
<i>Banksia platycarpa</i>	Shrub	May-Aug	Likely
<i>Banksia sclerophylla</i>	Shrub	Sep-Oct	Likely
<i>Calytrix chrysantha</i>	Shrub	Dec-Feb	Likely
<i>Calytrix eneabbensis</i>	Shrub	Jul-Oct	Likely
<i>Centrolepis caespitosa</i>	Annual Herb	Oct-Dec	Highly Unlikely
<i>Desmocladus elongatus</i>	Perennial Sedge	Aug-Dec	Likely
<i>Eucalyptus pendens</i>	Mallee	Aug-Nov	Unlikely
<i>Grevillea rudis</i>	Shrub	Sporadically	High
<i>Hemiantra</i> sp. <i>Watheroo</i> (S. Hancocks 4)	Shrub	-	Possible
<i>Hypolaena robusta</i>	Perennial Herb	Sep-Oct	Possible
<i>Verticordia aurea</i>	Shrub	Sep-Dec	Likely

5.0 Vegetation

5.1 Overview

The individual vegetation types (or mapping units) identified for the Warradarge study area are described in Section 5.2, while the condition and conservation significance of the units are discussed in Sections 5.3 and 5.4, respectively. A summary of the area of each unit is provided in Table 5.1, while the distribution of the vegetation types is illustrated in Appendix 7.

Table 5.1: Summary of mapping units and their area of extent within the Warradarge study area.

Unit Code (Short)	Unit Code	Description	Area (ha)
Modified Vegetation (M)			
M1	C	Cleared Land (paddocks and some tracks)	2,784.6
M2	Eto	<i>Eucalyptus tottiana</i> low open woodland	307.9
M3	P	Planted areas	16.1
Total			3,108.6
Intact Vegetation			
Drainage Areas (D)			
D1	EaEwKm	<i>Eucalyptus accedens</i> , <i>E. wandoo</i> woodland over <i>Kunzea micrantha</i> subsp. <i>petiolata</i> tall open shrubland	3.6
Loam/Clay Plains (LP)			
LP1	AmiREc	<i>Acacia microbotrya</i> tall open shrubland over <i>Regelia ciliata</i> shrubland	6.4
LP2	BAstBEbMsHaPEmAXn	<i>Banksia strictifolia</i> , <i>Baeckea</i> sp. Bunney Road (S. Patrick 4059) tall open shrubland over <i>Melaleuca seriata</i> , <i>Hakea anadenia</i> shrubland over <i>Petrophile megalostegia</i> low shrubland over <i>Alexgeorgea nitens</i> open sedgeland	9.1
Stony Hills and Slopes (H)			
Low Hillslopes and Plains Dominated by Powderbark Wandoo (<i>Eucalyptus accedens</i>) (HP)			
HP1	EaEw	<i>Eucalyptus accedens</i> , <i>E. wandoo</i> low closed to low open forest	7.4
HP2	EaBAAsALhOv	<i>Eucalyptus accedens</i> low woodland over <i>Banksia shuttleworthiana</i> , <i>Allocasuarina humilis</i> open heath over <i>Opercularia vaginata</i> open sedgeland	5.8
Hills and Slopes dominated by <i>Banksia</i> heaths (HB)			
HB1	EgiEdBAam	<i>Eucalyptus gittinsii</i> (<i>E. drummondii</i>) open tree mallee over <i>Banksia armata</i> var. <i>armata</i> open heath	133.2
HB2	EdEgiBASpp	<i>Eucalyptus drummondii</i> low open woodland over <i>E. gittinsii</i> open tree mallee over <i>Banksia</i> spp. open heath	69.8
HB3	EdEaBASpp	<i>Eucalyptus drummondii</i> , <i>E. accedens</i> low woodland over <i>Banksia</i> spp. open heath	31.6
HB4	BAGHiBFbPEsBAI	<i>Banksia glaucifolia</i> , <i>Hakea incrassata</i> , <i>Beaufortia bracteosa</i> , <i>Petrophile shuttleworthiana</i> , <i>Banksia leptophylla</i> var. <i>melletica</i> open heath	1.2
HB5	HaXdBASppMt	<i>Hakea anadenia</i> , <i>Xanthorrhoea drummondii</i> open shrubland over <i>Banksia</i>	36.3

Unit Code (Short)	Unit Code	Description	Area (ha)
		spp., <i>Melaleuca trichophylla</i> low shrubland	
HB6	BAspp.	<i>Banksia</i> spp. closed heath	31.5
Rocky Hillcrests and Plains with <i>Xanthorrhoea drummondii</i> Low Shrublands (HX)			
HX1	EMpAlhHauPEsXdBAspHh	<i>Eremaea pauciflora</i> , <i>Allocasuarina humilis</i> tall open shrubland over <i>Hakea auriculata</i> , <i>Petrophile shuttleworthiana</i> , <i>Xanthorrhoea drummondii</i> , <i>Banksia sphaerocarpa</i> var. <i>pumilio</i> , <i>Hibbertia hypericoides</i> low open heath	56.0
HX2	EgiDAdXd	<i>Eucalyptus gittinsii</i> open tree mallee over <i>Daviesia daphnoides</i> , <i>Xanthorrhoea drummondii</i> open shrubland	29.8
HX3	HaHauXdMEp	<i>Hakea anadenia</i> , <i>H. auriculata</i> , <i>Xanthorrhoea drummondii</i> low open heath over <i>Mesomelaena pseudostygia</i> very open sedgeland.	2.6
Hillslopes with <i>Melaleuca</i> (HM)			
HM1	MuMc	<i>Melaleuca uncinata</i> , <i>M. coronicarpa</i> closed heath	1.8
HM2	CLIMasBFbLcNUa	<i>Calothamnus longissimus</i> , <i>Melaleuca aspalathoides</i> , <i>Beaufortia bracteosa</i> low shrubland to low open heath over <i>Lepidosperma</i> aff. <i>costale</i> , <i>Neurachne alopecuroidea</i> open sedgeland/grassland	18.1
HM3	EaEsbBAseMtBAK	<i>Eucalyptus accedens</i> low open woodland over <i>Eucalyptus</i> sp. Badgingarra (D. Nicolle & M. French DN 3515) very open tree mallee over <i>Banksia sessilis</i> var. <i>flabellifolia</i> , <i>Melaleuca trichophylla</i> tall open scrub over <i>B. kippistiana</i> var. <i>kippistiana</i> open shrubland	12.3
HM4	BEbMtLs	<i>Baeckea</i> sp. Bunney Road (S. Patrick 4059), <i>Melaleuca trichophylla</i> shrubland over <i>Lepidosperma squamatum</i> open sedgeland	1.0
Sandy Plains and Low Hills (P)			
Vegetation dominated by <i>Eucalyptus todtiana</i> (Coastal Blackbutt) Low Woodlands (PE)			
PE1	EtoADcXdEMPjMEp	<i>Eucalyptus todtiana</i> low open woodland over <i>Adenanthos cygnorum</i> subsp. <i>cygnorum</i> , <i>Xanthorrhoea drummondii</i> open shrubland over <i>Eremaea pauciflora</i> , <i>Jacksonia floribunda</i> low shrubland over <i>Mesomelaena pseudostygia</i> very open sedgeland	11.0
PE2	EtoBACLEoBAspLOh	<i>Eucalyptus todtiana</i> low woodland over <i>Banksia candolleana</i> , <i>Lepidospermum oligandrum</i> , <i>B. sphaerocarpa</i> var. <i>pumilio</i> open heath over <i>Lomandra hastilis</i> very open sedgeland	7.3
PE3	EtoBACAlh	<i>Eucalyptus todtiana</i> low open woodland over <i>Banksia candolleana</i> , <i>Allocasuarina humilis</i> shrubland	0.9
PE4	EtoADcXd	<i>Eucalyptus todtiana</i> low open woodland over <i>Adenanthos cygnorum</i> subsp. <i>cygnorum</i> , <i>Xanthorrhoea drummondii</i>	41.1

Unit Code (Short)	Unit Code	Description	Area (ha)
		shrubland	
Sandy Hills and Plains with <i>Banksia</i> Low Woodlands (PB)			
PB1	BAaBAmLEo	<i>Banksia attenuata</i> , <i>B. menziesii</i> low woodland over <i>Leptospermum oligandrum</i> tall open shrubland	14.2
Sandy Plains dominated by Powderbark wandoo (PW)			
PW1	EaEdEMpHs	<i>Eucalyptus accedens</i> low open woodland over <i>E. drummondii</i> very open tree mallee over <i>Eremaea pauciflora</i> , <i>Hibbertia subvaginata</i> low shrubland	9.9
PW2	EaBEbGOMP	<i>Eucalyptus accedens</i> low open forest over <i>Baeckea</i> sp. Bunney Road (S. Patrick 4059), <i>Gompholobium pungens</i> low open shrubland	1.0
Total			542.3
Intact and Modified Total			3,650.9

5.2 Mapping Units

5.2.1 Modified Vegetation

Three mapping units within the study area were found to be extensively disturbed and were considered Completely Degraded.

M1 Cleared Land

The majority of the survey area (2,784.6 ha, 76.3%) comprised cleared land for crops and pasture (Plate 5.1). This total includes some minor tracks.

M2 *Eucalyptus todtiana* low open woodland

This vegetation unit comprised cleared areas with scattered trees of predominantly *Eucalyptus todtiana* over pasture grasses and annual herbs (Plate 5.3). This unit occupied 8.4 % of the study area. Associated species included *Nuytsia floribunda* and **Trifolium arvense* var. *arvense*. Two Priority flora species were recorded from this modified vegetation unit (*Austrostipa* sp. Cairn Hill (M.E. Trudgen 21176) and *Hemiandra* sp. Watheroo (S. Hancocks 4)). In the east section of the study area, one record of the Priority species *Baeckea* sp. Bunney Road (S. Patrick 4059) occurred just outside a section of this vegetation unit. The condition of this unit was Completely Degraded and it is not expected to support large populations of Priority flora.

M3 Planted Areas

This vegetation unit contained predominantly non-native species that had been planted. Occupying 0.4 % of the study area, this unit occurred in the northeast section and within the proposed transmission line route. This unit did not comprise native intact vegetation (Plate 5.3).



Plate 5.1: Vegetation unit M1.



Plate 5.2: Vegetation unit M2.



Plate 5.3: Vegetation unit M3 (left and right).

The following 25 intact vegetation units occurred within the remainder of the study area.

5.2.2 Vegetation of Drainage Areas

D1 *Eucalyptus accedens*, *E. wandoo* woodland over *Kunzea micrantha* subsp. *petiolata* tall open shrubland

Location:	This unit occurred on grey sands in a lower-lying valley floor in the northwest section of the study area.
Comments:	Low weed cover; few understory species.
Associated species:	* <i>Bromus rubens</i> , <i>Lomandra hastilis</i> and <i>Melaleuca uncinata</i> .
Vegetation Condition:	Excellent
Quadrats:	None
Relevés:	None
Photograph:	Plate 5.4



Plate 5.4: Vegetation unit D1.

5.2.3 Vegetation of Plains

LP1 *Acacia microbotrya* tall open shrubland over *Regelia ciliata* shrubland

Location:	This vegetation occurred on red loam/clay plains in the northwest section of the study area.
Comments:	This unit had an open structure, with a large area of bare ground. Soil type appears to be unusual for the locality.
Associated species:	<i>Astroloma glaucescens</i> , <i>Austrodanthonia setacea</i> , <i>Crassula colorata</i> , <i>Gnephosis tenuissima</i> and <i>Kunzea micrantha</i> subsp. <i>petiolata</i> .
Vegetation Condition:	Excellent. Some signs of disturbance (old fencing material).
Quadrats:	None
Relevés:	None
Photograph:	Plate 5.5

LP2 *Banksia strictifolia*, *Baeckea* sp. Bunney Road (S. Patrick 4059) tall open shrubland over *Melaleuca seriata*, *Hakea anadenia* shrubland over *Petrophile megalostegia* low shrubland over *Alexgeorgea nitens* open sedgeland.

Location:	This vegetation occurred on red to brown loam-sand plains in the north section of the study area.
Comments:	Variable rock cover (scattered laterite pebbles, cobbles and boulders). Scattered trees of <i>Eucalyptus accedens</i> and <i>E. drummondii</i> also occurred within this unit.
Associated species:	<i>Adenanthos cygnorum</i> subsp. <i>cygnorum</i> , <i>Allocasuarina microstachya</i> , <i>Astroloma glaucescens</i> , <i>Banksia cataglypta</i> , <i>Beaufortia elegans</i> , <i>Blennospora drummondii</i> , <i>Callitris arenaria</i> , <i>Dampiera lavandulacea</i> , <i>Eucalyptus accedens</i> , <i>E. drummondii</i> , <i>Gompholobium aristatum</i> , <i>Hakea trifurcata</i> , <i>Hemiandra</i> sp. <i>Watheroo</i> (S. Hancocks 4), <i>Hibbertia acerosa</i> , <i>H. subvaginata</i> , <i>Jacksonia hakeoides</i> , <i>Lachnostachys eriobotrya</i> , <i>Lepidosperma tenue</i> , <i>Leptospermum oligandrum</i> , <i>Levenhookia pusilla</i> , <i>L. stipitata</i> , <i>Neurachne alopecuroidea</i> , <i>Nuytsia floribunda</i> , <i>Opercularia vaginata</i> , <i>Petrophile shuttleworthiana</i> , <i>Pterochaeta paniculata</i> , <i>Schoenus andrewsii</i> , <i>Thysanotus manglesianus</i> , <i>*Ursinia anthemoides</i> , <i>Verticordia densiflora</i> and <i>*Vulpia muralis</i> .
Vegetation Condition:	Excellent. The two smaller sections of this unit were rated as Very Good due to higher weed densities and signs of grazing by stock.
Quadrats:	WWF17
Relevés:	None
Photograph:	Plate 5.6



Plate 5.5: Vegetation unit LP1.

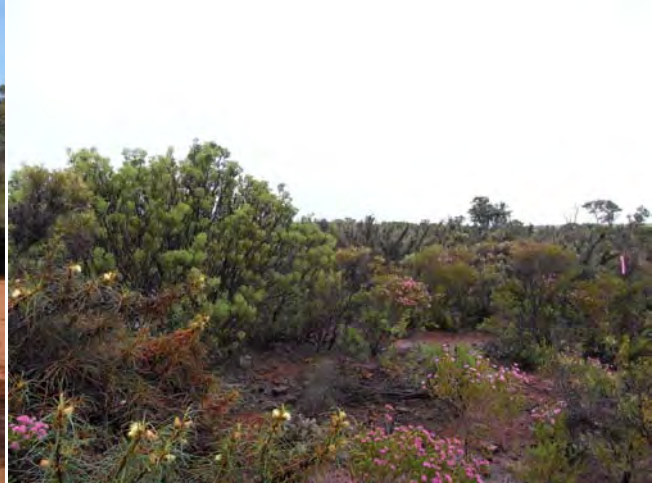


Plate 5.6: Vegetation unit LP2.

5.2.4 Vegetation of Stony Hills and Slopes

5.2.4.1 Low Hillslopes and Plains Dominated by Powderbark Wandoo (*Eucalyptus accedens*)

HP1 *Eucalyptus accedens*, *Eucalyptus wandoo* low closed to low open forest

Location:	This unit occurred on rocky slopes and crests in the west and southeast sections of the study area.
Comments:	Open understorey
Associated species:	<i>Baeckea</i> sp. Bunney Road (S. Patrick 4059), <i>Banksia glaucifolia</i> , <i>Crassula colorata</i> , <i>Hakea auriculata</i> , <i>H. lissocarpha</i> , <i>H. conchifolia</i> , <i>Lepidosperma squamatum</i> , <i>Lomandra hastilis</i> , <i>Melaleuca coronicarpa</i> , <i>Neurachne alopecuroidea</i> , <i>Olearia rudis</i> , <i>Petrophile shuttleworthiana</i> , * <i>Trifolium arvense</i> var. <i>arvense</i> and * <i>Ursinia anthemoides</i> .
Vegetation Condition:	Very Good. Signs of grazing in the smaller sections of this unit, that occurred in the west.
Quadrats:	None
Relevés:	None
Photograph:	Plate 5.7



Plate 5.7: Vegetation unit HP1 (left and right).

HP2 *Eucalyptus accedens* low woodland over *Banksia shuttleworthiana*,
Allocasuarina humilis open heath over *Opercularia vaginata* open sedgeland

Location:	This vegetation occurred in a low-lying area in the northeast section of the study area.
Comments:	Sparse cover of understorey species.
Associated species:	<i>Austrostipa macalpinei</i> , <i>A. elegantissima</i> , <i>Banksia strictifolia</i> , <i>Caustis dioica</i> , <i>Conostylis aculeata</i> subsp. <i>breviflora</i> , <i>Hakea lissocarpa</i> , <i>Hibbertia huegelii</i> , * <i>Hypochaeris glabra</i> , <i>Lepidosperma tenue</i> , <i>Neurachne alopecuroidea</i> , <i>Podotheca angustifolia</i> , <i>Schoenus pedicellatus</i> , <i>Trachymene pilosa</i> , * <i>Ursinia anthemoides</i> and * <i>Vulpia muralis</i> .
Vegetation Condition:	Very Good. Moderate weed densities and evidence of old tracks and grazing.
Quadrats:	WWF15
Relevés:	None
Photograph:	Plate 5.8



Plate 5.8: Vegetation unit HP2.

5.2.4.2 Hills and Slopes dominated by *Banksia* heaths

HB1 *Eucalyptus gittinsii* (*E. drummondii*) open tree mallee over *Banksia armata* var. *armata* open heath

Location:	This vegetation occurred on rocky and elevated stands of remnant vegetation in the northeast and east sections of the study area.
Comments:	Some small areas of rocky breakaways occurred along the edges of this unit but were not mapped separately. Here, the dominant tree species was <i>Eucalyptus accedens</i> with scattered tall shrubs (predominantly <i>Petrophile shuttleworthiana</i> and <i>Banksia sessilis</i> var. <i>flabellifolia</i>) and scattered low shrubs (including <i>Hibbertia hibernioides</i> var. <i>hibbertioides</i>).
Associated species:	<i>Acacia applanata</i> , <i>Allocasuarina humilis</i> , <i>Asteridea pulverulenta</i> , <i>Baeckea grandiflora</i> , <i>Baeckea</i> sp. Bunney Road (S. Patrick 4059), <i>Banksia glaucifolia</i> , <i>B. kippistiana</i> var. <i>kippistiana</i> , <i>B. sessilis</i> var. <i>flabellifolia</i> , <i>B. splendida</i> subsp. <i>macrocarpa</i> , <i>Conostylis androstemma</i> , <i>Dampiera lavandulacea</i> , <i>D. spicigera</i> , <i>Eucalyptus accedens</i> , <i>E. sp.</i> Badgingarra (D. Nicolle & M. French DN 3515), <i>Glischrocaryon aureum</i> , <i>Goodenia coerulea</i> , <i>Hakea gilbertii</i> , <i>H. lissocarpa</i> , <i>Hibbertia hypericoides</i> , <i>Hovea pungens</i> , <i>Isotoma hypocrateriformis</i> var. <i>trichogramma</i> , <i>Lepidosperma tenue</i> , <i>Lobelia rarifolia</i> , <i>Melaleuca ciliosa</i> , <i>M. trichophylla</i> , <i>Monotaxis grandiflora</i> var. <i>grandiflora</i> , <i>Opercularia vaginata</i> , <i>Petrophile shuttleworthiana</i> , <i>P. striata</i> , <i>Stylidium cygnorum</i> , <i>S. diuroides</i> subsp. <i>paucifoliatum</i> , <i>S. miniatum</i> , <i>Tetratheca confertifolia</i> and <i>Thysanotus manglesianus</i> .
Vegetation Condition:	Excellent
Quadrats:	WWF02, WWF03, WWF14, WWF18
Relevés:	WWFRB-11
Photograph:	Plate 5.9



Plate 5.9: Vegetation unit HB1.

HB2 *Eucalyptus drummondii* low open woodland over *E. gittinsii* open tree mallee over *Banksia* spp. open heath

Location:	This vegetation occurred in the small and medium sized pockets of remnant vegetation in the center and southeast section of the study area.
Comments:	This unit tended to occur at lower elevations than the unit HB1.
Associated species:	<i>Astroloma</i> sp. Cataby (E.A. Griffin 1022), <i>Austrostipa nitida</i> , <i>Baeckea grandiflora</i> , <i>Banksia cypholoba</i> , <i>B. glaucifolia</i> , <i>B. kippistiana</i> var. <i>kippistiana</i> , <i>B. nana</i> , <i>Banksia nobilis</i> subsp. <i>fragrans</i> , <i>B. splendida</i> subsp. <i>macrocarpa</i> , <i>Caustis dioica</i> , <i>Comesperma griffinii</i> , <i>Desmocladius elongatus</i> , <i>Drosera porrecta</i> , <i>Eucalyptus</i> sp. Badgingarra (D. Nicolle & M. French DN 3515), <i>Haemodorum</i> sp., <i>Hakea auriculata</i> , <i>Levenhookia stipitata</i> , <i>Melaleuca trichophylla</i> , <i>Microtis media</i> subsp. <i>media</i> , <i>Neurachne alopecuroidea</i> , <i>Opercularia vaginata</i> , <i>Petrophile shuttleworthiana</i> , <i>Schoenus pleiostemoneus</i> , <i>Stylidium cygnorum</i> , <i>S. miniatum</i> , <i>Thysanotus manglesianus</i> , <i>*Ursinia anthemoides</i> and <i>Xanthorrhoea drummondii</i> .
Vegetation Condition:	Excellent to Very Good. Unfenced areas of this unit had higher weed densities and signs of grazing by stock.
Quadrats:	WWF01, WWF20
Relevés:	None
Photographs:	Plate 5.10



Plate 5.10: Vegetation unit HB2.

HB3 *Eucalyptus drummondii*, *E. accedens* low woodland over *Banksia* spp. open heath

Location:	This vegetation occurred on rocky, elevated areas in the north, south and central sections of the study area.
Comments:	This unit occupied small areas, often within existing cleared areas.
Associated species:	<i>Banksia armata</i> var. <i>armata</i> , <i>B. kippistiana</i> var. <i>kippistiana</i> , <i>B. glaucifolia</i> , <i>Glischrocaryon aureum</i> , <i>Hakea flabellifolia</i> , <i>Melaleuca trichophylla</i> , <i>Mesomelaena pseudostygia</i> , <i>Neurachne alopecuroidea</i> , <i>Opercularia vaginata</i> , <i>Petrophile shuttleworthiana</i> , <i>*Ursinia anthemoides</i> and <i>Velleia trinervis</i> .
Vegetation Condition:	Good to Very Good. Evidence of disturbance and moderate weed density.
Quadrats:	None
Relevés:	None
Photograph:	Plate 5.11



Plate 5.11: Vegetation unit HB3 (left and right).

HB4 *Banksia glaucifolia*, *Hakea incrassata*, *Beaufortia bracteosa*, *Petrophile shuttleworthiana*, *B. leptophylla* var. *melletica* open heath

Location:	This unit occurred in the proposed transmission line route, extending from the northwest corner of the study area
Comments:	
Associated species:	<i>Allocasuarina humilis</i> , <i>Banksia shuttleworthiana</i> , <i>Calothamnus sanguineus</i> , <i>Calytrix depressa</i> , <i>Glischrocaryon aureum</i> , <i>Hakea conchifolia</i> , <i>Polianthion wichurae</i> , <i>Verticordia densiflora</i> var. <i>cespitosa</i> , <i>Leucopogon phyllostachys</i> , <i>Melaleuca leuropoma</i> , <i>Mesomelaena pseudostygia</i> , <i>Neurachne alopecuroidea</i> , <i>Pileanthus filifolius</i> , <i>Polianthion wichurae</i> , <i>Synaphea</i> sp. and <i>Xanthorrhoea drummondii</i> .
Vegetation Condition:	Excellent to Pristine
Quadrats:	None
Relevés:	None
Photograph:	Plate 5.12

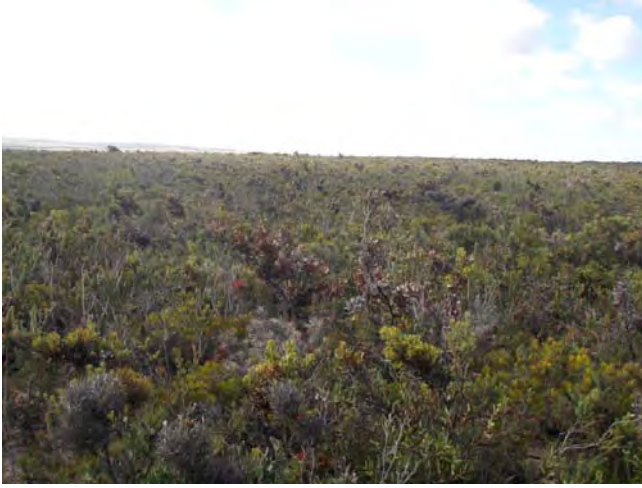


Plate 5.12: Vegetation unit HB4.

HB5 *Hakea anadenia*, *Xanthorrhoea drummondii* open shrubland over *Banksia* spp., *Melaleuca trichophylla* low open heath.

Location:	This vegetation occurred on the crest of a medium mesa in the southwest section of the study area. It was also recorded to the east of this mesa and on low rises further south.
Comments:	Site WWF08 was situated within a small stand of <i>Eucalyptus</i> sp. Badgingarra (D. Nicolle & M. French DN 3515) on the mesa crest. This unit was too small to be mapped separately and it was not considered substantially different from the broader crest vegetation. This unit has some similarity to the Lesueur-Coomallo Floristic Community (D1), listed as a TEC (see Section 4.5.1).
Associated species:	<i>Allocasuarina humilis</i> , <i>A. grevilleoides</i> , <i>A. ramosissima</i> , <i>Banksia cypholoba</i> , <i>B. glaucifolia</i> , <i>B. sessilis</i> var. <i>flabellifolia</i> , <i>B. kippistiana</i> , <i>B. carlinoides</i> , <i>Baeckea crispiflora</i> var. <i>tenuior</i> , <i>B. grandiflora</i> , <i>Calothamnus quadrifidus</i> , <i>Cassytha flava</i> , <i>Caustis dioica</i> , <i>Daviesia epiphyllum</i> , <i>Drosera menziesii</i> subsp. <i>penicillaris</i> , <i>Gastrolobium plicatum</i> , <i>Glischrocaryon aureum</i> , <i>Goodenia coerulea</i> , <i>Hakea auriculata</i> , <i>H. incrassata</i> , <i>Hibbertia</i> sp. Mt Lesueur (M. Hislop 174), <i>Jacksonia restioides</i> , <i>Lepidobolus quadratus</i> , <i>Melaleuca aspalathoides</i> , <i>Ptilotus</i> sp., <i>Thysanotus spiniger</i> , <i>Waitzia acuminata</i> .
Vegetation Condition:	Excellent to Very Good
Quadrats:	WWF08, WWF12
Relevés:	None
Photograph:	Plate 5.13



Plate 5.13: Vegetation unit HB5 at site WWF12 (left) and on a mesa crest near site WWF08 (right).

HB6 Banksia spp. closed heath

Location:	This vegetation occurred in the center, south and northeast of the study area.
Comments:	High Banksia richness.
Associated species:	<i>Austrostipa</i> sp. Cairn Hill (M.E. Trudgen 21176), <i>Baeckea grandiflora</i> , <i>Banksia carlinoides</i> , <i>B. kippistiana</i> var. <i>kippistiana</i> , <i>Banksia nana</i> , <i>B. platycarpa</i> , <i>B. sclerophylla</i> , <i>B. sessilis</i> var. <i>flabellifolia</i> , <i>B. sphaerocarpa</i> var. <i>pumilio</i> , <i>B. splendida</i> subsp. <i>macrocarpa</i> , <i>Cassytha glabella</i> forma <i>casuarinae</i> , <i>Caustis dioica</i> , <i>Conothamnus trinervis</i> , <i>Dampiera spicigera</i> , <i>Drosera barbigera</i> , <i>Gastrolobium polystachyum</i> , <i>Haemodorum venosum</i> , <i>Hakea auriculata</i> , <i>H. gilbertii</i> , <i>Hibbertia fasciculiflora</i> , <i>H. hypericoides</i> var. <i>hypericoides</i> , <i>Hypocalymma hirsutum</i> , <i>Leucopogon phyllostachys</i> , <i>Levenhookia stipitata</i> , <i>Melaleuca platycalyx</i> , <i>Mesomelaena pseudostygia</i> , <i>Neurachne alopecuroidea</i> , <i>Petrophile megalostegia</i> , <i>P. shuttleworthiana</i> , <i>Schoenus brevisetis</i> , <i>Stylidium caricifolium</i> , <i>S. cygnorum</i> , <i>Tetraria octandra</i> , <i>*Vulpia myuros</i> forma <i>megalura</i> and <i>Xanthorrhoea drummondii</i> .
Vegetation Condition:	Excellent to Very Good
Quadrats:	WWF10
Relevés:	WWFRB-12
Photograph:	Plate 5.14



Plate 5.14: Vegetation unit HB6.

5.2.4.3 Rocky Hillcrests and Plains with *Xanthorrhoea drummondii* Low Shrublands

HX1 *Eucalyptus gittinsii* open tree mallee over *Daviesia daphnoides*, *Xanthorrhoea drummondii* open shrubland

Location:	This vegetation occurred on elevated, rocky areas in the east.
Comments:	Surface covering of orange pebbles and gravel (possibly laterite).
Associated species:	<i>Baeckea grandiflora</i> , <i>Commersonia pulchella</i> , <i>Dampiera spicigera</i> , <i>Eucalyptus drummondii</i> , <i>Gastrolobium plicatum</i> , <i>Glischrocaryon aureum</i> , <i>Grevillea erinacea</i> , <i>Hakea flabellifolia</i> , <i>Melaleuca ciliata</i> , <i>Mesomelaena pseudostygia</i> , <i>Neurachne alopecuroidea</i> and <i>*Ursinia anthemoides</i> .
Vegetation Condition:	Excellent, some old tracks present
Quadrats:	None
Relevés:	None
Photograph:	Plate 5.15



Plate 5.15: Vegetation unit HX1.

HX2 *Eremaea pauciflora*, *Allocasuarina humilis* tall open shrubland over *Hakea auriculata*, *Petrophile shuttleworthiana*, *Xanthorrhoea drummondii*, *Banksia sphaerocarpa* var. *pumilio*, *Hibbertia hypericoides* low shrubland to low open heath

Location:	This vegetation occurred on broad, low ridges in the southwest section of the study area.
Comments:	This unit has some similarity to the Lesueur-Coomallo Floristic Community (D1), listed as a TEC (see Section 4.5.1).
Associated species:	<i>Allocasuarina microstachya</i> , <i>Andersonia lehmanniana</i> , <i>Baeckea grandiflora</i> , <i>Banksia sphaerocarpa</i> var. <i>pumilio</i> , <i>Caustis dioica</i> , <i>Conostylis tomentosa</i> , <i>Daviesia daphnoides</i> , <i>Eucalyptus pruiniramis</i> , <i>Gnephosis tenuissima</i> , <i>Goodenia coerulea</i> , <i>Hakea auriculata</i> , <i>Hibbertia fasciculiflora</i> , <i>Jacksonia restioides</i> , <i>Lachnagrostis plebeia</i> , <i>Lepidobolus quadratus</i> , <i>Lepidosperma tenue</i> , <i>Levenhookia pusilla</i> , <i>Melaleuca platycalyx</i> , <i>Mesomelaena pseudostygia</i> , <i>Neurachne alopecuroidea</i> , <i>Schoenus brevisetis</i> , <i>Schoenus pleiostemoneus</i> , <i>Stylidium stenosepalum</i> , <i>Thysanotus thyrsoides</i> , <i>Trachymene pilosa</i> , * <i>Ursinia anthemoides</i> and * <i>Vulpia myuros</i> forma <i>megalura</i> .
Vegetation Condition:	Excellent to Very Good. The smaller areas of this unit had higher weed densities and were rated as Very Good.
Quadrats:	None
Relevés:	RB07
Photograph:	Plate 5.16



Plate 5.16: Vegetation unit HX2 (left and right).

HX3	<i>Hakea anadenia</i> , <i>H. auriculata</i> , <i>Xanthorrhoea drummondii</i> low shrubland over <i>Mesomelaena pseudostygia</i> very open sedgeland.
Location:	Small areas of this vegetation occurred in the southwest section of the study area.
Comments:	Variable rock cover ranging from a continuous layer of orange pebbles to boulders (laterite).
Associated species:	<i>Allocasuarina humilis</i> , <i>Baeckea grandiflora</i> , <i>Beaufortia bracteosa</i> , <i>Banksia kippistiana</i> var. <i>kippistiana</i> , <i>Calothamnus sanguineus</i> , <i>Caustis dioica</i> , <i>Commersonia pulchella</i> , <i>Glischrocaryon aureum</i> , <i>Haemodorum spicatum</i> , <i>Lepidobolus quadratus</i> , <i>Lepidosperma squamatum</i> , <i>Leucopogon</i> sp. Warradarge (M. Hislop 1908), <i>Opercularia vaginata</i> , <i>Pterochaeta paniculata</i> , <i>Stenanthemum reissekii</i> , <i>Tetraria octandra</i> , <i>Trachymene pilosa</i> , * <i>Trifolium arvense</i> var. <i>arvense</i> and * <i>Ursinia anthemoides</i> .
Vegetation Condition:	Very Good. Presence of weeds in low to moderate densities and tracks.
Quadrats:	None
Relevés:	None
Photograph:	Plate 5.17



Plate 5.17: Vegetation unit HX3 (left and right).

5.2.4.4 Hillslopes with *Melaleuca* and *Baeckea*

HM1 *Melaleuca uncinata*, *M. coronicarpa* closed heath

Location:	This vegetation occurred on the north facing mid to lower slopes of a low mesa in the southwest section of the study area. It also occurred nearby, in a small area northwest of the mesa.
Comments:	Soil comprised white to grey sand with some outcropping laterite boulders on the mesa slopes.
Associated species:	<i>Austrostipa macalpinei</i> , <i>Baeckea crispiflora</i> var. <i>tenuior</i> , <i>Baeckea</i> sp. Bunney Road (S. Patrick 4059), <i>Beaufortia elegans</i> , <i>Calandrinia calyptrata</i> , <i>Commersonia pulchella</i> , <i>Dampiera linearis</i> , * <i>Ehrharta longiflora</i> , <i>Hakea lissocarpha</i> , <i>Isotoma hypocrateriformis</i> var. <i>trichogramma</i> , <i>Melaleuca aspalathoides</i> , <i>Pentaschistis airoides</i> , <i>Pimelea imbricata</i> var. <i>piliger</i> , <i>Podolepis canescens</i> , <i>Stylidium caricifolium</i> , <i>Trachymene pilosa</i> , <i>Verticordia</i> sp. and <i>Podolepis canescens</i>
Vegetation Condition:	Excellent
Quadrats:	WWF07
Relevés:	WWFRB-01
Photograph:	Plate 5.18



Plate 5.18: Vegetation unit HM1 (left and right).

HM2 *Calothamnus longissimus*, *Melaleuca aspalathoides*, *Beaufortia bracteosa* low shrubland to low open heath over *Lepidosperma* aff. *costale*, *Neurachne alopecuroidea* open sedgeland/grassland

Location:	This unit occurred on the slopes of the medium mesa in the west section of the study area and the slopes of a medium ridge in the southwest corner.
Comments:	Orange pebbles and cobbles, scattered over white/grey sand.
Associated species:	<i>Acacia lasiocarpa</i> var. <i>lasiocarpa</i> , <i>A. wilsonii</i> , <i>Allocasuarina grevilleoides</i> , <i>Allocasuarina ramosissima</i> , <i>Baeckea crispiflora</i> var. <i>tenuior</i> , <i>B. grandiflora</i> , <i>Banksia kippistiana</i> var. <i>kippistiana</i> , <i>Calytrix chrysantha</i> , <i>Cassytha glabella</i> forma <i>casuarinae</i> , <i>Daviesia chapmanii</i> , <i>D. epiphyllum</i> , <i>Gastrolobium plicatum</i> , <i>Glischrocaryon aureum</i> , <i>Goodenia coerulea</i> , <i>G. glareicola</i> , <i>Hibbertia hypericoides</i> , <i>Hibbertia polystachya</i> , <i>Melaleuca trichophylla</i> , <i>Lepidobolus quadratus</i> , <i>Patersonia occidentalis</i> var. <i>latifolia</i> , <i>Petrophile megalostegia</i> , <i>Pimelea imbricata</i> var. <i>piliger</i> , <i>Podolepis canescens</i> , <i>Schoenus clandestinus</i> , <i>Stenanthemum reissekii</i> , <i>Stylidium diuroides</i> subsp. <i>paucifoliatum</i> , <i>Tetraria octandra</i> , <i>Thelymitra stellata</i> and <i>Trachymene pilosa</i> .
Vegetation Condition:	Excellent
Quadrats:	WWF07
Relevés:	WWFRB-05
Photograph:	Plate 5.19



Plate 5.19: Vegetation unit HM2 (left and right).

HM3 *Eucalyptus accedens* low open woodland over *E. sp.* Badgingarra (D. Nicolle & M. French DN 3515) very open tree mallee over *Banksia sessilis* var. *flabellifolia*, *Melaleuca trichophylla* tall open scrub over *Banksia kippistiana* var. *kippistiana* open shrubland

Location:	This vegetation occurred on the slopes of a low ridge in the northeast section of the study area.
Comments:	Laterite conglomerate with outcropping present.
Associated species:	<i>Banksia nobilis</i> subsp. <i>fragrans</i> , <i>Calytrix oldfieldii</i> , <i>Caustis dioica</i> , <i>Dampiera spicigera</i> , <i>Hibbertia hypericoides</i> , <i>Loxocarya striata</i> , <i>Melaleuca ciliosa</i> , <i>Neurachne alopecuroidea</i> , <i>Opercularia vaginata</i> , <i>Polianthion wichurae</i> , <i>Schoenus clandestinus</i> and <i>Tetraria octandra</i> .
Vegetation Condition:	Excellent
Quadrats:	None
Relevés:	WWFRB-10
Photograph:	Plate 5.20



Plate 5.20: Vegetation unit HM3.

HM4 *Baeckea sp.* Bunney Road (S. Patrick 4059), *Melaleuca trichophylla* shrubland over *Lepidosperma squamatum* open sedgeland

Location:	This unit occurred in a small area on the slopes of a ridge in the southwest corner of the study area.
Comments:	Associated with outcropping pink clay (see Plate 5.22).
Associated species:	<i>Acacia lasiocarpa</i> var. <i>lasiocarpa</i> , <i>Beaufortia bracteosa</i> , <i>Darwinia neildiana</i> , <i>Daviesia chapmanii</i> , <i>Glischrocaryon aureum</i> , <i>Lissanthe powelliae</i> , <i>Stylidium eriopodum</i> and <i>Xanthorrhoea drummondii</i> .
Vegetation Condition:	Excellent
Quadrats:	None
Relevés:	None
Photograph:	Plate 5.21



Plate 5.21: Vegetation unit HM4.



Plate 5.22: Outcropping pink clay in vegetation unit HM4.

5.2.5 Vegetation of Sandy Plains

5.2.5.1 Vegetation dominated by *Eucalyptus totdtiana* (Coastal Blackbutt) Low Woodlands

PE1 *Eucalyptus totdtiana* low open woodland over *Adenanthos cygnorum* subsp. *cygnorum*, *Xanthorrhoea drummondii* open shrubland over *Eremaea pauciflora*, *Jacksonia floribunda* low shrubland over *Mesomelaena pseudostygia* very open sedgeland.

Location:	This vegetation was recorded from the western section of the study area.
Comments:	White/grey sand with no rock cover
Associated species:	<i>Acacia auronitens</i> , <i>Alexgeorgea nitens</i> , <i>Amphipogon turbinatus</i> , <i>Andersonia heterophylla</i> , <i>Anigozanthos humilis</i> subsp. <i>humilis</i> , <i>Arnocrinum gracillimum</i> , <i>Astroloma xerophyllum</i> , <i>Baeckea grandiflora</i> , <i>Banksia dallanneyi</i> subsp. <i>media</i> , <i>Comesperma virgatum</i> , <i>Conostylis teretifolia</i> subsp. <i>teretifolia</i> , <i>C. tomentosa</i> , <i>Daviesia podophylla</i> , <i>Desmocladius virgatus</i> , <i>Drosera echinoblastus</i> , <i>D. menziesii</i> subsp. <i>penicillaris</i> , <i>D. porrecta</i> , <i>Eremaea asterocarpa</i> , <i>E. beaufortoides</i> var. <i>microphylla</i> , <i>E. pauciflora</i> , <i>Haemodorum spicatum</i> , <i>Hibbertia acerosa</i> , <i>H. hypericoides</i> , <i>H. leucocrossa</i> , <i>H. sp.</i> Mt Lesueur (M. Hislop 174), <i>Hypolaena robusta</i> , <i>Jacksonia floribunda</i> , <i>J. lehmannii</i> , <i>Johnsonia pubescens</i> , <i>Leptospermum spinescens</i> , <i>Levenhookia pusilla</i> , <i>Melaleuca leuropoma</i> , <i>Mesomelaena pseudostygia</i> , <i>Schoenus breviculmis</i> , <i>S. insolitus</i> , <i>Stenanthemum humile</i> , <i>Stirlingia latifolia</i> , <i>Synaphea endothrix</i> and <i>Xanthosia huegelii</i> .
Vegetation Condition:	Excellent
Quadrats:	WWF05
Relevés:	None
Photograph:	Plate 5.23



Plate 5.23: Vegetation unit PE1.

PE2 *Eucalyptus tottiana* low woodland over *Banksia candolleana*, *Leptospermum oligandrum*, *B. sphaerocarpa* var. *pumilio* open heath over *Lomandra hastilis* very open sedgeland

Location:	This vegetation occurred in the west section of the study area.
Comments:	White sand with no rock cover
Associated species:	<i>Acacia barbinervis</i> subsp. <i>borealis</i> , <i>Allocasuarina humilis</i> , <i>Anigozanthos humilis</i> subsp. <i>humilis</i> , <i>Astroloma xerophyllum</i> , <i>Austrostipa macalpinei</i> , <i>Baeckea grandiflora</i> , <i>Banksia candolleana</i> , <i>B. shuttleworthiana</i> , <i>B. sphaerocarpa</i> var. <i>pumilio</i> , <i>Beaufortia elegans</i> , <i>Crassula colorata</i> var. <i>acuminata</i> , <i>Desmocladius virgatus</i> , <i>Drosera echinoblastus</i> , <i>Eremaea beaufortioides</i> var. <i>microphylla</i> , <i>E. pauciflora</i> , <i>Gompholobium tomentosum</i> , <i>Goodenia coerulea</i> , <i>Hibbertia hypericoides</i> , <i>H. leucocrossa</i> , <i>Leptospermum spinescens</i> , <i>Leucopogon oldfieldii</i> , <i>L. hermaphrodita</i> , <i>Melaleuca leuropoma</i> , <i>Mesomelaena pseudostygia</i> , <i>Neurachne alopecuroidea</i> , <i>*Pentameris airoides</i> , <i>Petrophile linearis</i> , <i>Schoenus brevisetis</i> , <i>S. clandestinus</i> , <i>S. curvifolius</i> , <i>Trachymene pilosa</i> and <i>*Ursinia anthemoides</i> .
Vegetation Condition:	Excellent
Quadrats:	WWF06
Relevés:	None
Photograph	Plate 5.24



Plate 5.24: Vegetation unit PE2.

PE3 *Eucalyptus tottiana* low open woodland over *Banksia candolleana*,
Allocasuarina humilis shrubland

Location:	This vegetation occurred in the proposed transmission line route.
Comments:	Soil consists of white sand.
Associated species:	<i>Banksia attenuata</i> , <i>Beaufortia elegans</i> , <i>Hakea incrassata</i> , <i>Hibbertia leucocrossa</i> , <i>Hypolaena robusta</i> , <i>Isopogon asper</i> , <i>I. adenanthoides</i> , <i>I. panduratus</i> subsp. <i>panduratus</i> , <i>Jacksonia floribunda</i> , <i>Lambertia multiflora</i> var. <i>multiflora</i> , <i>Leptospermum oligandrum</i> , <i>Mesomelaena pseudostygia</i> , <i>Pileanthus filifolius</i> and <i>Verticordia grandis</i> .
Vegetation Condition:	Excellent
Quadrats:	None
Relevés:	None
Photograph:	Plate 5.25

PE4 *Eucalyptus tottiana* low open woodland over *Adenanthos cygnorum* subsp. *cygnorum*, *Xanthorrhoea drummondii* shrubland

Location:	This vegetation occurred on sections of the crest of a low mesa in the southwest corner of the study area and in an area to the east.
Comments:	Grey sand and no rock cover
Associated species:	<i>Allocasuarina humilis</i> , <i>A. ramosissima</i> , <i>Anigozanthos humilis</i> subsp. <i>humilis</i> , <i>Aristida holathera</i> var. <i>holathera</i> , <i>Astroloma xerophyllum</i> , <i>Austrostipa hemipogon</i> , <i>A. sp.</i> Cairn Hill (M.E. Trudgen 21176), <i>Baeckea grandiflora</i> , <i>Banksia cypholoba</i> , <i>B. sclerophylla</i> , <i>Bossiaea eriocarpa</i> , <i>Caustis dioica</i> , <i>Conospermum nervosum</i> , <i>Conostylis teretifolia</i> subsp. <i>teretifolia</i> , <i>C. tomentosa</i> , <i>Crassula colorata</i> var. <i>colorata</i> , <i>Daviesia nudiflora</i> subsp. <i>hirtella</i> , <i>Desmocladius elongatus</i> , <i>D. virgatus</i> , <i>Drosera parvula</i> , <i>Eremaea pauciflora</i> , <i>Haemodorum spicatum</i> , <i>Hemianthera pungens</i> , <i>Hibbertia acerosa</i> , <i>H. hypericoides</i> , <i>H. leucocrossa</i> , <i>*Hypochaeris glabra</i> , <i>H. sp.</i> Mt Lesueur (M. Hislop 174), <i>Hovea trisperma</i> , <i>Grevillea erinacea</i> , <i>Jacksonia floribunda</i> , <i>Laxmannia sessiliflora</i> subsp. <i>drummondii</i> , <i>Lepidosperma scabrum</i> , <i>Levenhookia stipitata</i> , <i>Mesomelaena pseudostygia</i> , <i>*Pentameris airoides</i> , <i>Rytidosperma setaceum</i> , <i>Schoenus pedicellatus</i> , <i>Stirlingia latifolia</i> , <i>Synaphea spinulosa</i> subsp. <i>spinulosa</i> , <i>Trachymene pilosa</i> , <i>Trifolium arvense</i> var. <i>arvense</i> , <i>*Ursinia anthemoides</i> and <i>*Wahlenbergia capensis</i> .
Vegetation Condition:	Excellent
Quadrats:	WWF11, WWF13
Relevés:	None
Photograph:	Plate 5.26



Plate 5.25: Vegetation unit PE3.



Plate 5.26: Vegetation unit PE4.

5.2.5.2 Sandy Hills and Plains with *Banksia* Low Woodlands

PB1 *Banksia attenuata*, *B. menziesii* low woodland over *Leptospermum oligandrum* tall open shrubland

Location:	This vegetation occurred in the northeast of the study area on a low rise and lower slopes.
Comments:	White/ grey sand with no rock cover.
Associated species:	<i>Alexgeorgea nitens</i> , <i>Amphipogon turbinatus</i> , <i>Austrostipa macalpinei</i> , <i>Calytrix fraseri</i> , <i>Cassytha flava</i> , <i>Conostephium magnum</i> , <i>Cryptandra pungens</i> , <i>Drosera eneabba</i> , <i>D. humilis</i> , <i>Gompholobium tomentosum</i> , <i>Grevillea erinacea</i> , <i>Haemodorum spicatum</i> , <i>Petrophile brevifolia</i> , <i>Eremaea beaufortioides</i> var. <i>microphylla</i> , <i>Hakea incrassata</i> , <i>Hibbertia leucocrossa</i> , <i>H. subvaginata</i> , <i>*Hypochaeris glabra</i> , <i>Jacksonia hakeoides</i> , <i>J. nutans</i> , <i>Lachnostachys eriobotrya</i> , <i>Leptospermum squamatum</i> , <i>Levenhookia stipitata</i> , <i>Melaleuca leuropoma</i> , <i>Neurachne alopecuroidea</i> , <i>Opercularia vaginata</i> , <i>*Pentameris airoides</i> , <i>Podotheca angustifolia</i> , <i>Schoenus</i> sp. smooth culms (K.R. Newbey 7823), <i>Trachymene pilosa</i> , <i>*Ursinia anthemoides</i> and <i>*Vulpia myuros</i> forma <i>megalura</i> .
Vegetation Condition:	Excellent. Low weed density.
Quadrats:	WWF04, WWF16
Relevés:	None
Photograph:	Plate 5.27



Plate 5.27: Vegetation unit PB1.

5.2.5.3 Sandy Plains dominated by Powderbark wandoo

PW1 *Eucalyptus accedens* low open forest over *Baeckea* sp. Bunney Road (S. Patrick 4059), *Gompholobium pungens* low open shrubland

Location:	This vegetation was recorded in the southwest section of the study area at the base of a low mesa.
Comments:	Grey/ brown sand with no rocks.
Associated species:	<i>Glischrocaryon aureum</i> , <i>Hibbertia fasciculiflora</i> , <i>Lepidosperma squamatum</i> and <i>Neurachne alopecuroidea</i> .
Vegetation Condition:	Very Good to Excellent
Quadrats:	None
Relevés:	WWFRB03
Photograph:	Plate 5.28



Plate 5.28: Vegetation unit PW1.

PW2 *Eucalyptus accedens* low open woodland over *E. drummondii* very open tree mallee over *Eremaea pauciflora*, *Hibbertia subvaginata* low shrubland

Location:	This vegetation occurred on gently undulating plains and slopes in the east section of the study area.
Comments:	This unit was recorded from sections of white/ grey sand. Its distribution was patchy, occurring in association with the unit HX2, which occurred on areas that were rocky and contained outcropping laterite.
Associated species:	<i>Acacia saligna</i> , <i>Allocasuarina humilis</i> , <i>Conostylis aculeata</i> subsp. <i>breviflora</i> , <i>Crassula colorata</i> , <i>Eremaea pauciflora</i> , <i>Hakea prostrata</i> , <i>Jacksonia hakeoides</i> , <i>Lechenaultia hirsuta</i> , <i>Leptospermum oligandrum</i> , <i>Mesomelaena pseudostygia</i> , <i>Pileanthus filifolius</i> , <i>Pityrodia verbascina</i> , <i>Scaevola phlebopetala</i> , <i>*Ursinia anthemoides</i> and <i>Verticordia</i> sp.
Vegetation Condition:	Excellent
Quadrats:	None
Relevés:	None
Photograph:	Plate 5.29



Plate 5.29: Vegetation unit PW2.

5.3 Vegetation Condition

The majority of intact vegetation within the study area was in Very Good to Excellent condition. The main signs of anthropogenic disturbance were minor clearing for access tracks (historic), weed invasion and grazing by sheep.

Numerous weed species (21) were recorded, however these were largely non-invasive annual grasses and daisies (see Section 6.4). Weed invasion was generally concentrated around the perimeter of the remnant vegetation. The smaller areas of remnant vegetation had higher weed densities than larger stands, and populations tended to extend through a larger proportion of these smaller areas.

Almost all of the remnant vegetation in the northern half of the study area (Judeen Farm) was fenced. The vegetation in the southern half of the study area was not fenced and the degree of disturbance was noticeably higher. Sheep were observed grazing within these areas and there was evidence of damage via trampling. Weed densities were also higher, in general, within these unfenced sections of remnant vegetation.

The soil-borne pathogens that cause Dieback disease (*Phytophthora* spp.) are known from the locality, including the Mt Lesueur National Park (Mills 1992). Other disease causing pathogens such as *Armillaria luteobubulina* and *Botryosphaeria ribis* are also known from the northern kwongan and have the potential to cause significant problems within native vegetation. These pathogens can be spread through the movement of vehicles, humans, native animals and stock.

The vegetation types which include species that would be susceptible to infection (woodlands dominated by *Banksia attenuata* and *B. menziesii* and areas supporting *Xanthorrhoea drummondii*, *Banksia sessilis* and species in the family Eriacaceae) appeared to be in good health, with large numbers of individuals of these plants and no obvious signs of crown dieback.

While no specific surveys for Dieback or other plant pathogens were undertaken, the Warradarge Wind Farm study area did not appear to be affected. Vegetation units including species susceptible to infection, in particular units PB1 and PE3, should be considered risk zones for the management of Dieback.

5.4 Conservation Significance of the Vegetation Types

The vegetation types of the Warradarge study area are typical of those occurring in similar habitats in the broader locality.

Two of the vegetation units (HB5 and HX1) appear similar to the description available for the Lesueur-Coomallo Floristic Community (D1), which is listed as a TEC (see Section 4.5.1). This community is currently known from one 0.1 ha location on private land adjacent to the Lesueur National Park (Hamilton-Brown 2002b). The vegetation units that may represent this TEC were recorded on stony slopes and hills in the southwest section of the study area. These units are considered to be of Very High conservation significance. Biota will report these to the DEC.

None of the vegetation types represent PECs (see Section 4.5.2; (Mills 1992)), nor are they considered restricted to the study area.

The cleared land and planted vegetation units (M1 and M3) have no conservation value for vegetation. The Completely Degraded vegetation unit M2 has low conservation value for vegetation.

The remaining vegetation units are considered to be of High conservation significance. The Warradarge study area is situated in a locality that has been subject to extensive historical land clearing. Consequently, the conservation of native vegetation is of particular significance due to this high level of fragmentation and very low protection of vegetation in conservation reserves

(EPA 2010). Remnant vegetation is also valuable habitat for flora and fauna of conservation significance in the locality (see Sections 6.3 and 7.3.2).

Within the units classified as High conservation significance, there is some significance variability. Those vegetation units with any of the following characteristics are considered to be of elevated significance (within the category High):

- areas of large extent;
- vegetation in Excellent or Pristine condition;
- drainage areas or unusual soil types or habitats for the region; and
- support populations of Threatened and/or Priority flora.

There are only six vegetation units that, based on our survey work, do not have any of the characteristics outlined above (HP2, HB3, HB4, HX3, PE2 and PW1). Within the category High, they are of lower conservation significance.

6.0 Flora

6.1 Overview

A total of 406 native vascular plant species from 167 genera belonging to 55 families were recorded from the study area (Appendix 8). Of these, four Threatened flora and 23 Priority flora species were recorded as well as several species of potential conservation interest (see Section 6.3). Known locations of these species are shown on Figure 6.1 and are listed in Appendix 9. A further 21 introduced (weed) species were identified (Section 6.4). A complete species list is provided in Appendix 8.

6.2 Dominant Taxa and Groups

The plant families and genera with the greatest number of native taxa within the study area are shown in Table 6.1. These families and genera are those that generally dominate the habitats of the locality.

Table 6.1: Number of native plant species in the dominant families and genera within the study area.

Family	Number of Native Species	Genus	Number of Native Species
Proteaceae	62	<i>Banksia</i>	22
Myrtaceae	59	<i>Acacia</i>	15
Fabaceae	39	<i>Hakea</i>	14
Cyperaceae	17	<i>Stylidium</i>	11
Goodeniaceae	17	<i>Eucalyptus</i>	10
Asteraceae	16	<i>Melaleuca</i>	10
Ericaceae	14	<i>Schoenus</i>	10
Stylidaceae	13	<i>Hibbertia</i>	9

6.3 Flora of Conservation Significance

6.3.1 Threatened Flora

Four species listed as Threatened under the WA Wildlife Conservation Act 1950-1979 were recorded from the study area (*Acacia wilsonii*, *Banksia catoglypta*, *Eucalyptus pruiniramis*, and *Thelymitra stellata*). Two of these (*T. stellata* and *E. pruiniramis*) are also listed as Endangered under the Commonwealth EPBC Act 1999. These species are described below and their locations shown on Figure 6.1.

Acacia wilsonii

Threatened

This low spreading, wiry shrub grows to 0.5 m high and has horizontal branches bearing terete erect phyllodes that are sessile. *Acacia wilsonii* generally occurs on yellow/white sand, lateritic gravel and sandy clay over laterite in low heath vegetation. It is currently known only from three collections in the Moora District between Eneabba and Dandaragan over a range of 60 km (Patrick and Brown 2001). This species was recorded once, from the slopes of a low mesa (vegetation unit HM2) in the southwest section of the study area.

Banksia catoglypta

Threatened

This species is a non-ligotuberous shrub growing to 1 m in height and produces flowers from June to July. It is known to occur on lateritic breakaways in kwongan heath vegetation. *Banksia catoglypta* was formally upgraded from Priority 2 to Threatened in August 2010. A single specimen of this species was collected from clay plain habitat in the northwest section of study area (vegetation unit LP2). It should be noted that an error occurred during processing this voucher specimen and there is uncertainty surrounding the accuracy of the collection location.

Eucalyptus pruiniramis

Threatened (Endangered)

Eucalyptus pruiniramis is known to occur in skeletal soils over sandstone and laterite, usually on midslopes that are fairly high in the landscape. It generally occurs in an open, low mallee woodland structure, emergent from heath or scrub. Known associated genera include *Dryandra*, *Grevillea*, *Gastrolobium* and *Acacia*. It typically grows from 2.5 to 7 m in height and often has a straggly, hanging crown.

This species is known from nine populations, all north of the Three Springs area (see Figure 2.1) over a range of 160 km. Of these, four populations occur on road verges, four on private land, and one in a national park. The total known number of individual plants is estimated to be 58 (Patrick and Brown 2001). Within the Warradarge study area, one individual was recorded from a rocky plain in the southern section of the study area (vegetation unit HX1).

Thelymitra stellata (Star Sun Orchid)

Threatened (Endangered)

This orchid is a slender perennial growing to 50 cm high. It has golden-brown flowers with yellow or orange sepals and petals on a single, robust stem that are produced from late September to November. It grows in gravelly loam among low heath and scrub in *Eucalyptus marginata* and *E. wandoo* woodland, and in low heath on lateritic hilltops (Patrick and Brown 2001). This species is uncommon but has a relatively wide distribution. It is known from 23 populations, each of approximately 10 plants or less, between Eneabba and Pinjarra, with disjunct occurrences near Dumbleyung and Corrigin (Graham and Mitchell 2000, Durell and Buehrig 2001, Patrick and Brown 2001).

Thelymitra stellata was recorded once on the southwest facing slope of a low mesa (vegetation unit HM2).



Plate 6.1: *Thelymitra stellata* (collected at 351519 mE, 6684244 mN)

6.3.2 Priority Flora

Twenty-two (22) Priority flora species were recorded from the study area. The locations are provided on Figure 6.1, on maps in Appendix 1 and listed in Appendix 9. These species are described below.

Grevillea stenogyne

Priority 1

Grevillea stenogyne is currently known only from the type collection held at the WA Herbarium. This species was recorded once, opportunistically, from plains (of red loam) in the north section of the study area (vegetation unit LP2).

Arnocrinum gracillimum

Priority 2

Arnocrinum gracillimum is endemic to the Moora District and is known from five populations between Eneabba and Badgingarra (Patrick and Brown 2001). This species is a perennial herb flowering from October to November with purple, terminal spikes on 30 cm long flowering stems. It is known from lateritic grey sandy soils in low scrub or heath with associated species of *Adenanthos*, *Calothamnus*, *Hakea* and *Xanthorrhoea*. This species occurred on sandy plain habitat in the western section of the study area (vegetation unit PE1).

Baeckea sp. Bunney Road (S. Patrick 4059)

Priority 2

This slender erect shrub grows to 2.5 m in height and produces flowers from October to March. It typically grows on yellow-brown loam over lateritic gravel on plains, hillslopes and breakaways. This species was widespread in the survey area, occurring in a variety of habitats and vegetation types. It was considered to be dominant in the tall open shrubland stratum of quadrat site WWF17 (plain habitat with red to brown loamy sand) and the low open shrubland stratum of relevé WWFRB03 (sandy plain). It also occurred in association with clay plains, sandy plains, low stony plains and stony hillslope habitats (corresponding to six vegetation units: LP2, HM4, PW2, HP1, HB1 and HM1).

Comesperma griffinii

Priority 2

This herb grows to 0.15 m high and produces small white flowers in October. It has a basal rosette of clustered leaves and a slender taproot. It occurs in yellow or grey sands and is believed to be a post fire-ephemeral (Keighery 2002). It is currently known from scattered occurrences from Eneabba north to Mullewa, inland to Mount Gibson and south to Dalwallinu. *Comesperma griffinii* was recorded once from a stony hill (vegetation unit HB2).

Synaphea endothrix

Priority 2

Synaphea endothrix is an erect, clumped shrub growing to 0.6 m high and flowering from August to September. It typically occurs in gravelly loam or sand on lateritic rises. This species was recorded once from sandy plain habitat (vegetation unit PE1).

Allocasuarina grevilleoides

Priority 3

This small, dioecious shrub grows to 0.5 m high and flowers from September to November. It grows in grey sandy loam to white clay over lateritic gravel or quartz in low heath vegetation. This species has been recorded east of Eneabba and Badgingarra and from the Lesueur area. *Allocasuarina grevilleoides* was recorded three times from stony hillslopes in association with *Melaleuca* or *Banksia* (vegetation units HM2 and HB5).

Allocasuarina ramosissima

Priority 3

This species is an erect, dense shrub growing to 1 m in height. It occurs on sandy loam to clay loam with lateritic gravel in low shrubland or on heath with mallee trees. It flowers from September to November and has much-divided and whorled branches. Known populations occur between Three Springs and Dandaragan, with one population occurring just south of the Moora District (Patrick and Brown 2001).

This species was recorded three times from stony hillslopes with *Melaleuca* or *Banksia* and sandy plains with *Eucalyptus todtiana* habitat (vegetation units HM2, PE4 and HB5). It was a dominant species in relevé WWFRB04 (stony hillslope habitat).

Austrostipa sp. Cairn Hill (M.E. Trudgen 21176) Priority 3

This grass species was recorded four times in the study area). It was recorded from one relevé (WWFRB09) and three times opportunistically on sandy soils corresponding to stony hills and slopes (unit HB6), sandy plains (unit PE4) and modified vegetation (unit M2).

Banksia cypholoba Priority 3

Banksia cypholoba has short underground fire-tolerant stems and grows in sand and gravelly loam. It typically occurs in kwongan vegetation in association with *Eucalyptus todtiana*, or in thick scrub. This species was recorded three times on stony hillslope and sandy plain habitat (corresponding to vegetation units HB2, PE4 and HB5).

Banksia nobilis subsp. *fragrans* Priority 3

This erect shrub grows to 4 m without lignotubers and it usually occurs on lateritic rises in thick kwongan heath vegetation. It has yellow to green or pink flower that are produced between July and September. This species was recorded twice from stony hillslope habitat (vegetation units HM3 and HB2).

Banksia splendida subsp. *macrocarpa* Priority 3

This shrub has many branches and flowers from July to August. It grows to 2 m high and occurs on sandy loam soils in kwongan heath. Its known distribution extends from Tathra National Park to Badgingarra. This species was recorded three times from stony hill and slope habitats (vegetation types HB6, HB2 and HB1). It was considered to be dominant in the shrubland stratum of quadrat WWF14 (vegetation unit HM3).

Grevillea erinacea Priority 3

Grevillea erinacea is a spreading, prickly shrub to 1.8 m high, flowering mainly from July to October. It commonly grows in heath or shrubland in sandy soil over lateritic gravel and is known to occur in an area between Ellendale, Three Springs and Arrowsmith. *Grevillea erinacea* was recorded three times from sandy hills and plains dominated by *Banksia* or *Eucalyptus todtiana* woodlands, and rocky hillcrest habitat. It occurred in vegetation units PB1, HX2 and PE4.

Lepidobolus quadratus Priority 3

An erect perennial sedge to 30 cm high, *Lepidobolus quadratus* flowers from August to December. The species typically grows in sand to sandy clay with laterite in open low scrub or low heath usually in association with *Calothamnus*, *Lambertia*, *Xanthorrhoea* and *Dryandra* on breakaways and uplands. This species occurred three times, from stony hills and slopes (vegetation units HM2, HX1 and HB5).

Petrophile chrysanthra subsp. Watheroo (K.M. Allan 57) Priority 3

This taxon is more recently known as *Petrophile septemfida* Rye & K.A. Sheph (see Rye et al. 2011).

Growing to 1.2 m high, this shrub flowers from June to October and is commonly found in sand over laterite associated with *Dryandra* and *Hakea* species. It occurs from north of Tathra National Park east to near Coorow and southeast to Watheroo National Park (Rye et al. 2011). This species was recorded once from sandy soil in vegetation unit PE3.

Astroloma sp. Cataby (E.A. Griffin 1022) Priority 4

This species is a spreading or erect shrub growing to 35 cm high. It produces cream to white flowers between February and July. It usually grows in loam or sandy soils over laterite on hills and

breakaways. *Astroloma* sp. Cataby (E.A. Griffin 1022) was recorded once in association with *Banksia* heath (vegetation unit HB2).

Banksia platycarpa

Priority 4

Banksia platycarpa is an erect shrub to 1.5 m, growing on flat to undulating sites, midslopes or hilltops. It typically occurs in heath or tall shrubland in sandy soil, sometimes with lateritic gravel, and is commonly associated with *Eucalyptus tottiana* and species of *Adenanthos*, *Hakea* and *Banksia*. It occurs from east of Eneabba, south to Mogumber and is well represented in conservation reserves. *Banksia platycarpa* was recorded once in vegetation type HB6 (representing stony hills and slopes dominated by *Banksia* heaths).

Banksia sclerophylla

Priority 4

This species is a shrub to 60 cm with lignotubers, growing in sandy soils over laterite in kwongan scrub. This species typically flowers from September to October and is known to occur between Alexander Morrison National Park, Mount Lesueur and Badgingarra. This species occurred twice from the study area from vegetation units HB6 and PE4.

Calytrix chrysantha

Priority 4

Calytrix chrysantha is an erect hairless shrub growing to 1.3 m tall, with yellow flowers produced from December to February. It grows on grey sand and white to yellow clayey sand over gravel. It typically occurs in high open shrubland or open woodland over heath in association with *Eucalyptus tottiana* and *Banksia attenuata*. This species is known from a few populations north and west of Eneabba over a range of 40 km, but historical records indicate a larger range of 70 km including areas to the south and east of Eneabba (Patrick and Brown 2001).

Calytrix chrysantha was recorded four times in stony hillslope habitat (vegetation unit HM2).

Conostephium magnum

Priority 4

This species typically grows to 2 m high and flowers from July to September. It occurs in open woodland over white to grey sand, occasionally associated with lateritic gravels. Populations of *Conostephium magnum* extend from Eneabba south to Cataby, with a single isolated record further south near Gingin (Cranfield 2002). This species was recorded four times in *Banksia* low woodland (vegetation unit BAaBamLEo) on sandy hills and plains. It was also considered a dominant species in the shrubland stratum of site WWF04 (sandplain habitat).

Desmocladius elongatus

Priority 4

Desmocladius elongatus is an erect, rhizomatous sedge growing to 35 cm. It flowers from August to November and typically grows in deep sand to sandy clay over laterite on slopes and uplands in heath. It is known to occur from Eneabba south to Cataby with most populations recorded from disturbed road verges (Patrick and Brown 2001). *Desmocladius elongatus* was recorded twice from the study area, from stony hills and sandy plains (vegetation units HB2 and PE4).

Hemiandra sp. Watheroo (S. Hancocks 4)

Priority 4

Hemiandra sp. Watheroo is a small, erect shrub up to 50 cm high, growing on white-grey sand on flat ground, slopes or low hills in open woodland and open scrub. It produces flowers between October and January. Flower colour may be consistent in individual plants but is likely to vary within a population. This species has a restricted distribution of approximately 380 km², and as of 2005 is known to occur in four surveyed populations containing 11,300 mature individuals, with 98% of the total population located in conservation parks and Crown Land (DEWHA n.d.).

This species was recorded twice from the study area, in the north of the study area on red loam plains and in disturbed *Eucalyptus tottiana* woodland (units LP2 and M2).

Hypolaena robusta

Priority 4

Hypolaena robusta is a dioecious, perennial herb to 0.5 m high, typically occurring on white sand and flowering from September to October. This species is very distinct from other *Hypolaena*

species in its exceptionally stout rhizomes and taller culms. This species was recorded in vegetation types PE1 and PE3, corresponding to *Eucalyptus tottiana* dominated sandy plains and low hills.

6.3.3 Other Flora of Conservation Interest

A number of specimens collected are considered species of interest for the following reasons:

- they are a newly discovered species;
- they represent significant range extensions to the known distribution (as indicated by the current voucher specimen records shown on FloraBase); and
- the record fills an apparent gap in the range (as shown on FloraBase).

Where there is adequate voucher material, specimens of all the above taxa will be submitted to the WA Herbarium. These species are described below.

6.3.3.1 Newly Discovered Species

Ptilotus sp. nov.

A new species, *Ptilotus* sp. nov., was collected at site WWF12. This site was situated on a broad stony ridge dominated by *Banksia* heaths over light brown sandy loam with lateritic pebbles, cobbles and boulders (vegetation unit HB5). Mr Rob Davis, of the WA Herbarium, has indicated that this entity will be named *Ptilotus* sp. Warradarge (pers. comm. January 2012). As an interim measure it will be classified as a Priority 1 species.

6.3.3.2 Significant Range Extensions or Filled Gaps in Known Range

Cassytha glabella forma *casuarinae*

Cassytha glabella forma *casuarinae* was recorded twice, from quadrats WWF09 and WWF10, corresponding to hillslope habitat dominated by *Banksia* or *Melaleuca* over brown/grey sandy-loam (vegetation units HM2 and HB6). Current specimens vouchered for WA are from as far north as the Swan Coastal Plain bioregion.

Comesperma virgatum

This species was recorded eight times during the survey. It occurred on stony hills and slopes containing *Banksia* heath, rocky hillcrests and plains containing *Xanthorrhoea drummondii*, and *Eucalyptus tottiana* dominated sandy plains and low hills (corresponding to vegetation units HB6, PE4, HB5, PE1 and HX1). Currently, only one voucher has been made for the Geraldton Sandplains bioregion, 150 km northwest of the study area.

Gonocarpus cordiger

The single collection of this species in the study area represents a range extension from its known distribution that is currently concentrated in the Jarrah Forest and northern parts of the Swan Coastal Plain bioregions. The specimen was collected from stony hillslope habitat with *Eucalyptus* spp. woodland over mixed proteaceous shrubland (vegetation unit HM3).

Grevillea obliquistigma subsp. *obliquistigma*

This *Grevillea* species is currently distributed along the border separating the Eremaean and South West Botanical Provinces, with the majority of vouchered specimens occurring in the former. Very few records exist in the Geraldton Sandplains bioregion, and none are situated as far west as the study area. This species was collected once from stony hillslope habitat within vegetation unit HB2.

Melaleuca nesophila

Currently only vouchered from the Esperance bioregion, it is likely that this *Melaleuca* species was introduced to the study area. A single collection was made from an area of modified (re-planted) vegetation, classified as vegetation unit M3.

Schoenus breviculmis

There are very few records of *Schoenus breviculmis* on FloraBase and most are scattered along the southern coast of Western Australia from Albany to Esperance. The closest record is 300 km southeast of the study area in the Jarrah Forest bioregion, indicating that this collection represents a large range extension. The single specimen was recorded from an area of sandy plains and low hills with *Eucalyptus tottiana* open woodland (vegetation unit PE1).

Synaphea interioris

On opportunistic collection of *Synaphea interioris* was made from an area of stony hills and slopes dominated by a proteaceous-myrtaceous rich shrubland (vegetation unit HB5). Currently there are no specimens vouchered for the Geraldton Sandplains bioregion. The majority of records are in the Avon Wheatbelt bioregion, extending towards southeast coastal, and inland bioregions. This collection represents a range extension of approximately 150 km.

Table 6.2: Locations of conservation significant flora and other flora of interest, and their corresponding vegetation units.

Species	Vegetation Unit	Location		
		Collection	Easting (mE)	Northing (mN)
Threatened				
Acacia wilsonii	HM2	WWF09	351728	6684273
Banksia catoglypta	LP2	Opportunistic	356339	6687948
Eucalyptus pruiniramis	HX1	Opportunistic	353534	6682041
Thelymitra stellata	HM2	Opportunistic	351519	6684244
Priority 1				
Grevillea stenogyne	LP2	Opportunistic	356095	6688024
Ptilotus sp.	HB5	WWF12	352345	6684019
Priority 2				
Arnocrinum gracillimum	PE1	Opportunistic	350803	6684780
Baeckea sp. Bunney Road (S. Patrick 4059)	None	Opportunistic	355798	6684475
	HM4	Opportunistic	352468	6681973
	HM1	WWF07	351524	6684410
	LP2	WWF17	356139	6688065
	HM1	WWFRB01	351092	6684630
	PW2	WWFRB03	351408	6684446
	HB1	Opportunistic	357422	6687891
	HB1	Opportunistic	356589	6684859
	HP1	Opportunistic	356347	6684584
Comesperma griffinii	HB2	WWF20	355105	6684325
Synaphea endothrix	PE1	WWF05	350803	6684780
Priority 3				
Allocasuarina grevilleoides	HB5	WWF12	352345	6684019
	HM2	WWFRB04	351392	6684376
	HM2	WWFRB05	351534	6684227
Allocasuarina ramosissima	HB5	Opportunistic	352665	6682144
	PE4	WWF11	351992	6683898
	HB5	WWF12	352345	6684019
	HM2	WWFRB04	351392	6684376
Austrostipa sp. Cairn Hill (M.E. Trudgen 21176)	HB6	Opportunistic	353246	6684913
	Eto	WWFRB09	353128	6683659
	Eto	Opportunistic	350803	6684891
	PE4	Opportunistic	352947	6684281
Banksia cypholoba	HB5	WWF12	352345	6684019
	HB2	WWF20	355105	6684325
	PE4	Opportunistic	352171	6683295
Banksia nobilis subsp. fragrans	HB2	Opportunistic	356600	6684252
	HM3	Opportunistic	355961	6686309
Banksia splendida subsp. macrocarpa	HB1	WWF14	355840	6686327
	HB6	Opportunistic	353343	6684754
	HB2	WWF20	355105	6684325
Grevillea erinacea	HX2	Opportunistic	356566	6684442
	PB1	WWF16	356640	6686289
	PE4	Opportunistic	353135	6684386
Lepidobolus quadratus	HM2	Opportunistic	351513	6684251
	HX1	Opportunistic	352014	6683282
	HB5	Opportunistic	352346	6684140
Petrophile chrysantha subsp.	PE3	Opportunistic	350157	6687432

Species	Vegetation Unit	Location		
		Collection	Easting (mE)	Northing (mN)
Watheroo (K.M. Allan 57) [#]				
Priority 4				
<i>Astroloma</i> sp. Cataby (E.A. Griffin 1022)	HB2	WWF01	354420	6686098
<i>Banksia platycarpa</i>	HB6	Opportunistic	353246	6684913
<i>Banksia sclerophylla</i>	HB6	WWF10	353364	6684706
	PE4	Opportunistic	551959	6683933
<i>Calytrix chrysantha</i>	HM2	Opportunistic	351407	6684397
	HM2	WWFRB05	351534	6684227
	HM2	Opportunistic	351618	6684288
	HB5	WWF12	352345	6684019
<i>Conostephium magnum</i>	PB1	WWF04	356403	6686689
	PB1	WWF16	356640	6686289
	PB1	WWF16	356640	6686289
	PB1	Opportunistic	356387	6686759
<i>Desmocladius elongatus</i>	HB2	WWF01	354420	6686098
	PE4	Opportunistic	352171	6683295
<i>Hemiandra</i> sp. Watheroo (S. Hancocks 4)	Eto	WWFRB09	353128	6683659
	LP2	Opportunistic	356339	6687948
<i>Hypolaena robusta</i>	PE3	Opportunistic	350157	6687432
	PE1	WWF05	350803	6684780
	PE1	Opportunistic	350806	6684824
Range Extensions				
<i>Cassytha glabella</i> forma <i>casuarinae</i>	HM2	WWF09	351728	6684273
	HB6	WWF10	353364	6684706
<i>Comesperma virgatum</i>	HX1	Opportunistic	353534	6682041
	PE1	WWF05	350803	6684780
	PE1	Opportunistic	350811	6684787
	PE1	Opportunistic	350803	6684780
	HB5	Opportunistic	351550	6684343
	HB5	Opportunistic	352345	6684019
	PE4	Opportunistic	351959	6683933
	HB6	Opportunistic	353364	6684706
<i>Gonocarpus cordiger</i>	HM3	Opportunistic	356164	6686367
<i>Grevillea obliquistigma</i> subsp. <i>obliquistigma</i>	HB2	Opportunistic	356293	6683398
<i>Melaleuca nesophila</i>	P	Opportunistic	356811	6687212
<i>Schoenus breviculmis</i>	PE1	WWF05	350803	6684780
<i>Synaphea interioris</i>	HB5	Opportunistic	352345	6684019

[#]more recently known as *Petrophile septemfida* Rye & K.A. Sheph (see Rye et al. 2011).

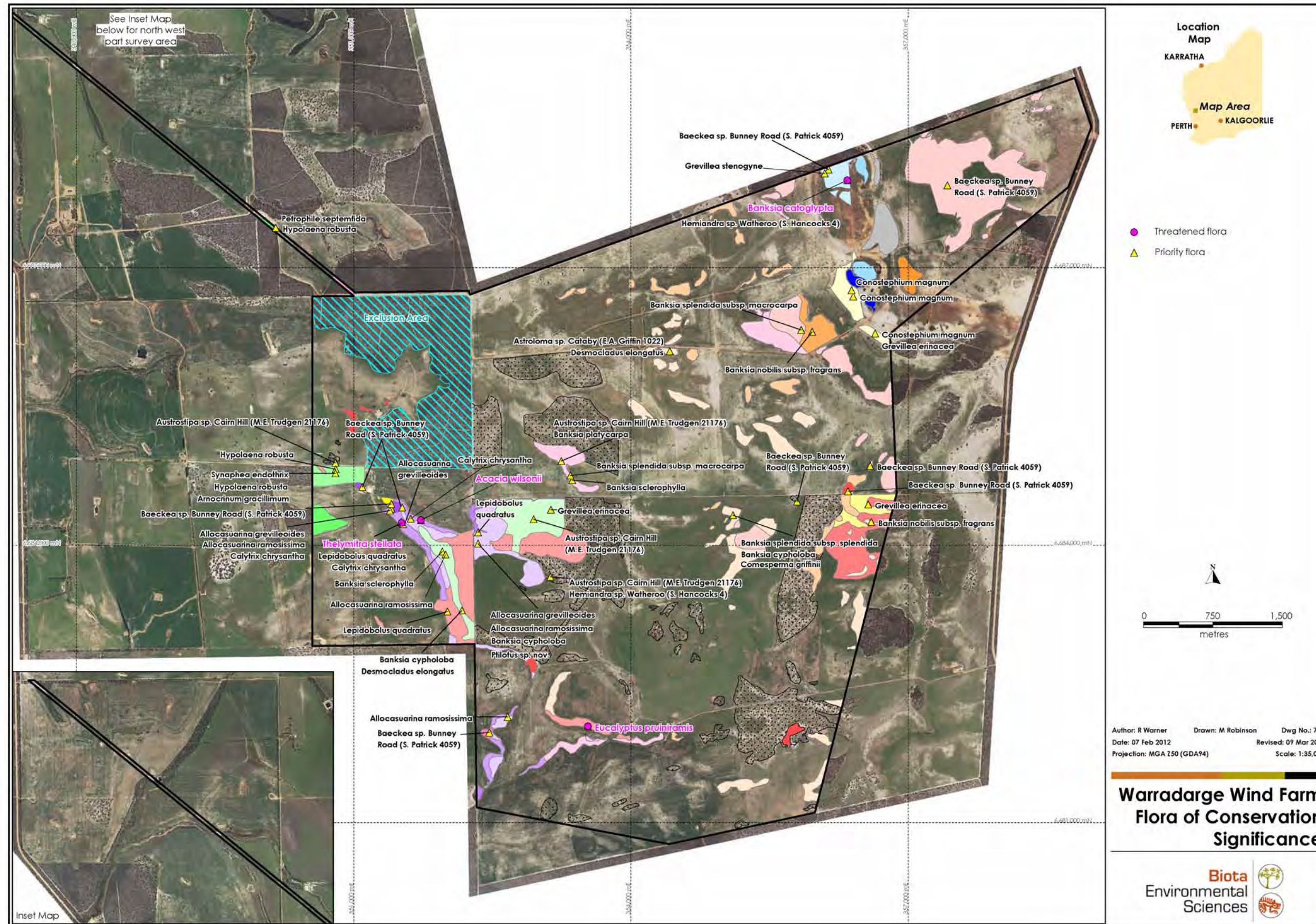


Figure 6.1: Locations of Threatened and Priority flora species in the study area.

6.4 Introduced Flora (Weeds)

A total of 21 introduced species were recorded from the study area (see Table 6.3). As most weeds were relatively widespread within the study area, individual locations were not recorded consistently. Many of the annual species that were recorded from only single specimens or a small number of locations may be more widespread.

Most weed species recorded were non-invasive. However, Paterson's Curse (**Echium plantagineum*) is listed as a Declared Plant for WA (category P1 and P4³) under the Agriculture and Related Resources Protection Act 1976.

The majority of weed species recorded (seven) were grasses or daisies (families Poaceae and Asteraceae). Given that the study area has been extensively cleared and is currently used for agricultural purposes, the presence of introduced species was expected and not considered unusual for the region. Higher densities of weeds occurred in unfenced areas of remnant vegetation, and where remnant vegetation pockets were small in area. Weed densities also tended to be higher on the perimeter of the remnants.

Table 6.3: Introduced flora species (weeds) recorded from the study area (the prefix * denotes an introduced species).

Family	Species	Number of Records from Study Area
Poaceae	* <i>Bromus diandrus</i>	2
	* <i>Bromus rubens</i>	1
	* <i>Ehrharta longiflora</i>	3
	* <i>Pentameris airoides</i>	8
	* <i>Vulpia fasciculata</i>	1
	* <i>Vulpia muralis</i>	4
	* <i>Vulpia myuros</i> forma <i>megalura</i>	3
Asteraceae	* <i>Arctotheca calendula</i>	2
	* <i>Hypochaeris glabra</i>	13
	* <i>Hypochaeris radicata</i>	1
	* <i>Ursinia anthemoides</i>	10
Brassicaceae	* <i>Brassica barrelieri</i> subsp. <i>oxyrrhina</i>	1
	* <i>Diplotaxis muralis</i>	1
	* <i>Raphanus raphanistrum</i>	1
Boraginaceae	* <i>Echium plantagineum</i>	1
Campanulaceae	* <i>Wahlenbergia capensis</i>	6
Cyperaceae	* <i>Isolepis marginata</i>	1
Fabaceae	* <i>Acacia iteaphylla</i>	1
	* <i>Trifolium arvense</i> var. <i>arvense</i>	2
Geraniaceae	* <i>Erodium botrys</i>	1
Scrophulariaceae	* <i>Zaluzianskya divaricata</i>	1

Weed species recorded from the study area are described below.

**Acacia iteaphylla* (Flinders Range Wattle)

This wattle is a large, weeping shrub to 5 m with narrow grey-green phyllodes to 10 cm and yellow flowers. **Acacia iteaphylla* grows mainly in *Eucalyptus marginata* woodlands on sandy soils and is currently distributed in the coastal and sub-coastal districts of WA.

³ P1: prohibits movement of plants and their seeds within the State. This prohibits the movement of contaminated machinery and produce including livestock and fodder; P4: prevent the spread of infestation from the property on or in livestock, fodder, grain, vehicles and/or machinery. Treat to destroy and prevent seed set on all plants.

****Arctotheca calendula* (Cape Weed)**

**Arctotheca calendula* is a rosette-forming annual that is native to South Africa. This daisy occurs in all habitats in the southwest of WA, often dominating cropland and pastures.

****Brassica barrelieri* subsp. *oxyrrhina* (Smooth-stem Turnip)**

This species is a rosetted annual growing to 0.5 m high, generally in disturbed areas. It produces white, cream or yellow flowers in early spring and is recorded mainly in the Swan Coastal Plain bioregion, with scattered occurrences throughout the South-west Botanical Province.

****Bromus diandrus* (Great Brome)**

This annual species is a common weed of pastures, crops and disturbed sites, but also occurs in native grasslands, woodlands and in coastal habitats. This highly competitive grass species is widely distributed throughout southwest WA from Denham to Esperance and inland to Kalgoorlie.

****Bromus rubens* (Red Brome)**

**Bromus rubens* is a slender annual deciduous grass with red-purple flowers produced in early spring. It commonly occurs in shallow, dry or poorly textured clay soils and is capable of displacing native flora species. It is widely distributed throughout the entire South-west Botanical Province with scattered occurrences inland to Kalgoorlie and along the coast from Esperance to Eucla.

****Diplotaxis muralis* (Wall Rocket)**

This erect to ascending annual species grows to 0.5 m high and mainly occurs on sandy soils and in association with limestone. Its current distribution is predominantly coastal from Denham to Esperance with occasional records inland between Geraldton and Albany.

****Echium plantagineum* (Paterson's Curse)**

This large, bristly annual produces numerous purple flowers during late winter and spring. **Echium plantagineum* occurs in disturbed areas, including agricultural land and roadsides, throughout the southwest of WA. This species is a Declared Plant (P1 and P4) under the Agriculture and Related Resources Protection Act 1976.

****Ehrharta longiflora* (Annual Veldt Grass)**

**Ehrharta longiflora* is a tufted annual to 30 cm with a greenish-purple inflorescence. It occurs on offshore islands, coastal dunes and sandy soils from Shark Bay to Eucla and inland along disturbed creeklines and grazed woodlands in the western wheatbelt.

****Erodium botrys* (Long Storksbill)**

An ascending or decumbent annual growing to 20 cm, this species flowers from August to November and is distributed throughout the South-west Botanical Province.

****Hypochaeris glabra* (Smooth Catsear)**

**Hypochaeris glabra* is a rosetted annual or short-lived perennial with yellow, dandelion-like flower heads and smooth leaves. This weed is widely distributed throughout the southwest of WA.

****Hypochaeris radicata* (Flat Weed)**

**Hypochaeris radicata* is a rosetted annual to 0.5 m high, flowering throughout the year. This species is common in disturbed areas and can also be found invading natural vegetation in riparian zones and along the coast. Its current distribution is from Perth to Ravensthorpe.

****Isolepis marginata* (Coarse Club-rush)**

This species is a small annual sedge occurring in winter-wet depressions, along watercourses, and on granite outcrops from Shark Bay to east of Esperance.

****Pentameris airoides* (False Hairgrass)**

**Pentameris airoides* is a delicate tufted annual grass. This is a common and widespread weed of granite rocks, woodlands, shrublands and disturbed sites from Carnarvon to Kalgoorlie.

****Raphanus raphanistrum* (Wild Radish)**

**Raphanus raphanistrum* is an erect annual weed of highly disturbed edges, winter crops, degraded pastures and other disturbed habitats. It grows on a range of soil types and flowers from autumn to summer. It is currently recorded from major cities throughout the north of WA and across the southwest of WA.

****Trifolium arvense* var. *arvense* (Hare's Foot Clover)**

This erect or spreading annual to 0.5 m high is found in low rainfall areas of southwest WA. It mainly occurs in association with sandy loam and granite, generally in agricultural areas. This species flowers year-round, apart from late winter.

****Ursinia anthemoides* (Ursinia)**

**Ursinia anthemoides* is a slender, erect annual with divided leaves. It is a common and widespread weed in various habitats of southwest WA. *Ursinia* was the most common weed species in the study area.

****Vulpia fasciculata* (Dune Fescue)**

**Vulpia fasciculata* is an annual grass to 0.5 m high with stiff, erect or ascending stems. It produces flowers between September and December. Most records of this weed are from coastal habitats, between Perth to Esperance.

****Vulpia muralis* (Wall Fescue)**

Vulpia muralis is a slender annual grass growing to 0.6 m high and flowering from August to December. Current records of this weed species are scattered throughout the South-west Botanical Province and further inland into the Murchison, Yalgoo and Coolgardie Bioregions.

****Vulpia myuros* forma *megalura* (Foxtail Fescue)**

This species is a small, tufted annual grass to 0.7 m high, flowering between late winter and early spring. It is a weed of agricultural land and disturbed areas, preferring sandy soils and gravels. It has the ability, however, to tolerate a wide range of substrates. Scattered records of this weed occur throughout the southwest of WA but are concentrated in the Swan Coastal Plain and Jarrah Forest bioregions.

****Wahlenbergia capensis* (Cape Bluebell)**

This species is a slender, erect annual to 50 cm high with blue or greenish flowers. It occurs from Geraldton to Ravensthorpe, on sandy soils in woodlands or heaths and on roadsides.

****Zaluzianskya divaricata* (Spreading Night Phlox)**

Zaluzianskya divaricata is an erect annual herb growing to 35 cm high. The leaves are opposite, ovate and toothed. Flowers are produced in spring in an open terminal cluster and petals are yellow with a central red line. This species prefers habitats of sandy soils and is often abundant in agricultural areas and disturbed woodlands.

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7.0 Fauna

7.1 Overview

When determining the significance of fauna species and fauna habitats, their distribution and abundance across the relevant bioregions is typically assessed. The following four elements are considered:

1. the broad fauna habitats available within the study area;
2. an inventory of the terrestrial fauna, including migratory birds, likely to occur in the study area;
3. possible species of conservation significance and their corresponding habitats; and
4. possible impacts to fauna likely to occur in the study area.

7.2 Fauna Habitats

7.2.1 Overview

A total of five broad fauna habitats were identified for the study area based on the vegetation mapping, field groundtruthing and an examination of aerial photography. These comprised:

1. Modified Vegetation
 - Consisting of cleared land, planted areas, or *Eucalyptus tottiana* low open woodland with a degraded understorey, on deep yellow to white sands.
2. Drainage Areas
 - *Eucalyptus* spp. woodland over *Kunzea* tall open shrubland.
3. Loam/Clay Plains
 - *Acacia* tall open shrubland over *Regelia ciliata* shrubland.
 - *Eucalyptus* low open woodland over a layered Proteaceous-Myrtaceous tall to low shrubland over an open sedgeland.
4. Stony Hills and Slopes
 - Low hill slopes and plains dominated by *Eucalyptus accedens* (Powderbark Wandoo).
 - Hills and slopes dominated by *Melaleuca*, *Baeckea* and species-rich *Banksia* heaths.
 - Rocky hillcrests and plains of *Xanthorrhoea drummondii* low shrublands.
5. Sandy Plains and Low Hills
 - *Eucalyptus tottiana* (Coastal Blackbutt) low woodlands on deep white sand.
 - Sandy plains dominated by either *Eucalyptus accedens* (Powderbark Wandoo) or *Banksia* low woodlands.

7.2.2 Fauna Habitat of Conservation Significance

The five broad fauna habitats described for the study area are considered to be common and widespread within the Lesueur Sandplains subregion. Vegetation dominated by a species-rich proteaceous heath (see Table 7.1, Appendix 1) is of particular conservation significance, as it is typical foraging habitat for Carnaby's Cockatoo (*Calyptorhynchus latirostris*), a conservation significant species (described in detail in Section 7.3.2.2). Those units likely to be foraging habitat for this species are listed in Table 7.1, and shown in Plate 7.1.

Table 7.1: Vegetation units representing typical *Calyptrorhynchus latirostris* foraging habitat and the extent and broad location within the study area.

Unit Code	Study area location	Area (ha)
Hills and Slopes dominated by <i>Banksia</i> heaths		
HB1	Majority of the northeast, including some large stands	133.2
HB2	Scattered small remnants in the center	69.8
HB3	Scattered small remnants in the north	31.6
HB4	Most southern section of the transmission line route	1.2
HB5	Western section on low mesa crest and adjacent areas; low broad ridges in the south-west corner	36.3
HB6	Four remnants scattered through study area	31.5
Sandy Hills and Plains with <i>Banksia</i> Low Woodlands		
PB1	Two remnants in the northeast (divided by minor track).	14.2
Total		317.8



Plate 7.1: Typical foraging habitat for Carnaby's Cockatoo (*Calyptrorhynchus latirostris*) in the study area (*Eucalyptus mallee* over *Banksia* spp. heath; HB1 (left) and HB2 (right)).

None of the vegetation of the study area included mature trees of sufficient diameter to provide nesting resources for *C. latirostris*. Typical eucalypt trunks within the study area are shown in Plate 7.1.

7.3 Database Search Results

7.3.1 Fauna Assemblage

Database searches indicated that a total of 187 native vertebrate fauna species potentially occur in the Warradarge locality (see Table 7.2, Appendix 10). This total comprises 133 bird species, 10 native mammals (seven non-volant, three volant), and 44 herpetofauna species (eight amphibians and 36 reptiles). Considering that only 15% of the study area contains intact remnant vegetation, the actual number occurring in the study area is likely to be a considerably lower subset of this total.

Table 7.2: Number of vertebrate fauna species potentially occurring in the study area.

Fauna Group	Number of Potentially Occurring Species
Avifauna	133
Native Non-volant Mammals	7
Native Volant Mammals	3
Amphibians	8
Reptiles	36
Total	187

7.3.2 Fauna of Conservation Significance

7.3.2.1 Statutory Framework

Native fauna species that are rare, threatened with extinction, or have high conservation value, are specially protected by law under the WA Wildlife Conservation Act 1950-1979.

In addition, many of these species are listed under the Federal EPBC Act 1999. Some avifauna species are also listed under the Japan and Australia Migratory Bird Agreement (JAMBA), Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA) and the China and Australia Migratory Bird Agreement (CAMBA). The framework for ranking communities of conservation significance is presented in Appendix 1.

7.3.2.2 Fauna of Conservation Significance known from the Locality

Relevant database searches (Appendix 3 and 4) identified 12 fauna species of conservation significance that may occur in the study area (see Table 7.3). Of these, three species are State listed as Schedule 1, as well as being Federally listed, under the EPBC Act 1999, as either Endangered or Vulnerable. Also listed were five migratory birds protected jointly under three bilateral Migratory Birds Agreements and the EPBC Act 1999.

Table 7.3: Fauna species of conservation significance that may occur within the study area.

Species	Status		International Agreements
	State	Federal	
<i>Calyptorhynchus latirostris</i> (Carnaby's Cockatoo)	Schedule 1	Endangered	-
<i>Calyptorhynchus baudinii</i> (Baudin's Cockatoo)	Schedule 1	Vulnerable	-
<i>Leipoa ocellata</i> (Malleefowl)	Schedule 1	Vulnerable/ Migratory	J
<i>Apus pacificus</i> (Fork-tailed Swift)	Schedule 3	Migratory	C, J, R
<i>Ardea alba</i> (Great Egret, White Egret)	Schedule 3	Migratory	C, J
<i>Ardea ibis</i> (Cattle Egret)	Schedule 3	Migratory	C, J
<i>Haliaeetus leucogaster</i> (White-bellied Sea-eagle)	Schedule 3	Migratory	C
<i>Merops ornatus</i> (Rainbow Bee-eater)	Schedule 3	Migratory	J
<i>Neelaps calonotos</i> (Black-striped Snake)	Priority 3		-
<i>Ardeotis australis</i> (Australian Bustard)	Priority 4		-
<i>Calamanthus campestris</i> subsp. <i>montanellus</i> (Rufous Fieldwren)	Priority 4		-
<i>Oreocica gutturalis</i> subsp. <i>gutturalis</i> (Crested Bellbird)	Priority 4		-

NB: CAMBA=China-Australia Migratory Bird Agreement ; JAMBA=Japan-Australia Migratory Bird Agreement; and ROKAMBA=Republic of Korea-Australia Migratory Bird Agreement.

The likelihood of occurrence within the study area is discussed for each species below, along with a brief description of their ecology and distribution.

Calyptorhynchus latirostris (Carnaby's Cockatoo)

Schedule 1, Endangered

Distribution and Ecology: *Calyptorhynchus latirostris* is endemic and confined to the south-west of Western Australia, ranging north to the lower Murchison River and east to Durokoppin and Cape Arid (Johnstone et al. 2006). Its range is believed to have contracted by more than 30% since the late 1940s (Mawson 1997).

Carnaby's Cockatoo generally favours proteaceous scrubs, kwongan heaths, and adjacent *Eucalyptus* woodlands and forests occurring on sandplains (R.E. Johnstone, pers. comm. 2012), especially those that contain *Eucalyptus salmonophloia* and *E. wandoo* (Saunders 1986). It also occurs in remnant patches of native vegetation on land otherwise cleared for agriculture (Saunders 1974).

It is attracted to seeding *Banksia*, *Hakea*, *Eucalyptus*, *Corymbia*, *Grevillea*, *Melaleuca*, *Callistemon* and *Allocasuarina* species (Storr 1991, Mawson 1995) and nests in large hollows in tall,

smooth-barked eucalypts, particularly *Eucalyptus wandoo* (Saunders 1979, Storr 1991, Cale 2003), *E. camaldulensis*, and *E. occidentalis* (R.E. Johnstone, pers. comm. 2012). This species is resident in high-rainfall areas, and is a breeding migrant to drier regions and at sites where most of the native vegetation has been cleared (Saunders 1980).

Significance of The Warradarge Region: According to R.E. Johnstone (pers. comm. 2012), breeding has been recorded in several localities (Dookanooka, Three Springs, Coorow, Coomallo, and Carnamah) and along numerous roads and tracks (Eneabba-Three Springs Road, Coorow-Green Head Road, and Marchagee Track) in close proximity to the study area. The majority of the individuals that have been recorded in the Warradarge area were non-breeding autumn-winter visitors, most likely from breeding sites to the northeast and east (e.g. the Three Springs, Carnamah and Coorow regions).

Extracts from the Storr-Johnstone Bird Data Bank indicate that birds in the central Wheatbelt (Three Springs, Coorow, Badgingarra and Moora regions) tend to move west after breeding in February into higher rainfall areas, especially towards coastal sandplains supporting *Banksia* scrubs (Higgins 1999), and then further south onto Kwongan heaths and pine plantations on the Swan Coastal Plain. The exceptions are some large flocks (300 or more individuals) that have remained throughout the entire autumn-winter period in the Eneabba area and Badgingarra National Park where suitable feeding and roosting habitat is available (R.E. Johnstone, pers. comm. 2012).

Likelihood of Occurrence: Based on available records (historical and recent), the greater Carnamah-Coorow region contains important breeding and roosting habitat for Carnaby's Cockatoos. Some areas within, and in close proximity to, the study area are likely to provide important feeding habitat for both local and migratory flocks. It is likely that this species will occur in the study area, feeding on typical proteaceous heath vegetation, or in passing during migration movements. No large trees were observed, and the study area does not therefore appear to offer any nesting opportunities for *Calyptorhynchus latirostris*.

Calyptorhynchus baudinii (Baudin's Cockatoo)

Schedule 1, Vulnerable

Distribution and Ecology: *Calyptorhynchus baudinii* is found only in the extreme south-west of Western Australia. The range of this species, which is generally bounded by the 750 mm isohyet, extends from Albany northward to Gidgegannup and Mundaring and inland to the Stirling Ranges and near Boyup Brook (Storr 1991).

Likelihood of Occurrence: Database searches indicate that Baudin's Cockatoo was historically recorded in the area. However, this is probably because it was formerly grouped with Carnaby's Cockatoo (*Calyptorhynchus latirostris*) and treated as a single species. Due to the current known range of *C. baudinii*, this species is highly unlikely to occur within the study area.

Leipoa ocellata (Malleefowl)

Schedule 1, Vulnerable

Distribution and Ecology: In Western Australia, Malleefowl are known from semi-arid rangelands and the central and eastern wheatbelt of Western Australia (Benshemesh 2010). The species is mostly located south and west of a line extending from Cape Farquhar, north of Carnarvon, through to Eucla in the south-east (Barrett et al. 2003), with the area of occupancy known to be decreasing (Garnett and Crowley 2000). *Leipoa ocellata* is at very low density in the northern sandplains, with few recent records.

The species occupies a variety of habitats including shrublands and low woodlands that are dominated by mallee vegetation. It also occurs in other habitat types including eucalypt or native pine (*Callitris*) woodlands, *Acacia* shrublands, *Melaleuca uncinata* vegetation or coastal heathlands, and they are also known to forage in croplands that lie adjacent to more typical habitat (Benshemesh 2010).

Likelihood of Occurrence: Based on its current known distribution, Malleefowl are considered unlikely to occur in the study area. No evidence of the species presence (its distinctive mounds) were recorded during the field survey.

Apus pacificus (Fork-tailed Swift)

Schedule 3, Migratory

Distribution and Ecology: The Fork-tailed Swift is a non-breeding visitor to all states and territories of Australia, usually between October and late April. This species mainly occurs over inland plains, above foothills and are widespread in coastal and subcoastal areas. Terrestrial habitats include dry or open areas, riparian woodland and tea-tree swamps, low scrub, and heathland. They are also found near open farmland and inland and coastal sand-dunes (Higgins 1999). The Fork-tailed Swift is an aerial eater, flying anywhere from 1 m to 300 m above the ground to forage.

Likelihood of Occurrence: The Fork-tailed Swift does not breed in Australia. It may be a transitory visitor to the area.

Ardea alba (Great Egret, White Egret)

Schedule 3, Migratory

Distribution and Ecology: *Ardea alba* is widespread in Australia and occurs in all states and territories. Minor breeding sites are scattered across its known distribution and include a wide range of wetland habitats in south-western WA (Phillimore and Recher 2004), particularly in Melaleuca swamps (Marchant and Higgins 1990). In south-western WA, multi-directional post-breeding movements of up to 280 km have been recorded (McKilligan 2005). Regular seasonal movements are mostly to and from breeding colonies, and towards the coast in the dry season (Marchant and Higgins 1990).

Likelihood of Occurrence: It is considered unlikely that *Ardea alba* occurs within the study area or its immediate surrounds as typical habitat is absent.

Ardea ibis (Cattle Egret)

Schedule 3, Migratory

Distribution and Ecology: In WA and the Northern Territory, *Ardea ibis* is generally located from Wyndham to Arnhem Land, although non-breeding populations have been recorded in the far southwest coastal areas of WA (Marchant and Higgins 1990). Typical habitat includes temperate grasslands, wooded lands and terrestrial wetlands. High numbers have also been observed in moist, low-lying poorly drained pastures with an abundance of high grass, and in farmland areas (Marchant and Higgins 1990).

Likelihood of Occurrence: This species may occur in the locality, based on its preferred habitat and known distribution.

Haliaeetus leucogaster (White-bellied Sea-Eagle)

Schedule 3, Migratory

Distribution and Ecology: *Haliaeetus leucogaster* is distributed along the coastline of mainland Australia. The inland limits of the species are restricted in southwest WA, where it is confined to a narrow band along the coast (Blakers et al. 1984). Home ranges occupied by the White-bellied Sea-Eagle can be up to 100 km² (Mooney and Brothers 1986). Within these ranges, breeding areas are typically located close to water (Emison and Bilney 1982).

The species' terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland, forest and even urban areas (Bell 1984). While the White-bellied Sea-Eagle generally forages over large expanses of open water, it will also forage over open terrestrial habitats such as grasslands (Sedgwick 1978). This species is sensitive to disturbance when nesting, especially during the early stages of the breeding season, and may desert nests and young if disturbed by humans or exposed to human activity (Stokes 1996).

Likelihood of Occurrence: Due to the inland location of the study area, it is unlikely that nesting sites will be present, and it would be at best an infrequent visitor to the area.

Merops ornatus (Rainbow Bee-eater)

Schedule 3, Migratory

Distribution and Ecology: The Rainbow Bee-eater is distributed across much of mainland Australia and is said to be seasonally common and locally abundant throughout much of its range (Birdlife International 2005). Records indicate that the distribution of the species has expanded in southwestern WA (Storr and Johnstone 1988). The southern populations of the Rainbow Bee-eater migrate northward from February to April, and return to their breeding grounds in September and October (Serventy and Whittell 1976). The species occurs mainly in open forests, woodlands, shrublands (Higgins 1999), and in various cleared or semi-cleared habitats (Morris 1977), including farmland (Leach 1988).

Likelihood of Occurrence: It is considered likely that the species will occur in the study area due to its high abundance, widespread distribution across mainland Australia, and known occurrence in cleared habitats including farmland.

Neelaps calonotus (Black-striped Snake)

Priority 3

Distribution and Ecology: This bright orange-red snake is restricted to the sandy coastal strip near Perth, between Mandurah and Lancelin. It occurs on dunes and sandplains vegetated with eucalypt/Banksia heaths and woodlands (Wilson and Swan 2010).

Likelihood of Occurrence: The study area is outside the known range for this species and it is considered highly unlikely to occur.

Ardeotis australis (Australian Bustard)

Priority 4

Distribution and Ecology: The Australian Bustard occurs over much of Western Australia, with the exception of the more heavily wooded southern portions of the State (Johnstone and Storr 1998). This species prefers open or lightly wooded grassland and is highly nomadic and apparently moves in response to rainfall (Marchant and Higgins 1993). This species breeds from March to September and the eggs are laid on bare, preferably stony, ground (Johnstone and Storr 1998), which makes the eggs and young vulnerable to predation by foxes and cats.

Likelihood of Occurrence: The Australian Bustard is considered likely to periodically occur in the study area.

Calamanthus campestris subsp. *montanellus* (Rufous Fieldwren)

Priority 4

Distribution and Ecology: Rufous Fieldwren is endemic to the southwest WA wheatbelt region and in some coastal heathlands to the southwest, in lower densities (Blakers et al. 1984). It typically inhabits saltmarsh, samphire and low, sparse heaths (Higgins and Peter 2002) and forages in low vegetation.

Likelihood of Occurrence: This species may occur occasionally in the study area.

Oreoica gutturalis subsp. *gutturalis* (Crested Bellbird)

Priority 4

Distribution and Ecology: The present range of the Crested Bellbird has contracted towards inland regions in southwestern Australia (Saunders and Ingram 1995). This bird lives in the shrub-layer of eucalypt woodland, mallee, Acacia shrubland and heath (Blakers et al. 1984). The species has been eliminated from much of its former range by clearing and is particularly sensitive to fragmentation (Traill and Duncan 2000).

Likelihood of Occurrence: This species was last recorded close to the locality in Moora in 1982 and 1989. It is considered unlikely to occur in the study area.

7.3.2.3 Migratory Avifauna

Species listed as Migratory that potentially occur within the study area include *Apus pacificus* (Fork-tailed Swift), *Ardea alba* (Great Egret), *Ardea ibis* (Cattle Egret), *Haliaeetus leucogaster* (White-bellied Sea-Eagle), and *Merops ornatus* (Rainbow Bee-Eater). Of these five migratory avifauna, all except *Ardea alba* would be expected to occur within the study area. They are

expected to be transitory visitors only, and it is considered unlikely that the area would comprise important habitat for these species.

7.3.2.4 Summary

Of the 12 conservation significant species listed on database searches, only four are considered likely to occur in the current study area. This is based on preferred habitat and ecology:

- *Calyptorhynchus latirostris* (Carnaby's Cockatoo) – Schedule 1, Vulnerable
- *Ardea ibis* (Cattle Egret) - Migratory
- *Merops ornatus* (Rainbow Bee-eater) - Migratory
- *Ardeotis australis* (Australian Bustard) – Priority 4

As discussed above, all of these species are likely to only be transitory visitors to the habitats of the study area and none would be reliant on the area for any significant breeding purposes.

7.4 Potential Impacts to Fauna

Potential impacts to fauna include:

- loss of habitat through clearing of vegetation for turbines, tracks and associated infrastructure;
- direct mortality during clearing and construction activities; and
- mortality (birds and bats) arising from collisions with wind turbine blades.

While direct mortalities from wind turbine blades and infrastructure do pose a potential threat to volant (flying) fauna (birds and bats) the most relevant factor for the current proposal is the removal of habitat by clearing remnant native vegetation, in particular the Federally listed *Calyptorhynchus latirostris*. Potential impacts to fauna are discussed by group below.

7.4.1 Avifauna

The most relevant factor for avifauna is the removal of habitat by clearing vegetation. In particular, the potential loss of significant stands of foraging and feeding habitat for Carnaby's Cockatoo, which includes vegetation dominated by *Eucalyptus mallee* over a species-rich proteaceous heath. The study area contains a total of 317.8 ha of this foraging habitat, within small and large pockets of remnant vegetation (see Section 7.2.2). Verve Energy is adopting a design approach of maximising the use of existing cleared areas and minimising further clearing of vegetation. Implementation of this in the final design will mean the impact of habitat removal should not be significant.

Previous studies into fauna impacts associated with wind farms in Australia have indicated that the construction of wind turbines could result in bird and bat mortalities. While these studies indicate that the rate of strike fatalities in birds is small, it can be up to seven birds per turbine each year if located on a major migratory path (Biota 2008). Other studies describe significant numbers of bird deaths including resident, migratory and often endangered species, although most of the mortalities have been due to stationary structures such as buildings, towers and powerlines (Biota 2002a). In fine weather conditions, birds tend to fly into objects that they cannot see clearly or cannot discriminate from the background, for example transmission wires cause the greatest mortality of birds and guy ropes around turbines cause greater mortality than the actual towers themselves (Dillon Consulting Ltd 2000). The Warradarge study area is not sited in proximity to any wetlands or known major roosts or breeding locations for migratory species and it is unlikely to be on a major migratory path. The wind farm is unlikely to present a high risk to migratory birds.

Resident birds most at risk of turbine strikes would be species using the updrafts and thermals to gain height (such as raptors and other birds of prey) along with those that might fly at turbine height, such as migrant species flying amongst eucalypt woodland and those visiting the low heaths to feed (e.g. Carnaby's Cockatoo; Johnstone 2002).

Direct bird strikes with turbines and individuals that are caught in wind currents represents another possible risk to the Threatened species *Calyptorhynchus latirostris*. However, R.E. Johnstone (pers. comm. 2012) advises that the probability of this species encountering the proposed turbines and related infrastructure is very low for the following reasons:

- There is a low rate at which *Calyptorhynchus latirostris* appears to visit open farmland in the Warradarge area. In general, small flocks of less than 50 individuals are recorded as irregular visitors flying over farmland, compared to very large aggregations reported from intact bushland in the Eneabba and Badgingarra areas;
- Actual site utilisation would be very low at the Warradarge study area as it is mostly cleared and has relatively limited feeding, roosting and breeding habitat in close proximity;
- Although the species generally flies at turbine height (30-100 m above ground), they are very competent flyers in all conditions and would be capable of avoiding wind turbines. Individuals have been observed navigating around turbines and similar structures, even under low light conditions (R.E. Johnstone, pers. com. 2009); and
- The Storr-Johnstone Bird Data Bank contains no records of *C. latirostris* hitting powerlines.

Studies also indicate that raptors are especially susceptible to negative impacts by wind farms (Stewart et al. 2007, Smallwood et al. 2009) and are more likely to collide with turbine blades than many other avian species due to their morphology, foraging behaviour (Janss 2000), and tendency to fly at turbine blade heights. Compounding the problem, raptors are long-lived, have a low reproductive output (six years old; Marchant and Higgins 1993), and breed in solitary and monogamous pairs, making them particularly susceptible to mortality events. However, a number of studies have found that the risk of collision is very low, with individuals avoiding the swept area of the turbine blades in most cases [over 99%; (Smales 2006)].

In additionally, the low heath communities of the area mainly support species belonging to the Acanthizidae (Scrubwrens, Thornbills) and Maluridae (Wrens and Emu-wrens) families. These are low fliers and likely to spend most of their time within the denser heath habitat, and are therefore not considered to be at risk from the wind turbines.

7.4.2 Bats

While the majority of literature on the impacts of wind farms tends to focus on bird species, most of the findings are similarly applicable to bat species. The main risk to bats is blade strikes as echolocation calls attenuate quickly in air, and it has been suggested that bats may not have enough warning to avoid a collision (Horn et al. 2008).

Two bat species may occur in the vicinity of the study area, *Vespadelus regulus* (Southern Forest Bat) and *Nyctophilus geoffroyi* (Lesser Long-eared Bat; Appendix 10). The presence of these species is dictated by the availability of preferred roost sites (typically tree hollows) and foraging habitats (forest, woodland and scrub)(Hosken 1996). The likelihood of these species coming into contact with wind turbines while foraging or commuting (Horn et al. 2008), is dependent to some degree on their foraging range and height. *Vespadelus regulus* generally forages along the edges of vegetation, in closed zones and it occasionally ventures into the open. *Nyctophilus geoffroyi* is very agile and forages mainly in closed areas, gleaning insects from surfaces (Fullard et al. 1991, Bullen and McKenzie 2001).

The movement of local resident species between pockets of remnant vegetation might also bring them into contact with turbines. Since the placement of turbines in the study area will mean they are in close proximity to native vegetation, it is possible that the risk of collision will be greater for species that forage away from native vegetation, or change roost sites on a regular basis (such as *N. geoffroyi*; Hosken 1996). While no detailed studies have been conducted on south-western bats, it is likely that species that forage in closed habitats or follow the contours of the vegetation (*V. regulus* and *N. geoffroyi*) would be less likely to cross open areas and therefore encounter turbines.

The Warradarge region is not identified as having a particularly rich bat fauna. This is because large areas of the region have been cleared for agriculture, vegetation is generally low heathland and roosting habitat (rocky areas and caves) are absent. Based on the available data, the risk to bats from the proposed wind farm is considered to be very low. None of the bats previously recorded or predicted to occur in the locality are species that are specially protected under State or Federal legislation.

7.4.3 Ground-dwelling Fauna

The main impacts to ground-dwelling fauna from the proposed project is the localised loss of individuals and local scale habitat removal. Direct mortalities are likely to arise from the clearing of habitat associated with the construction of wind farm infrastructure and turbine access roads. In order to minimise impacts, existing tracks should be used wherever possible and unused cleared areas should be rehabilitated as soon as practicable to re-establish fauna habitat.

A number of indirect modifications may also occur to fauna habitats as a result of construction, ongoing operations and maintenance. These include the spread of weeds and soil borne pathogens, and the spread of feral or introduced animals. As the majority of the land within the study area has been extensively cleared for agricultural use, it is considered unlikely that any additional disturbances within the immediate vicinity will have lasting detrimental impacts on local fauna populations.

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8.0 Summary of Findings

8.1.1 Vegetation

A large proportion of the study area (76%) comprised cleared land (predominantly for pasture), which has no conservation value as vegetation.

The unit M2 (*Eucalyptus tottiana* low open woodland) was scattered throughout the study area and occupied a small proportion (8.4%). Its condition was rated as Completely Degraded, containing an understorey of predominantly pasture grasses. There was a very small proportion (0.4%) of the unit M3, which contained mostly non-native trees and shrubs. These two units were considered to be of low conservation value.

Twenty-five intact vegetation units were identified within the study area and most were in Very Good to Excellent condition. The main signs of anthropogenic disturbance were minor clearing for access tracks, weed invasion and grazing by sheep. There was no evidence of Dieback or other plant pathogens, however susceptible species did occur in the area. In particular, vegetation units PB1 and PE3 should be considered risk zones for the management of Dieback.

None of the vegetation types represent PECs. Two of the vegetation types (HB5 and HX1) appear similar to the description that is available for the Lesueur-Coomallo Floristic Community (D1), which is listed as a TEC. These units are considered to be of Very High conservation significance. Clearing of these units should be avoided, where possible.

The remainder of the vegetation was of High conservation significance. The Warradarge study area is situated in a locality that has been subject to extensive historical land clearing. Consequently, the conservation of native vegetation is of particular significance due to this high level of fragmentation and very low protection of vegetation in conservation reserves (EPA 2010).

8.1.2 Flora

A total of 406 native vascular plant species from 167 genera belonging to 55 families were recorded from the study area. This number would appear to be within the expected range for a study area of this size, taking into consideration that the region is characterised by high species richness and endemism. For comparison, a spring survey of the Mumbida property, approximately 100 km north-northwest of the Warradarge study area, recorded a total of 197 native flora species from 107 genera and 47 families (Biota 2001). While the Mumbida survey area was considerably smaller in size than the area under review (356 ha compared to 3650.9 ha), it contained a comparable area of intact vegetation (542.3 ha). In addition, the Mount Lesueur National Park (some 27,000 ha) is believed to contain approximately 900 flora species (DEC n.d.)

The suite of species recorded in the Warradarge study area, and the dominant genera and plant families, were largely typical of the Geraldton Sandplains bioregion.

Four species listed as Threatened under the WA Wildlife Conservation Act 1950-1979 were recorded from the study area (*Acacia wilsonii*, *Banksia cataglypta*, *Eucalyptus pruiniramis*, and *Thelymitra stellata*). Two of these (*T. stellata* and *E. pruiniramis*) are also listed as Endangered under the Commonwealth EPBC Act 1999.

In addition, 22 species listed as Priority flora under the WA Wildlife Conservation Act 1950-1979 were recorded from the study area. These comprised one Priority 1 (*Grevillea stenogyne*), four Priority 2 (*Arnocrinum gracillimum*, *Baeckea* sp. Bunney Road (S. Patrick 4059), *Comesperma griffinii* and *Synaphea endothrix*), nine Priority 3 (*Allocasuarina grevilleoides*, *A. ramosissima*, *Austrostipa* sp. Cairn Hill (M.E. Trudgen 21176), *Banksia cypholoba*, *B. nobilis* subsp. *fragrans*, *B. splendida* subsp. *macrocarpa*, *Grevillea erinacea*, *Lepidobolus quadratus*, *Petrophile chrysantha* subsp. *Watheroo* (K.M. Allan 57)) and eight Priority 4 species (*Astroloma* sp. Cataby (E.A. Griffin

1022), *Banksia platycarpa*, *B. sclerophylla*, *Calytrix chrysantha*, *Conostephium magnum*, *Desmocladius elongatus*, *Hemiandra* sp. Watheroo (S. Hancock 4) and *Hypolaena robusta*).

One new species was identified (*Ptilotus* sp. nov.) and seven species were range extensions for the locality (*Cassytha glabella* forma *casuarinae*, *Comesperma virgatum*, *Gonocarpus cordiger*, *Grevillea obliquistigma* subsp. *obliquistigma*, *Melaleuca nesophila*, *Schoenus breviculmis* and *Synaphea interioris*).

Twenty-one (21) species of introduced flora (weeds) were recorded from the study area. Of these, grasses (family Poaceae) and daisies (family Asteraceae) comprised 52%. The majority were non-invasive species, however *Echium plantagineum* is a Declared Plant under the Agriculture and Related Resources Protection Act 1976. Only one individual of this species was recorded in the study area.

8.1.3 Fauna

A total of five broad fauna habitats have been identified for the study area (modified vegetation, drainage areas, loam/clay plains, stony hills and slopes and sandy plains and low hills). These are considered to be common and widespread within the Lesueur Sandplains subregion.

Database searches indicated that up 187 native vertebrate fauna species may occur in the study area. This total comprises 133 bird species, 10 native mammals (seven non-volant, three volant), and 44 herpetofauna species (eight amphibians and 36 reptiles). Considering that only 15% of the study area contains intact remnant vegetation, the actual number occurring in the study area is likely to be a considerably lower subset of this total.

Twelve fauna species of conservation significance were identified for the locality comprising three Schedule 1 species, five Schedule 3, one Priority 3, and three Priority 4 species. Of these, seven are considered likely to occur as transitory visitors: *Calyptorhynchus latirostris* (Carnaby's Black-Cockatoo), *Apus pacificus* (Fork-tailed Swift), *Ardea ibis* (Cattle Egret), *Haliaeetus leucogaster* (White-bellied Sea-Eagle), *Merops ornatus* (Rainbow Bee-eater), *Ardeotis australis* (Australian Bustard), and *Calamanthus campestris* subsp. *montanellus* (Rufous Fieldwren). Of these, five are federally listed under the EPBC Act 1999 (Carnaby's Cockatoo, Fork-tailed Swift, Cattle Egret, White-bellied Sea-eagle and Rainbow Bee-eater). Only four species, *C. latirostris*, *A. ibis*, *M. ornatus* and *A. australis*, are considered likely to be periodic visitors to the study area.

Of these, Carnaby's Cockatoo is believed to be of most relevance to the proposed wind farm, as preferred foraging habitat (vegetation dominated by a species-rich proteaceous heath) is present in the study area. This species has been recorded historically, and more recently, in close proximity to the study area. The majority of these observations are autumn-winter visitors from breeding sites to the northeast and east as they migrate south to the Swan Coastal Plain. No roost sites, or potential roost sites, were observed in the study area. If clearing of foraging habitat for this species is kept to a minimum, the local and regional conservation status of this species is unlikely to be affected.

There is also a very low risk that individual avifauna mortalities may occur as a result of bird strikes with wind turbine blades. The low heath communities of the area typically support low flying species from the Acanthizidae and Maluridae families, and as such are not at risk. Carnaby's Cockatoos would appear to be the only species at any risk from bird strikes, although it is still considered to be a very low risk. Given the widespread distribution of these species and their ability to fly competently in all conditions, it is unlikely that the proposed project will have a detrimental effect on population numbers at a local or regional scale.

Based on the available data, it appears that the risk to bats from the proposed wind farm would not be significant. The vegetation of the study area is generally low heathland, and significant roost sites (e.g. tree hollows) are absent.

9.0 Glossary and Acronyms

Annual (plant)	A plant that lives for only one year or season.
Anthropogenic	Caused by humans
CAMBA	China and Australia Migratory Bird Agreement.
Conservation significant	A plant or animal that is recognised to be rare, unusual, new or poorly sampled and has an assigned conservation ranking (see Appendix 1 for more on the conservation framework).
DEC	Department of Environment and Conservation.
Dominant species	The species that occurred most abundantly in a stratum.
DRF	Declared Rare Flora.
Endemic	Being unique to a defined geographic location.
EPBC Act 1999	The Federal Environment Protection and Biodiversity Conservation Act 1999.
EPA	Environmental Protection Authority.
Herpetofauna	Amphibians and Reptiles, collectively.
IBRA	Interim Biogeographic Regionalisation for Australia
Isohyet	A line drawn through geographical points recording equal amounts of precipitation during a specific period.
JAMBA	Japan and Australia Migratory Bird Agreement.
Kwongan	A type of heath vegetation found on the coastal plains of Western Australia.
Lignotuber	A woody swelling of the stem below or just above the ground. Assists in regeneration after fire.
Mapping note	An unbounded flora survey site that it recorded for the purposes of vegetation mapping. These sites record a more brief set of data than a quadrat site.
Myrtaceous	Relating to, or denoting plants of the Myrtaceae family.
NatureMap	An online database of Western Australian flora and fauna used to produce maps and lists of species of a given area; http://naturemap.dec.wa.gov.au
Opportunistic	A plant species collected from outside the formal quadrat sites.
PEC	Priority Ecological Community
Perennial	A plant that lives for more than two growing seasons.
Phyllode	Leaf like structure
Proteaceous	Relating to, or denoting plants of the Proteaceae family.
Quadrat	A 100 m ² bounded sample area of uniform vegetation (usually 10 m by 10 m) in which all species present are recorded.
Raptor	Bird of prey, such as eagles and hawks.
Relevé	An unbounded flora quadrat site
ROKAMBA	Republic of Korea-Australia Migratory Bird Agreement.
Stratum	A horizontal level of vegetation defined by growth habit and/or height.
Taxon (pl. taxa)	A taxonomic distinction at a species level or below.
Taxonomist	Scientist who identifies and names species (taxonomy)
TEC	Threatened Ecological Community

Vertebrate	Having a backbone or spinal column.
Volant	The ability to fly and/or glide.
WA	Western Australia

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6.4 Introduced Flora (Weeds)

A total of 21 introduced species were recorded from the study area (see Table 6.3). As most weeds were relatively widespread within the study area, individual locations were not recorded consistently. Many of the annual species that were recorded from only single specimens or a small number of locations may be more widespread.

Most weed species recorded were non-invasive. However, Paterson's Curse (**Echium plantagineum*) is listed as a Declared Plant for WA (category P1 and P4³) under the Agriculture and Related Resources Protection Act 1976.

The majority of weed species recorded (seven) were grasses or daisies (families Poaceae and Asteraceae). Given that the study area has been extensively cleared and is currently used for agricultural purposes, the presence of introduced species was expected and not considered unusual for the region. Higher densities of weeds occurred in unfenced areas of remnant vegetation, and where remnant vegetation pockets were small in area. Weed densities also tended to be higher on the perimeter of the remnants.

Table 6.3: Introduced flora species (weeds) recorded from the study area (the prefix * denotes an introduced species).

Family	Species	Number of Records from Study Area
Poaceae	* <i>Bromus diandrus</i>	2
	* <i>Bromus rubens</i>	1
	* <i>Ehrharta longiflora</i>	3
	* <i>Pentameris airoides</i>	8
	* <i>Vulpia fasciculata</i>	1
	* <i>Vulpia muralis</i>	4
	* <i>Vulpia myuros</i> forma <i>megalura</i>	3
Asteraceae	* <i>Arctotheca calendula</i>	2
	* <i>Hypochaeris glabra</i>	13
	* <i>Hypochaeris radicata</i>	1
	* <i>Ursinia anthemoides</i>	10
Brassicaceae	* <i>Brassica barrelieri</i> subsp. <i>oxyrrhina</i>	1
	* <i>Diplotaxis muralis</i>	1
	* <i>Raphanus raphanistrum</i>	1
Boraginaceae	* <i>Echium plantagineum</i>	1
Campanulaceae	* <i>Wahlenbergia capensis</i>	6
Cyperaceae	* <i>Isolepis marginata</i>	1
Fabaceae	* <i>Acacia iteaphylla</i>	1
	* <i>Trifolium arvense</i> var. <i>arvense</i>	2
Geraniaceae	* <i>Erodium botrys</i>	1
Scrophulariaceae	* <i>Zaluzianskya divaricata</i>	1

Weed species recorded from the study area are described below.

**Acacia iteaphylla* (Flinders Range Wattle)

This wattle is a large, weeping shrub to 5 m with narrow grey-green phyllodes to 10 cm and yellow flowers. **Acacia iteaphylla* grows mainly in *Eucalyptus marginata* woodlands on sandy soils and is currently distributed in the coastal and sub-coastal districts of WA.

³ P1: prohibits movement of plants and their seeds within the State. This prohibits the movement of contaminated machinery and produce including livestock and fodder; P4: prevent the spread of infestation from the property on or in livestock, fodder, grain, vehicles and/or machinery. Treat to destroy and prevent seed set on all plants.

****Arctotheca calendula* (Cape Weed)**

**Arctotheca calendula* is a rosette-forming annual that is native to South Africa. This daisy occurs in all habitats in the southwest of WA, often dominating cropland and pastures.

****Brassica barrelieri* subsp. *oxyrrhina* (Smooth-stem Turnip)**

This species is a rosetted annual growing to 0.5 m high, generally in disturbed areas. It produces white, cream or yellow flowers in early spring and is recorded mainly in the Swan Coastal Plain bioregion, with scattered occurrences throughout the South-west Botanical Province.

****Bromus diandrus* (Great Brome)**

This annual species is a common weed of pastures, crops and disturbed sites, but also occurs in native grasslands, woodlands and in coastal habitats. This highly competitive grass species is widely distributed throughout southwest WA from Denham to Esperance and inland to Kalgoorlie.

****Bromus rubens* (Red Brome)**

**Bromus rubens* is a slender annual deciduous grass with red-purple flowers produced in early spring. It commonly occurs in shallow, dry or poorly textured clay soils and is capable of displacing native flora species. It is widely distributed throughout the entire South-west Botanical Province with scattered occurrences inland to Kalgoorlie and along the coast from Esperance to Eucla.

****Diplotaxis muralis* (Wall Rocket)**

This erect to ascending annual species grows to 0.5 m high and mainly occurs on sandy soils and in association with limestone. Its current distribution is predominantly coastal from Denham to Esperance with occasional records inland between Geraldton and Albany.

****Echium plantagineum* (Paterson's Curse)**

This large, bristly annual produces numerous purple flowers during late winter and spring. **Echium plantagineum* occurs in disturbed areas, including agricultural land and roadsides, throughout the southwest of WA. This species is a Declared Plant (P1 and P4) under the Agriculture and Related Resources Protection Act 1976.

****Ehrharta longiflora* (Annual Veldt Grass)**

**Ehrharta longiflora* is a tufted annual to 30 cm with a greenish-purple inflorescence. It occurs on offshore islands, coastal dunes and sandy soils from Shark Bay to Eucla and inland along disturbed creeklines and grazed woodlands in the western wheatbelt.

****Erodium botrys* (Long Storksbill)**

An ascending or decumbent annual growing to 20 cm, this species flowers from August to November and is distributed throughout the South-west Botanical Province.

****Hypochaeris glabra* (Smooth Catsear)**

**Hypochaeris glabra* is a rosetted annual or short-lived perennial with yellow, dandelion-like flower heads and smooth leaves. This weed is widely distributed throughout the southwest of WA.

****Hypochaeris radicata* (Flat Weed)**

**Hypochaeris radicata* is a rosetted annual to 0.5 m high, flowering throughout the year. This species is common in disturbed areas and can also be found invading natural vegetation in riparian zones and along the coast. Its current distribution is from Perth to Ravensthorpe.

****Isolepis marginata* (Coarse Club-rush)**

This species is a small annual sedge occurring in winter-wet depressions, along watercourses, and on granite outcrops from Shark Bay to east of Esperance.

****Pentameris airoides* (False Hairgrass)**

**Pentameris airoides* is a delicate tufted annual grass. This is a common and widespread weed of granite rocks, woodlands, shrublands and disturbed sites from Carnarvon to Kalgoorlie.

**Raphanus raphanistrum* (Wild Radish)

**Raphanus raphanistrum* is an erect annual weed of highly disturbed edges, winter crops, degraded pastures and other disturbed habitats. It grows on a range of soil types and flowers from autumn to summer. It is currently recorded from major cities throughout the north of WA and across the southwest of WA.

**Trifolium arvense* var. *arvense* (Hare's Foot Clover)

This erect or spreading annual to 0.5 m high is found in low rainfall areas of southwest WA. It mainly occurs in association with sandy loam and granite, generally in agricultural areas. This species flowers year-round, apart from late winter.

**Ursinia anthemoides* (Ursinia)

**Ursinia anthemoides* is a slender, erect annual with divided leaves. It is a common and widespread weed in various habitats of southwest WA. Ursinia was the most common weed species in the study area.

**Vulpia fasciculata* (Dune Fescue)

**Vulpia fasciculata* is an annual grass to 0.5 m high with stiff, erect or ascending stems. It produces flowers between September and December. Most records of this weed are from coastal habitats, between Perth to Esperance.

**Vulpia muralis* (Wall Fescue)

Vulpia muralis is a slender annual grass growing to 0.6 m high and flowering from August to December. Current records of this weed species are scattered throughout the South-west Botanical Province and further inland into the Murchison, Yalgoo and Coolgardie Bioregions.

**Vulpia myuros* forma *megalura* (Foxtail Fescue)

This species is a small, tufted annual grass to 0.7 m high, flowering between late winter and early spring. It is a weed of agricultural land and disturbed areas, preferring sandy soils and gravels. It has the ability, however, to tolerate a wide range of substrates. Scattered records of this weed occur throughout the southwest of WA but are concentrated in the Swan Coastal Plain and Jarrah Forest bioregions.

**Wahlenbergia capensis* (Cape Bluebell)

This species is a slender, erect annual to 50 cm high with blue or greenish flowers. It occurs from Geraldton to Ravensthorpe, on sandy soils in woodlands or heaths and on roadsides.

**Zaluzianskya divaricata* (Spreading Night Phlox)

Zaluzianskya divaricata is an erect annual herb growing to 35 cm high. The leaves are opposite, ovate and toothed. Flowers are produced in spring in an open terminal cluster and petals are yellow with a central red line. This species prefers habitats of sandy soils and is often abundant in agricultural areas and disturbed woodlands.

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7.0 Fauna

7.1 Overview

When determining the significance of fauna species and fauna habitats, their distribution and abundance across the relevant bioregions is typically assessed. The following four elements are considered:

1. the broad fauna habitats available within the study area;
2. an inventory of the terrestrial fauna, including migratory birds, likely to occur in the study area;
3. possible species of conservation significance and their corresponding habitats; and
4. possible impacts to fauna likely to occur in the study area.

7.2 Fauna Habitats

7.2.1 Overview

A total of five broad fauna habitats were identified for the study area based on the vegetation mapping, field groundtruthing and an examination of aerial photography. These comprised:

1. Modified Vegetation
 - Consisting of cleared land, planted areas, or *Eucalyptus tottiana* low open woodland with a degraded understorey, on deep yellow to white sands.
2. Drainage Areas
 - *Eucalyptus* spp. woodland over *Kunzea* tall open shrubland.
3. Loam/Clay Plains
 - *Acacia* tall open shrubland over *Regelia ciliata* shrubland.
 - *Eucalyptus* low open woodland over a layered Proteaceous-Myrtaceous tall to low shrubland over an open sedgeland.
4. Stony Hills and Slopes
 - Low hill slopes and plains dominated by *Eucalyptus accedens* (Powderbark Wandoo).
 - Hills and slopes dominated by *Melaleuca*, *Baeckea* and species-rich *Banksia* heaths.
 - Rocky hillcrests and plains of *Xanthorrhoea drummondii* low shrublands.
5. Sandy Plains and Low Hills
 - *Eucalyptus tottiana* (Coastal Blackbutt) low woodlands on deep white sand.
 - Sandy plains dominated by either *Eucalyptus accedens* (Powderbark Wandoo) or *Banksia* low woodlands.

7.2.2 Fauna Habitat of Conservation Significance

The five broad fauna habitats described for the study area are considered to be common and widespread within the Lesueur Sandplains subregion. Vegetation dominated by a species-rich proteaceous heath (see Table 7.1, Appendix 1) is of particular conservation significance, as it is typical foraging habitat for Carnaby's Cockatoo (*Calyptorhynchus latirostris*), a conservation significant species (described in detail in Section 7.3.2.2). Those units likely to be foraging habitat for this species are listed in Table 7.1, and shown in Plate 7.1.

Table 7.1: Vegetation units representing typical *Calyptrorhynchus latirostris* foraging habitat and the extent and broad location within the study area.

Unit Code	Study area location	Area (ha)
Hills and Slopes dominated by <i>Banksia</i> heaths		
HB1	Majority of the northeast, including some large stands	133.2
HB2	Scattered small remnants in the center	69.8
HB3	Scattered small remnants in the north	31.6
HB4	Most southern section of the transmission line route	1.2
HB5	Western section on low mesa crest and adjacent areas; low broad ridges in the south-west corner	36.3
HB6	Four remnants scattered through study area	31.5
Sandy Hills and Plains with <i>Banksia</i> Low Woodlands		
PB1	Two remnants in the northeast (divided by minor track).	14.2
Total		317.8



Plate 7.1: Typical foraging habitat for Carnaby's Cockatoo (*Calyptrorhynchus latirostris*) in the study area (*Eucalyptus mallee* over *Banksia* spp. heath; HB1 (left) and HB2 (right)).

None of the vegetation of the study area included mature trees of sufficient diameter to provide nesting resources for *C. latirostris*. Typical eucalypt trunks within the study area are shown in Plate 7.1.

7.3 Database Search Results

7.3.1 Fauna Assemblage

Database searches indicated that a total of 187 native vertebrate fauna species potentially occur in the Warradarge locality (see Table 7.2, Appendix 10). This total comprises 133 bird species, 10 native mammals (seven non-volant, three volant), and 44 herpetofauna species (eight amphibians and 36 reptiles). Considering that only 15% of the study area contains intact remnant vegetation, the actual number occurring in the study area is likely to be a considerably lower subset of this total.

Table 7.2: Number of vertebrate fauna species potentially occurring in the study area.

Fauna Group	Number of Potentially Occurring Species
Avifauna	133
Native Non-volant Mammals	7
Native Volant Mammals	3
Amphibians	8
Reptiles	36
Total	187

7.3.2 Fauna of Conservation Significance

7.3.2.1 Statutory Framework

Native fauna species that are rare, threatened with extinction, or have high conservation value, are specially protected by law under the WA Wildlife Conservation Act 1950-1979.

In addition, many of these species are listed under the Federal EPBC Act 1999. Some avifauna species are also listed under the Japan and Australia Migratory Bird Agreement (JAMBA), Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA) and the China and Australia Migratory Bird Agreement (CAMBA). The framework for ranking communities of conservation significance is presented in Appendix 1.

7.3.2.2 Fauna of Conservation Significance known from the Locality

Relevant database searches (Appendix 3 and 4) identified 12 fauna species of conservation significance that may occur in the study area (see Table 7.3). Of these, three species are State listed as Schedule 1, as well as being Federally listed, under the EPBC Act 1999, as either Endangered or Vulnerable. Also listed were five migratory birds protected jointly under three bilateral Migratory Birds Agreements and the EPBC Act 1999.

Table 7.3: Fauna species of conservation significance that may occur within the study area.

Species	Status		International Agreements
	State	Federal	
<i>Calyptorhynchus latirostris</i> (Carnaby's Cockatoo)	Schedule 1	Endangered	-
<i>Calyptorhynchus baudinii</i> (Baudin's Cockatoo)	Schedule 1	Vulnerable	-
<i>Leipoa ocellata</i> (Malleefowl)	Schedule 1	Vulnerable/ Migratory	J
<i>Apus pacificus</i> (Fork-tailed Swift)	Schedule 3	Migratory	C, J, R
<i>Ardea alba</i> (Great Egret, White Egret)	Schedule 3	Migratory	C, J
<i>Ardea ibis</i> (Cattle Egret)	Schedule 3	Migratory	C, J
<i>Haliaeetus leucogaster</i> (White-bellied Sea-eagle)	Schedule 3	Migratory	C
<i>Merops ornatus</i> (Rainbow Bee-eater)	Schedule 3	Migratory	J
<i>Neelaps calonotos</i> (Black-striped Snake)	Priority 3		-
<i>Ardeotis australis</i> (Australian Bustard)	Priority 4		-
<i>Calamanthus campestris</i> subsp. <i>montanellus</i> (Rufous Fieldwren)	Priority 4		-
<i>Oreocica gutturalis</i> subsp. <i>gutturalis</i> (Crested Bellbird)	Priority 4		-

NB: CAMBA=China-Australia Migratory Bird Agreement ; JAMBA=Japan-Australia Migratory Bird Agreement; and ROKAMBA=Republic of Korea-Australia Migratory Bird Agreement.

The likelihood of occurrence within the study area is discussed for each species below, along with a brief description of their ecology and distribution.

Calyptorhynchus latirostris (Carnaby's Cockatoo)

Schedule 1, Endangered

Distribution and Ecology: *Calyptorhynchus latirostris* is endemic and confined to the south-west of Western Australia, ranging north to the lower Murchison River and east to Durokoppin and Cape Arid (Johnstone et al. 2006). Its range is believed to have contracted by more than 30% since the late 1940s (Mawson 1997).

Carnaby's Cockatoo generally favours proteaceous scrubs, kwongan heaths, and adjacent *Eucalyptus* woodlands and forests occurring on sandplains (R.E. Johnstone, pers. comm. 2012), especially those that contain *Eucalyptus salmonophloia* and *E. wandoo* (Saunders 1986). It also occurs in remnant patches of native vegetation on land otherwise cleared for agriculture (Saunders 1974).

It is attracted to seeding *Banksia*, *Hakea*, *Eucalyptus*, *Corymbia*, *Grevillea*, *Melaleuca*, *Callistemon* and *Allocasuarina* species (Storr 1991, Mawson 1995) and nests in large hollows in tall,

smooth-barked eucalypts, particularly *Eucalyptus wandoo* (Saunders 1979, Storr 1991, Cale 2003), *E. camaldulensis*, and *E. occidentalis* (R.E. Johnstone, pers. comm. 2012). This species is resident in high-rainfall areas, and is a breeding migrant to drier regions and at sites where most of the native vegetation has been cleared (Saunders 1980).

Significance of The Warradarge Region: According to R.E. Johnstone (pers. comm. 2012), breeding has been recorded in several localities (Dookanooka, Three Springs, Coorow, Coomallo, and Carnamah) and along numerous roads and tracks (Eneabba-Three Springs Road, Coorow-Green Head Road, and Marchagee Track) in close proximity to the study area. The majority of the individuals that have been recorded in the Warradarge area were non-breeding autumn-winter visitors, most likely from breeding sites to the northeast and east (e.g. the Three Springs, Carnamah and Coorow regions).

Extracts from the Storr-Johnstone Bird Data Bank indicate that birds in the central Wheatbelt (Three Springs, Coorow, Badgingarra and Moora regions) tend to move west after breeding in February into higher rainfall areas, especially towards coastal sandplains supporting *Banksia* scrubs (Higgins 1999), and then further south onto Kwongan heaths and pine plantations on the Swan Coastal Plain. The exceptions are some large flocks (300 or more individuals) that have remained throughout the entire autumn-winter period in the Eneabba area and Badgingarra National Park where suitable feeding and roosting habitat is available (R.E. Johnstone, pers. comm. 2012).

Likelihood of Occurrence: Based on available records (historical and recent), the greater Carnamah-Coorow region contains important breeding and roosting habitat for Carnaby's Cockatoos. Some areas within, and in close proximity to, the study area are likely to provide important feeding habitat for both local and migratory flocks. It is likely that this species will occur in the study area, feeding on typical proteaceous heath vegetation, or in passing during migration movements. No large trees were observed, and the study area does not therefore appear to offer any nesting opportunities for *Calyptorhynchus latirostris*.

Calyptorhynchus baudinii (Baudin's Cockatoo)

Schedule 1, Vulnerable

Distribution and Ecology: *Calyptorhynchus baudinii* is found only in the extreme south-west of Western Australia. The range of this species, which is generally bounded by the 750 mm isohyet, extends from Albany northward to Gidgegannup and Mundaring and inland to the Stirling Ranges and near Boyup Brook (Storr 1991).

Likelihood of Occurrence: Database searches indicate that Baudin's Cockatoo was historically recorded in the area. However, this is probably because it was formerly grouped with Carnaby's Cockatoo (*Calyptorhynchus latirostris*) and treated as a single species. Due to the current known range of *C. baudinii*, this species is highly unlikely to occur within the study area.

Leipoa ocellata (Malleefowl)

Schedule 1, Vulnerable

Distribution and Ecology: In Western Australia, Malleefowl are known from semi-arid rangelands and the central and eastern wheatbelt of Western Australia (Benshemesh 2010). The species is mostly located south and west of a line extending from Cape Farquhar, north of Carnarvon, through to Eucla in the south-east (Barrett et al. 2003), with the area of occupancy known to be decreasing (Garnett and Crowley 2000). *Leipoa ocellata* is at very low density in the northern sandplains, with few recent records.

The species occupies a variety of habitats including shrublands and low woodlands that are dominated by mallee vegetation. It also occurs in other habitat types including eucalypt or native pine (*Callitris*) woodlands, *Acacia* shrublands, *Melaleuca uncinata* vegetation or coastal heathlands, and they are also known to forage in croplands that lie adjacent to more typical habitat (Benshemesh 2010).

Likelihood of Occurrence: Based on its current known distribution, Malleefowl are considered unlikely to occur in the study area. No evidence of the species presence (its distinctive mounds) were recorded during the field survey.

Apus pacificus (Fork-tailed Swift)

Schedule 3, Migratory

Distribution and Ecology: The Fork-tailed Swift is a non-breeding visitor to all states and territories of Australia, usually between October and late April. This species mainly occurs over inland plains, above foothills and are widespread in coastal and subcoastal areas. Terrestrial habitats include dry or open areas, riparian woodland and tea-tree swamps, low scrub, and heathland. They are also found near open farmland and inland and coastal sand-dunes (Higgins 1999). The Fork-tailed Swift is an aerial eater, flying anywhere from 1 m to 300 m above the ground to forage.

Likelihood of Occurrence: The Fork-tailed Swift does not breed in Australia. It may be a transitory visitor to the area.

Ardea alba (Great Egret, White Egret)

Schedule 3, Migratory

Distribution and Ecology: *Ardea alba* is widespread in Australia and occurs in all states and territories. Minor breeding sites are scattered across its known distribution and include a wide range of wetland habitats in south-western WA (Phillimore and Recher 2004), particularly in Melaleuca swamps (Marchant and Higgins 1990). In south-western WA, multi-directional post-breeding movements of up to 280 km have been recorded (McKilligan 2005). Regular seasonal movements are mostly to and from breeding colonies, and towards the coast in the dry season (Marchant and Higgins 1990).

Likelihood of Occurrence: It is considered unlikely that *Ardea alba* occurs within the study area or its immediate surrounds as typical habitat is absent.

Ardea ibis (Cattle Egret)

Schedule 3, Migratory

Distribution and Ecology: In WA and the Northern Territory, *Ardea ibis* is generally located from Wyndham to Arnhem Land, although non-breeding populations have been recorded in the far southwest coastal areas of WA (Marchant and Higgins 1990). Typical habitat includes temperate grasslands, wooded lands and terrestrial wetlands. High numbers have also been observed in moist, low-lying poorly drained pastures with an abundance of high grass, and in farmland areas (Marchant and Higgins 1990).

Likelihood of Occurrence: This species may occur in the locality, based on its preferred habitat and known distribution.

Haliaeetus leucogaster (White-bellied Sea-Eagle)

Schedule 3, Migratory

Distribution and Ecology: *Haliaeetus leucogaster* is distributed along the coastline of mainland Australia. The inland limits of the species are restricted in southwest WA, where it is confined to a narrow band along the coast (Blakers et al. 1984). Home ranges occupied by the White-bellied Sea-Eagle can be up to 100 km² (Mooney and Brothers 1986). Within these ranges, breeding areas are typically located close to water (Emison and Bilney 1982).

The species' terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland, forest and even urban areas (Bell 1984). While the White-bellied Sea-Eagle generally forages over large expanses of open water, it will also forage over open terrestrial habitats such as grasslands (Sedgwick 1978). This species is sensitive to disturbance when nesting, especially during the early stages of the breeding season, and may desert nests and young if disturbed by humans or exposed to human activity (Stokes 1996).

Likelihood of Occurrence: Due to the inland location of the study area, it is unlikely that nesting sites will be present, and it would be at best an infrequent visitor to the area.

Merops ornatus (Rainbow Bee-eater)

Schedule 3, Migratory

Distribution and Ecology: The Rainbow Bee-eater is distributed across much of mainland Australia and is said to be seasonally common and locally abundant throughout much of its range (Birdlife International 2005). Records indicate that the distribution of the species has expanded in southwestern WA (Storr and Johnstone 1988). The southern populations of the Rainbow Bee-eater migrate northward from February to April, and return to their breeding grounds in September and October (Serventy and Whittell 1976). The species occurs mainly in open forests, woodlands, shrublands (Higgins 1999), and in various cleared or semi-cleared habitats (Morris 1977), including farmland (Leach 1988).

Likelihood of Occurrence: It is considered likely that the species will occur in the study area due to its high abundance, widespread distribution across mainland Australia, and known occurrence in cleared habitats including farmland.

Neelaps calonotus (Black-striped Snake)

Priority 3

Distribution and Ecology: This bright orange-red snake is restricted to the sandy coastal strip near Perth, between Mandurah and Lancelin. It occurs on dunes and sandplains vegetated with eucalypt/Banksia heaths and woodlands (Wilson and Swan 2010).

Likelihood of Occurrence: The study area is outside the known range for this species and it is considered highly unlikely to occur.

Ardeotis australis (Australian Bustard)

Priority 4

Distribution and Ecology: The Australian Bustard occurs over much of Western Australia, with the exception of the more heavily wooded southern portions of the State (Johnstone and Storr 1998). This species prefers open or lightly wooded grassland and is highly nomadic and apparently moves in response to rainfall (Marchant and Higgins 1993). This species breeds from March to September and the eggs are laid on bare, preferably stony, ground (Johnstone and Storr 1998), which makes the eggs and young vulnerable to predation by foxes and cats.

Likelihood of Occurrence: The Australian Bustard is considered likely to periodically occur in the study area.

Calamanthus campestris subsp. *montanellus* (Rufous Fieldwren)

Priority 4

Distribution and Ecology: Rufous Fieldwren is endemic to the southwest WA wheatbelt region and in some coastal heathlands to the southwest, in lower densities (Blakers et al. 1984). It typically inhabits saltmarsh, samphire and low, sparse heaths (Higgins and Peter 2002) and forages in low vegetation.

Likelihood of Occurrence: This species may occur occasionally in the study area.

Oreoica gutturalis subsp. *gutturalis* (Crested Bellbird)

Priority 4

Distribution and Ecology: The present range of the Crested Bellbird has contracted towards inland regions in southwestern Australia (Saunders and Ingram 1995). This bird lives in the shrub-layer of eucalypt woodland, mallee, Acacia shrubland and heath (Blakers et al. 1984). The species has been eliminated from much of its former range by clearing and is particularly sensitive to fragmentation (Traill and Duncan 2000).

Likelihood of Occurrence: This species was last recorded close to the locality in Moora in 1982 and 1989. It is considered unlikely to occur in the study area.

7.3.2.3 Migratory Avifauna

Species listed as Migratory that potentially occur within the study area include *Apus pacificus* (Fork-tailed Swift), *Ardea alba* (Great Egret), *Ardea ibis* (Cattle Egret), *Haliaeetus leucogaster* (White-bellied Sea-Eagle), and *Merops ornatus* (Rainbow Bee-Eater). Of these five migratory avifauna, all except *Ardea alba* would be expected to occur within the study area. They are

expected to be transitory visitors only, and it is considered unlikely that the area would comprise important habitat for these species.

7.3.2.4 Summary

Of the 12 conservation significant species listed on database searches, only four are considered likely to occur in the current study area. This is based on preferred habitat and ecology:

- *Calyptorhynchus latirostris* (Carnaby's Cockatoo) – Schedule 1, Vulnerable
- *Ardea ibis* (Cattle Egret) - Migratory
- *Merops ornatus* (Rainbow Bee-eater) - Migratory
- *Ardeotis australis* (Australian Bustard) – Priority 4

As discussed above, all of these species are likely to only be transitory visitors to the habitats of the study area and none would be reliant on the area for any significant breeding purposes.

7.4 Potential Impacts to Fauna

Potential impacts to fauna include:

- loss of habitat through clearing of vegetation for turbines, tracks and associated infrastructure;
- direct mortality during clearing and construction activities; and
- mortality (birds and bats) arising from collisions with wind turbine blades.

While direct mortalities from wind turbine blades and infrastructure do pose a potential threat to volant (flying) fauna (birds and bats) the most relevant factor for the current proposal is the removal of habitat by clearing remnant native vegetation, in particular the Federally listed *Calyptorhynchus latirostris*. Potential impacts to fauna are discussed by group below.

7.4.1 Avifauna

The most relevant factor for avifauna is the removal of habitat by clearing vegetation. In particular, the potential loss of significant stands of foraging and feeding habitat for Carnaby's Cockatoo, which includes vegetation dominated by *Eucalyptus mallee* over a species-rich proteaceous heath. The study area contains a total of 317.8 ha of this foraging habitat, within small and large pockets of remnant vegetation (see Section 7.2.2). Verve Energy is adopting a design approach of maximising the use of existing cleared areas and minimising further clearing of vegetation. Implementation of this in the final design will mean the impact of habitat removal should not be significant.

Previous studies into fauna impacts associated with wind farms in Australia have indicated that the construction of wind turbines could result in bird and bat mortalities. While these studies indicate that the rate of strike fatalities in birds is small, it can be up to seven birds per turbine each year if located on a major migratory path (Biota 2008). Other studies describe significant numbers of bird deaths including resident, migratory and often endangered species, although most of the mortalities have been due to stationary structures such as buildings, towers and powerlines (Biota 2002a). In fine weather conditions, birds tend to fly into objects that they cannot see clearly or cannot discriminate from the background, for example transmission wires cause the greatest mortality of birds and guy ropes around turbines cause greater mortality than the actual towers themselves (Dillon Consulting Ltd 2000). The Warradarge study area is not sited in proximity to any wetlands or known major roosts or breeding locations for migratory species and it is unlikely to be on a major migratory path. The wind farm is unlikely to present a high risk to migratory birds.

Resident birds most at risk of turbine strikes would be species using the updrafts and thermals to gain height (such as raptors and other birds of prey) along with those that might fly at turbine height, such as migrant species flying amongst eucalypt woodland and those visiting the low heaths to feed (e.g. Carnaby's Cockatoo; Johnstone 2002).

Direct bird strikes with turbines and individuals that are caught in wind currents represents another possible risk to the Threatened species *Calyptorhynchus latirostris*. However, R.E. Johnstone (pers. comm. 2012) advises that the probability of this species encountering the proposed turbines and related infrastructure is very low for the following reasons:

- There is a low rate at which *Calyptorhynchus latirostris* appears to visit open farmland in the Warradarge area. In general, small flocks of less than 50 individuals are recorded as irregular visitors flying over farmland, compared to very large aggregations reported from intact bushland in the Eneabba and Badgingarra areas;
- Actual site utilisation would be very low at the Warradarge study area as it is mostly cleared and has relatively limited feeding, roosting and breeding habitat in close proximity;
- Although the species generally flies at turbine height (30-100 m above ground), they are very competent flyers in all conditions and would be capable of avoiding wind turbines. Individuals have been observed navigating around turbines and similar structures, even under low light conditions (R.E. Johnstone, pers. com. 2009); and
- The Storr-Johnstone Bird Data Bank contains no records of *C. latirostris* hitting powerlines.

Studies also indicate that raptors are especially susceptible to negative impacts by wind farms (Stewart et al. 2007, Smallwood et al. 2009) and are more likely to collide with turbine blades than many other avian species due to their morphology, foraging behaviour (Janss 2000), and tendency to fly at turbine blade heights. Compounding the problem, raptors are long-lived, have a low reproductive output (six years old; Marchant and Higgins 1993), and breed in solitary and monogamous pairs, making them particularly susceptible to mortality events. However, a number of studies have found that the risk of collision is very low, with individuals avoiding the swept area of the turbine blades in most cases [over 99%; (Smales 2006)].

In additionally, the low heath communities of the area mainly support species belonging to the Acanthizidae (Scrubwrens, Thornbills) and Maluridae (Wrens and Emu-wrens) families. These are low fliers and likely to spend most of their time within the denser heath habitat, and are therefore not considered to be at risk from the wind turbines.

7.4.2 Bats

While the majority of literature on the impacts of wind farms tends to focus on bird species, most of the findings are similarly applicable to bat species. The main risk to bats is blade strikes as echolocation calls attenuate quickly in air, and it has been suggested that bats may not have enough warning to avoid a collision (Horn et al. 2008).

Two bat species may occur in the vicinity of the study area, *Vespadelus regulus* (Southern Forest Bat) and *Nyctophilus geoffroyi* (Lesser Long-eared Bat; Appendix 10). The presence of these species is dictated by the availability of preferred roost sites (typically tree hollows) and foraging habitats (forest, woodland and scrub) (Hosken 1996). The likelihood of these species coming into contact with wind turbines while foraging or commuting (Horn et al. 2008), is dependent to some degree on their foraging range and height. *Vespadelus regulus* generally forages along the edges of vegetation, in closed zones and it occasionally ventures into the open. *Nyctophilus geoffroyi* is very agile and forages mainly in closed areas, gleaning insects from surfaces (Fullard et al. 1991, Bullen and McKenzie 2001).

The movement of local resident species between pockets of remnant vegetation might also bring them into contact with turbines. Since the placement of turbines in the study area will mean they are in close proximity to native vegetation, it is possible that the risk of collision will be greater for species that forage away from native vegetation, or change roost sites on a regular basis (such as *N. geoffroyi*; Hosken 1996). While no detailed studies have been conducted on south-western bats, it is likely that species that forage in closed habitats or follow the contours of the vegetation (*V. regulus* and *N. geoffroyi*) would be less likely to cross open areas and therefore encounter turbines.

The Warradarge region is not identified as having a particularly rich bat fauna. This is because large areas of the region have been cleared for agriculture, vegetation is generally low heathland and roosting habitat (rocky areas and caves) are absent. Based on the available data, the risk to bats from the proposed wind farm is considered to be very low. None of the bats previously recorded or predicted to occur in the locality are species that are specially protected under State or Federal legislation.

7.4.3 Ground-dwelling Fauna

The main impacts to ground-dwelling fauna from the proposed project is the localised loss of individuals and local scale habitat removal. Direct mortalities are likely to arise from the clearing of habitat associated with the construction of wind farm infrastructure and turbine access roads. In order to minimise impacts, existing tracks should be used wherever possible and unused cleared areas should be rehabilitated as soon as practicable to re-establish fauna habitat.

A number of indirect modifications may also occur to fauna habitats as a result of construction, ongoing operations and maintenance. These include the spread of weeds and soil borne pathogens, and the spread of feral or introduced animals. As the majority of the land within the study area has been extensively cleared for agricultural use, it is considered unlikely that any additional disturbances within the immediate vicinity will have lasting detrimental impacts on local fauna populations.

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8.0 Summary of Findings

8.1.1 Vegetation

A large proportion of the study area (76%) comprised cleared land (predominantly for pasture), which has no conservation value as vegetation.

The unit M2 (*Eucalyptus tottiana* low open woodland) was scattered throughout the study area and occupied a small proportion (8.4%). Its condition was rated as Completely Degraded, containing an understorey of predominantly pasture grasses. There was a very small proportion (0.4%) of the unit M3, which contained mostly non-native trees and shrubs. These two units were considered to be of low conservation value.

Twenty-five intact vegetation units were identified within the study area and most were in Very Good to Excellent condition. The main signs of anthropogenic disturbance were minor clearing for access tracks, weed invasion and grazing by sheep. There was no evidence of Dieback or other plant pathogens, however susceptible species did occur in the area. In particular, vegetation units PB1 and PE3 should be considered risk zones for the management of Dieback.

None of the vegetation types represent PECs. Two of the vegetation types (HB5 and HX1) appear similar to the description that is available for the Lesueur-Coomallo Floristic Community (D1), which is listed as a TEC. These units are considered to be of Very High conservation significance. Clearing of these units should be avoided, where possible.

The remainder of the vegetation was of High conservation significance. The Warradarge study area is situated in a locality that has been subject to extensive historical land clearing. Consequently, the conservation of native vegetation is of particular significance due to this high level of fragmentation and very low protection of vegetation in conservation reserves (EPA 2010).

8.1.2 Flora

A total of 406 native vascular plant species from 167 genera belonging to 55 families were recorded from the study area. This number would appear to be within the expected range for a study area of this size, taking into consideration that the region is characterised by high species richness and endemism. For comparison, a spring survey of the Mumbida property, approximately 100 km north-northwest of the Warradarge study area, recorded a total of 197 native flora species from 107 genera and 47 families (Biota 2001). While the Mumbida survey area was considerably smaller in size than the area under review (356 ha compared to 3650.9 ha), it contained a comparable area of intact vegetation (542.3 ha). In addition, the Mount Lesueur National Park (some 27,000 ha) is believed to contain approximately 900 flora species (DEC n.d.)

The suite of species recorded in the Warradarge study area, and the dominant genera and plant families, were largely typical of the Geraldton Sandplains bioregion.

Four species listed as Threatened under the WA Wildlife Conservation Act 1950-1979 were recorded from the study area (*Acacia wilsonii*, *Banksia cataglypta*, *Eucalyptus pruiniramis*, and *Thelymitra stellata*). Two of these (*T. stellata* and *E. pruiniramis*) are also listed as Endangered under the Commonwealth EPBC Act 1999.

In addition, 22 species listed as Priority flora under the WA Wildlife Conservation Act 1950-1979 were recorded from the study area. These comprised one Priority 1 (*Grevillea stenogyne*), four Priority 2 (*Arnocrinum gracillimum*, *Baeckea* sp. Bunney Road (S. Patrick 4059), *Comesperma griffinii* and *Synaphea endothrix*), nine Priority 3 (*Allocasuarina grevilleoides*, *A. ramosissima*, *Austrostipa* sp. Cairn Hill (M.E. Trudgen 21176), *Banksia cypholoba*, *B. nobilis* subsp. *fragrans*, *B. splendida* subsp. *macrocarpa*, *Grevillea erinacea*, *Lepidobolus quadratus*, *Petrophile chrysantha* subsp. *Watheroo* (K.M. Allan 57)) and eight Priority 4 species (*Astroloma* sp. Cataby (E.A. Griffin

1022), *Banksia platycarpa*, *B. sclerophylla*, *Calytrix chrysantha*, *Conostephium magnum*, *Desmocladus elongatus*, *Hemiandra* sp. Watheroo (S. Hancocks 4) and *Hypolaena robusta*).

One new species was identified (*Ptilotus* sp. nov.) and seven species were range extensions for the locality (*Cassytha glabella* forma *casuarinae*, *Comesperma virgatum*, *Gonocarpus cordiger*, *Grevillea obliquistigma* subsp. *obliquistigma*, *Melaleuca nesophila*, *Schoenus breviculmis* and *Synaphea interioris*).

Twenty-one (21) species of introduced flora (weeds) were recorded from the study area. Of these, grasses (family Poaceae) and daisies (family Asteraceae) comprised 52%. The majority were non-invasive species, however *Echium plantagineum* is a Declared Plant under the Agriculture and Related Resources Protection Act 1976. Only one individual of this species was recorded in the study area.

8.1.3 Fauna

A total of five broad fauna habitats have been identified for the study area (modified vegetation, drainage areas, loam/clay plains, stony hills and slopes and sandy plains and low hills). These are considered to be common and widespread within the Lesueur Sandplains subregion.

Database searches indicated that up 187 native vertebrate fauna species may occur in the study area. This total comprises 133 bird species, 10 native mammals (seven non-volant, three volant), and 44 herpetofauna species (eight amphibians and 36 reptiles). Considering that only 15% of the study area contains intact remnant vegetation, the actual number occurring in the study area is likely to be a considerably lower subset of this total.

Twelve fauna species of conservation significance were identified for the locality comprising three Schedule 1 species, five Schedule 3, one Priority 3, and three Priority 4 species. Of these, seven are considered likely to occur as transitory visitors: *Calyptorhynchus latirostris* (Carnaby's Black-Cockatoo), *Apus pacificus* (Fork-tailed Swift), *Ardea ibis* (Cattle Egret), *Haliaeetus leucogaster* (White-bellied Sea-Eagle), *Merops ornatus* (Rainbow Bee-eater), *Ardeotis australis* (Australian Bustard), and *Calamanthus campestris* subsp. *montanellus* (Rufous Fieldwren). Of these, five are federally listed under the EPBC Act 1999 (Carnaby's Cockatoo, Fork-tailed Swift, Cattle Egret, White-bellied Sea-eagle and Rainbow Bee-eater). Only four species, *C. latirostris*, *A. ibis*, *M. ornatus* and *A. australis*, are considered likely to be periodic visitors to the study area.

Of these, Carnaby's Cockatoo is believed to be of most relevance to the proposed wind farm, as preferred foraging habitat (vegetation dominated by a species-rich proteaceous heath) is present in the study area. This species has been recorded historically, and more recently, in close proximity to the study area. The majority of these observations are autumn-winter visitors from breeding sites to the northeast and east as they migrate south to the Swan Coastal Plain. No roost sites, or potential roost sites, were observed in the study area. If clearing of foraging habitat for this species is kept to a minimum, the local and regional conservation status of this species is unlikely to be affected.

There is also a very low risk that individual avifauna mortalities may occur as a result of bird strikes with wind turbine blades. The low heath communities of the area typically support low flying species from the Acanthizidae and Maluridae families, and as such are not at risk. Carnaby's Cockatoos would appear to be the only species at any risk from bird strikes, although it is still considered to be a very low risk. Given the widespread distribution of these species and their ability to fly competently in all conditions, it is unlikely that the proposed project will have a detrimental effect on population numbers at a local or regional scale.

Based on the available data, it appears that the risk to bats from the proposed wind farm would not be significant. The vegetation of the study area is generally low heathland, and significant roost sites (e.g. tree hollows) are absent.

9.0 Glossary and Acronyms

Annual (plant)	A plant that lives for only one year or season.
Anthropogenic	Caused by humans
CAMBA	China and Australia Migratory Bird Agreement.
Conservation significant	A plant or animal that is recognised to be rare, unusual, new or poorly sampled and has an assigned conservation ranking (see Appendix 1 for more on the conservation framework).
DEC	Department of Environment and Conservation.
Dominant species	The species that occurred most abundantly in a stratum.
DRF	Declared Rare Flora.
Endemic	Being unique to a defined geographic location.
EPBC Act 1999	The Federal Environment Protection and Biodiversity Conservation Act 1999.
EPA	Environmental Protection Authority.
Herpetofauna	Amphibians and Reptiles, collectively.
IBRA	Interim Biogeographic Regionalisation for Australia
Isohyet	A line drawn through geographical points recording equal amounts of precipitation during a specific period.
JAMBA	Japan and Australia Migratory Bird Agreement.
Kwongan	A type of heath vegetation found on the coastal plains of Western Australia.
Lignotuber	A woody swelling of the stem below or just above the ground. Assists in regeneration after fire.
Mapping note	An unbounded flora survey site that it recorded for the purposes of vegetation mapping. These sites record a more brief set of data than a quadrat site.
Myrtaceous	Relating to, or denoting plants of the Myrtaceae family.
NatureMap	An online database of Western Australian flora and fauna used to produce maps and lists of species of a given area; http://naturemap.dec.wa.gov.au
Opportunistic	A plant species collected from outside the formal quadrat sites.
PEC	Priority Ecological Community
Perennial	A plant that lives for more than two growing seasons.
Phyllode	Leaf like structure
Proteaceous	Relating to, or denoting plants of the Proteaceae family.
Quadrat	A 100 m ² bounded sample area of uniform vegetation (usually 10 m by 10 m) in which all species present are recorded.
Raptor	Bird of prey, such as eagles and hawks.
Relevé	An unbounded flora quadrat site
ROKAMBA	Republic of Korea-Australia Migratory Bird Agreement.
Stratum	A horizontal level of vegetation defined by growth habit and/or height.
Taxon (pl. taxa)	A taxonomic distinction at a species level or below.
Taxonomist	Scientist who identifies and names species (taxonomy)
TEC	Threatened Ecological Community

Vertebrate	Having a backbone or spinal column.
Volant	The ability to fly and/or glide.
WA	Western Australia

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Appendix 1

Framework for Listing the Conservation Status of Species and Communities in Western Australia



A. Definitions, Categories and Criteria for Threatened and Priority Ecological Communities

1. General Definitions

Ecological Community

A naturally occurring biological assemblage that occurs in a particular type of habitat.

Note: The scale at which ecological communities are defined will often depend on the level of detail in the information source, therefore no particular scale is specified.

A threatened ecological community (TEC) is one which is found to fit into one of the following categories; "presumed totally destroyed", "critically endangered", "endangered" or "vulnerable".

Possible threatened ecological communities that do not meet survey criteria are added to DEC's Priority Ecological Community Lists under Priorities 1, 2 and 3. Ecological Communities that are adequately known, are rare but not threatened, or meet criteria for Near Threatened, or that have been recently removed from the threatened list, are placed in Priority 4. These ecological communities require regular monitoring. Conservation Dependent ecological communities are placed in Priority 5.

An assemblage is a defined group of biological entities.

Habitat is defined as the areas in which an organism and/or assemblage of organisms lives. It includes the abiotic factors (e.g. substrate and topography), and the biotic factors.

Occurrence: a discrete example of an ecological community, separated from other examples of the same community by more than 20 metres of a different ecological community, an artificial surface or a totally destroyed community.

By ensuring that every discrete occurrence is recognised and recorded future changes in status can be readily monitored.

Adequately Surveyed is defined as follows:

"An ecological community that has been searched for thoroughly in most likely habitats, by relevant experts."

Community structure is defined as follows:

"The spatial organisation, construction and arrangement of the biological elements comprising a biological assemblage" (e.g. *Eucalyptus salmonophloia* woodland over scattered small shrubs over dense herbs; structure in a faunal assemblage could refer to trophic structure, e.g. dominance by feeders on detritus as distinct from feeders on live plants).

Definitions of Modification and Destruction of an ecological community:

Modification: "changes to some or all of ecological processes (including abiotic processes such as hydrology), species composition and community structure as a direct or indirect result of human activities. The level of damage involved could be ameliorated naturally or by human intervention."

Destruction: "modification such that reestablishment of ecological processes, species composition and community structure within the range of variability exhibited by the original community is unlikely within the foreseeable future even with positive human intervention."

Note: Modification and destruction are difficult concepts to quantify, and their application will be determined by scientific judgement. Examples of modification and total destruction are cited below:

Modification of ecological processes: The hydrology of Toolibin Lake has been altered by clearing of the catchment such that death of some of the original flora has occurred due to dependence on fresh water. The system may be bought back to a semblance of the original state by redirecting saline runoff and pumping waters of the rising underground watertable away to restore the hydrological balance. Total destruction of downstream lakes has occurred due to hydrology being altered to the point that few of the original flora or fauna species are able to tolerate the level of salinity and/or water logging.

Modification of structure: The understorey of a plant community may be altered by weed invasion due to nutrient enrichment by addition of fertiliser. Should the additional nutrients be removed from the system the balance may be restored, and the original plant species better able to compete. Total destruction may occur if additional nutrients continue to be added to the system causing the understorey to be completely replaced by weed species, and death of overstorey species due to inability to tolerate high nutrient levels.

Modification of species composition: Pollution may cause alteration of the invertebrate species present in a freshwater lake. Removal of pollutants may allow the return of the original inhabitant species. Addition of residual highly toxic substances may cause permanent changes to water quality, and total destruction of the community.

Threatening processes are defined as follows:

“Any process or activity that threatens to destroy or significantly modify the ecological community and/or affect the continuing evolutionary processes within any ecological community.”

Examples of some of the continuing threatening processes in Western Australia include: general pollution; competition, predation and change induced in ecological communities as a result of introduced animals; competition and displacement of native plants by introduced species; hydrological changes; inappropriate fire regimes; diseases resulting from introduced micro-organisms; direct human exploitation and disturbance of ecological communities.

Restoration is defined as returning an ecological community to its pre-disturbance or natural state in terms of abiotic conditions, community structure and species composition.

Rehabilitation is defined as the re-establishment of ecological attributes in a damaged ecological community although the community will remain modified.

2. Definitions and Criteria for Presumed Totally Destroyed, Critically Endangered, Endangered and Vulnerable Ecological Communities

ECOLOGICAL COMMUNITIES

Presumed Totally Destroyed (PD)

An ecological community that has been adequately searched for but for which no representative occurrences have been located. The community has been found to be totally destroyed or so extensively modified throughout its range that no occurrence of it is likely to recover its species composition and/or structure in the foreseeable future.

An ecological community will be listed as presumed totally destroyed if there are no recent records of the community being extant and either of the following applies (A or B):

- A) Records within the last 50 years have not been confirmed despite thorough searches of known or likely habitats or
- B) All occurrences recorded within the last 50 years have since been destroyed

Critically Endangered (CR)

An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or that was originally of limited distribution and is facing severe modification or destruction throughout its range in the immediate future, or is already severely degraded throughout its range but capable of being substantially restored or rehabilitated.

An ecological community will be listed as Critically Endangered when it has been adequately surveyed and is found to be facing an extremely high risk of total destruction in the immediate future. This will be determined on the basis of the best available information, by it meeting any one or more of the following criteria (A, B or C):

- A) The estimated geographic range, and/or total area occupied, and/or number of discrete occurrences since European settlement have been reduced by at least 90% and either or both of the following apply (i or ii):
 - i) geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is imminent (within approximately 10 years);
 - ii) modification throughout its range is continuing such that in the immediate future (within approximately 10 years) the community is unlikely to be capable of being substantially rehabilitated.
- B) Current distribution is limited, and one or more of the following apply (i, ii or iii):
 - i) geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the immediate future (within approximately 10 years);
 - ii) there are very few occurrences, each of which is small and/or isolated and extremely vulnerable to known threatening processes;

- iii) there may be many occurrences but total area is very small and each occurrence is small and/or isolated and extremely vulnerable to known threatening processes.

C) The ecological community exists only as highly modified occurrences that may be capable of being rehabilitated if such work begins in the immediate future (within approximately 10 years).

Endangered (EN)

An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or was originally of limited distribution and is in danger of significant modification throughout its range or severe modification or destruction over most of its range in the near future.

An ecological community will be listed as Endangered when it has been adequately surveyed and is not Critically Endangered but is facing a very high risk of total destruction in the near future. This will be determined on the basis of the best available information by it meeting any one or more of the following criteria (A, B, or C):

- A) The geographic range, and/or total area occupied, and/or number of discrete occurrences have been reduced by at least 70% since European settlement and either or both of the following apply (i or ii):
 - i) the estimated geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is likely in the short term future (within approximately 20 years);
 - ii) modification throughout its range is continuing such that in the short term future (within approximately 20 years) the community is unlikely to be capable of being substantially restored or rehabilitated.
- B) Current distribution is limited, and one or more of the following apply (i, ii or iii):
 - i) geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the short term future (within approximately 20 years);
 - ii) there are few occurrences, each of which is small and/or isolated and all or most occurrences are very vulnerable to known threatening processes;
 - iii) there may be many occurrences but total area is small and all or most occurrences are small and/or isolated and very vulnerable to known threatening processes.
- C) The ecological community exists only as very modified occurrences that may be capable of being substantially restored or rehabilitated if such work begins in the short-term future (within approximately 20 years).

Vulnerable (VU)

An ecological community that has been adequately surveyed and is found to be declining and/or has declined in distribution and/or condition and whose ultimate security has not yet been assured and/or a community that is still widespread but is believed likely to move into a category of higher threat in the near future if threatening processes continue or begin operating throughout its range.

An ecological community will be listed as Vulnerable when it has been adequately surveyed and is not Critically Endangered or Endangered but is facing a high risk of total destruction or significant modification in the medium to long-term future. This will be determined on the basis of the best available information by it meeting any one or more of the following criteria (A, B or C):

- A) The ecological community exists largely as modified occurrences that are likely to be capable of being substantially restored or rehabilitated.
- B) The ecological community may already be modified and would be vulnerable to threatening processes, is restricted in area and/or range and/or is only found at a few locations.
- C) The ecological community may be still widespread but is believed likely to move into a category of higher threat in the medium to long term future because of existing or impending threatening processes.

3. Definitions and Criteria for Priority Ecological Communities

PRIORITY ECOLOGICAL COMMUNITY LIST

Possible threatened ecological communities that do not meet survey criteria or that are not adequately defined are added to the Priority Ecological Community Lists under Priorities 1, 2 and 3. These three categories are ranked in order of priority for survey and/or definition of the community, and evaluation of conservation status, so that consideration can be given to their declaration as threatened ecological communities. Ecological Communities that are adequately known, and are rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list, are placed in Priority 4. These ecological communities require regular monitoring. Conservation Dependent ecological communities are placed in Priority 5.

Priority One: Poorly-known ecological communities

Ecological communities with apparently few, small occurrences, all or most not actively managed for conservation (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) and for which current threats exist. Communities may be included if they are comparatively well-known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under immediate threat from known threatening processes across their range.

Priority Two: Poorly-known ecological communities

Communities that are known from few small occurrences, all or most of which are actively managed for conservation (e.g. within national parks, conservation parks, nature reserves, State forest, unallocated Crown land, water reserves, etc.) and not under imminent threat of destruction or degradation. Communities may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under threat from known threatening processes.

Priority Three: Poorly known ecological communities

- (i) Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation or:
- (ii) communities known from a few widespread occurrences, which are either large or within significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat, or;
- (iii) communities made up of large, and/or widespread occurrences, that may or not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stock, and inappropriate fire regimes.

Communities may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and/or are not well defined, and known threatening processes exist that could affect them.

Priority Four: Ecological communities that are adequately known, rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list. These communities require regular monitoring.

- (a) Rare. Ecological communities known from few occurrences that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These communities are usually represented on conservation lands.
- (b) Near Threatened. Ecological communities that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable.
- (c) Ecological communities that have been removed from the list of threatened communities during the past five years.

Priority Five: Conservation Dependent ecological communities

Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.

Reference:

DEC (2010): Definitions, Categories and Criteria for Threatened and Priority Ecological Communities: <http://www.dec.wa.gov.au/content/view/849/2017/>, accessed on 13th December 2011.

B. Threatened Flora Statutory Framework

In Western Australia, all native flora species are protected under the *Wildlife Conservation Act 1950-1979*, making it an offence to remove or harm native flora species without approval. In addition to this basic level of statutory protection, a number of plant species are assigned an additional level of conservation significance based on the fact that there are a limited number of known populations, some of which may be under threat.

Species of the highest conservation significance are designated Declared Rare Flora (DRF), either extant or presumed extinct:

- X: Threatened Flora - Presumed Extinct: taxa which have not been collected, or otherwise verified, over the past 50 years despite thorough searching, or of which all known wild populations have been destroyed more recently, and have been gazetted as such, following approval by the Minister for the Environment, after recommendation by the State's Endangered Flora Consultative Committee;
- T: Threatened Flora - Extant: taxa which have been adequately searched for, and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection, and have been gazetted as such, following approval by the Minister for the Environment, after recommendation by the State's Endangered Flora Consultative Committee. (= Threatened Flora = Endangered + Vulnerable)

Species that appear to be rare or threatened, but for which there is insufficient information to properly evaluate their conservation significance, are assigned to one of four Priority flora categories:

- P1: Priority One - Poorly Known: taxa which are known from one or a few (generally <5) populations which are under threat, either due to small population size, or being on lands under immediate threat, e.g. road verges, urban areas, farmland, active mineral leases, etc., or the plants are under threat, e.g. from disease, grazing by feral animals, etc. May include taxa with threatened populations on protected lands. Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.
- P2: Priority Two - Poorly Known: taxa which are known from one or a few (generally <5) populations, at least some of which are not believed to be under immediate threat (i.e. not currently endangered). Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.
- P3: Priority Three - Poorly Known: taxa which are known from several populations, at least some of which are not believed to be under immediate threat (i.e. not currently endangered). Such taxa are under consideration for declaration as 'rare flora', but are in need of further survey.
- P4: Priority Four - Rare: taxa which are considered to have been adequately surveyed and which, whilst being rare (in Australia), are not currently threatened by any identifiable factors. These taxa require monitoring every 5–10 years.
- P5: Priority Five – Conservation Dependent Taxa: Taxa that are not threatened but are subject to a specific conservation program, the cessation of which would result in the taxa becoming threatened within five years.

Note that of the above classifications, only 'Declared Rare Flora' has statutory standing. The Priority Flora classifications are employed by the Department of Environment and Conservation to manage and classify their database of species considered potentially rare or at risk, but these categories have no legislative status. Note also that proposals that appear likely to affect DRF require formal written approval from the Minister for the Environment under Section 23(f) of the *Wildlife Conservation Act 1950-1979* in addition to the requirements of the *Environmental Protection (Native Vegetation Clearing) Regulations 2004*.

Reference:

DEC (2011). Listing of Species and Ecological Communities:

<http://www.dec.wa.gov.au/content/view/852/2010/1/1/>, accessed on 13th December 2011.

C. Threatened Fauna Statutory Framework

Native fauna species that are rare, threatened with extinction, or have high conservation value are specially protected by law under the Western Australian *Wildlife Conservation Act 1950-1979*. In addition, many of these species are listed under the *Federal Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act 1999).

Classification of rare and endangered fauna under the *Wildlife Conservation (Specially Protected Fauna) Notice 2005* recognises four distinct schedules of taxa:

Schedule 1	Taxa that are rare or likely to become extinct and are declared to be fauna in need of special protection;
Schedule 2	Taxa that are presumed to be extinct and are declared to be fauna in need of special protection;
Schedule 3	Birds that are subject to an agreement between the governments of Australia and Japan relating to the protection of migratory birds and birds in danger of extinction, which are declared to be fauna in need of special protection; and
Schedule 4	Taxa that are in need of special protection, otherwise than for the reasons mentioned in paragraphs (1), (2) and (3).

In addition to the above classification, fauna are also classified under five different Priority codes:

Priority One	Taxa with few, poorly known populations on threatened lands. Taxa that are known from a few specimens or sight records from one or a few localities on lands not managed for conservation. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.
Priority Two	Taxa with few, poorly known populations on conservation lands, or taxa with several, poorly known populations not on conservation lands. Taxa that are known from few specimens or sight records from one or a few localities on lands not under immediate threat of habitat destruction or degradation. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.
Priority Three	Taxa with several, poorly known populations, some on conservation lands. Taxa that are known from few specimens or sight records from several localities, some of which are on lands not under immediate threat of habitat destruction or degradation. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.
Priority Four	Taxa in need of monitoring. Taxa which are considered to have been adequately surveyed or for which sufficient knowledge is available and which are considered not currently threatened or in need of special protection, but could be if present circumstances change. These taxa are usually represented on conservation lands. Taxa which are declining significantly but are not yet threatened.
Priority Five	Taxa in need of monitoring Taxa that are not considered threatened but are subject to a specific conservation program, the cessation of which would result in the species becoming threatened within five years.

Fauna species of national conservation significance are listed under the EPBC Act 1999, and may be classified as 'critically endangered', 'endangered', 'vulnerable' or 'conservation dependent' (consistent with IUCN categories; see http://www.redlist.org/info/categories_criteria2001.html).

Appendix 2

NatureMap Database Search Results- Flora



NatureMap Species Report

Created By Guest user on 21/09/2011

Kingdom Plantae

Method 'By Circle'

Centre 115°28' 27" E,29°57' 14" S

Buffer 15km

Group By Family

Family	Species	Records
Apiaceae	2	2
Asparagaceae	5	5
Asteraceae	2	2
Boraginaceae	1	3
Boryaceae	1	1
Byblidaceae	1	1
Campanulaceae	1	1
Casuarinaceae	3	10
Cyperaceae	17	36
Dilleniaceae	6	11
Droseraceae	5	10
Ecdeiocoleaceae	1	1
Elaeocarpaceae	1	2
Ericaceae	13	24
Euphorbiaceae	5	6
Fabaceae	42	76
Goodeniaceae	11	15
Gyrostemonaceae	1	1
Haemodoraceae	18	39
Hemerocallidaceae	2	2
Lamiaceae	7	12
Lauraceae	2	3
Loganiaceae	1	1
Malvaceae	3	6
Myrtaceae	69	158
Orchidaceae	5	8
Poaceae	2	3
Proteaceae	82	190
Restionaceae	12	31
Rhamnaceae	1	1
Rubiaceae	1	1
Rutaceae	5	8
Sapindaceae	1	2
Stylidiaceae	8	26
Thymelaeaceae	2	2
Violaceae	1	1
TOTAL	340	701

Name	ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
Apiaceae					
1.	-8357	<i>Platysace</i> sp.			
2.	14996	<i>Platysace</i> sp. <i>Eneabba</i> (R. Hnatiuk 770001)			
Asparagaceae					
3.	1228	<i>Lomandra hermaphrodita</i>			
4.	1243	<i>Lomandra sericea</i> (Silky Mat Rush)			
5.	1328	<i>Thysanotus dichotomus</i> (Branching Fringe Lily)			
6.	1339	<i>Thysanotus multiflorus</i> (Many-flowered Fringe Lily)			
7.	1343	<i>Thysanotus patersonii</i>			
Asteraceae					
8.	14377	<i>Erymophyllum ramosum</i> subsp. <i>ramosum</i>			
9.	8184	<i>Podotrochea gnaphalioides</i> (Golden Long-heads)			
Boraginaceae					
10.	29716	<i>Halgania</i> sp. <i>Wongan Hills</i> (K.F. Kenneally 2393)			
Boryaceae					
11.	1273	<i>Borya sphaerocephala</i> (Pincushions)			
Byblidaceae					
12.	20230	<i>Byblis lamellata</i>			
Campanulaceae					

	Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
13.	7396	<i>Isotoma hypocrateriformis</i> (Woodbridge Poison)			
Casuarinaceae					
14.	1732	<i>Allocasuarina humilis</i> (Dwarf Sheoak)			
15.	1734	<i>Allocasuarina microstachya</i>			
16.	1736	<i>Allocasuarina ramosissima</i>		P3	
Cyperaceae					
17.	760	<i>Caustis dioica</i>			
18.	13765	<i>Caustis gigas</i>		P2	
19.	768	<i>Cyathochaeta avenacea</i>			
20.	17618	<i>Cyathochaeta equitans</i>			
21.	936	<i>Lepidosperma leptostachyum</i>			
22.	955	<i>Mesomelaena pseudostygia</i>			
23.	11623	<i>Mesomelaena stygia</i> subsp. <i>defflexa</i>		P3	
24.	957	<i>Mesomelaena tetragona</i> (Semaphore Sedge)			
25.	978	<i>Schoenus brevisetis</i>			
26.	984	<i>Schoenus curvifolius</i>			
27.	17606	<i>Schoenus griffinianus</i>		P3	
28.	17617	<i>Schoenus insolitus</i>			
29.	1007	<i>Schoenus pedicellatus</i>			
30.	1009	<i>Schoenus pleiostemoneus</i>			
31.	18164	<i>Schoenus</i> sp. <i>smooth culms</i> (K.R. Newbey 7823)			
32.	1019	<i>Schoenus subflavus</i> (Yellow Bog-rush)			
33.	1036	<i>Tetraria octandra</i>			
Dilleniaceae					
34.	5108	<i>Hibbertia acerosa</i> (Needle Leaved Guinea Flower)			
35.	5116	<i>Hibbertia crassifolia</i>			
36.	35521	<i>Hibbertia fasciculiflora</i>			
37.	-7810	<i>Hibbertia helianthemoides</i> (Northern)			
38.	5135	<i>Hibbertia hypericoides</i> (Yellow Buttercups)			
39.	5173	<i>Hibbertia subvaginata</i>			
Droseraceae					
40.	3095	<i>Drosera erythrorhiza</i> (Red Ink Sundew)			
41.	13208	<i>Drosera marchantii</i> subsp. <i>prophylla</i>		P3	
42.	11196	<i>Drosera menziesii</i> subsp. <i>thysanosepala</i>			
43.	11246	<i>Drosera neesii</i> subsp. <i>borealis</i>			
44.	3131	<i>Drosera stolonifera</i> (Leafy Sundew)			
Ecdeiocoleaceae					
45.	18404	<i>Georgeantha hexandra</i>			
Elaeocarpaceae					
46.	23982	<i>Tetratheca angulata</i>		P3	
Ericaceae					
47.	11606	<i>Andersonia lehmanniana</i> subsp. <i>pubescens</i>			
48.	6328	<i>Astroloma glaucescens</i>			
49.	6337	<i>Astroloma stomarrhena</i> (Red Swamp Cranberry)			
50.	6339	<i>Astroloma xerophyllum</i>			
51.	6348	<i>Conostephium pendulum</i> (Pearl Flower)			
52.	6374	<i>Leucopogon conostephioides</i>			
53.	6418	<i>Leucopogon obtectus</i> (Hidden Beard-heath)		T	
54.	6420	<i>Leucopogon oldfieldii</i>			
55.	6421	<i>Leucopogon oliganthus</i>			
56.	19578	<i>Leucopogon</i> sp. <i>Bifid Eneabba</i> (M. Hislop 1927)			
57.	34157	<i>Leucopogon</i> sp. <i>Northern ciliate</i> (R. Davis 3393)			
58.	37040	<i>Leucopogon</i> sp. <i>Watheroo</i> (R.D. Royce 9616)			
59.	20648	<i>Lissanthe powelliae</i>			
Euphorbiaceae					
60.	4662	<i>Monotaxis grandiflora</i> (Diamond of the Desert)			
61.	4666	<i>Monotaxis occidentalis</i>			
62.	4698	<i>Ricinocarpos muricatus</i>			
63.	4713	<i>Stachystemon axillaris</i> (Leafy Stachystemon)			
64.	-4004	<i>Stachystemon</i> sp.			Y
Fabaceae					
65.	3231	<i>Acacia auronitens</i>			
66.	15470	<i>Acacia barbinervis</i> subsp. <i>borealis</i>			
67.	3319	<i>Acacia epacantha</i>		P3	
68.	3382	<i>Acacia incrassata</i>			
69.	11678	<i>Acacia moirii</i> subsp. <i>recurvistipula</i>			

	Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
70.	15481	<i>Acacia pulchella</i> var. <i>glaberrima</i>			
71.	15480	<i>Acacia pulchella</i> var. <i>reflexa</i>			
72.	16142	<i>Acacia puncticulata</i>			
73.	3541	<i>Acacia sessilis</i>			
74.	3602	<i>Acacia willdenowiana</i> (Grass Wattle)			
75.	-3825	<i>Acacia willdenowiana</i> (<i>Phyllodes glauca</i>)			Y
76.	3710	<i>Bossiaea eriocarpa</i> (Common Brown Pea)			
77.	13111	<i>Chorizema aciculare</i> subsp. <i>laxum</i>			
78.	14199	<i>Daviesia chapmanii</i>			
79.	3803	<i>Daviesia daphnoides</i>			
80.	12326	<i>Daviesia hakeoides</i> subsp. <i>subnuda</i>			
81.	3816	<i>Daviesia incrassata</i>			
82.	15506	<i>Daviesia incrassata</i> subsp. <i>teres</i>			
83.	3819	<i>Daviesia longifolia</i>			
84.	3824	<i>Daviesia nudiflora</i>			
85.	3831	<i>Daviesia pedunculata</i>			
86.	3833	<i>Daviesia podophylla</i>			
87.	14201	<i>Daviesia pteroclada</i>		P3	
88.	29078	<i>Dillwynia</i> sp. Northern Sandplains (M. Hislop 3278)			
89.	3894	<i>Gastrolobium callistachys</i> (Rock Poison)			
90.	3912	<i>Gastrolobium oxylobioides</i> (Champion Bay Poison)			
91.	3915	<i>Gastrolobium plicatum</i>			
92.	3945	<i>Gompholobium aristatum</i>			
93.	3957	<i>Gompholobium tomentosum</i> (Hairy Yellow Pea)			
94.	3967	<i>Hovea stricta</i>			
95.	19700	<i>Isotropis cuneifolia</i> subsp. <i>cuneifolia</i>			
96.	14747	<i>Jacksonia anthoclada</i>		P3	
97.	4003	<i>Jacksonia carduacea</i>		P3	
98.	4010	<i>Jacksonia floribunda</i> (Holly Pea)			
99.	4015	<i>Jacksonia hakeoides</i>			
100.	4018	<i>Jacksonia lehmannii</i>			
101.	14778	<i>Jacksonia nutans</i>			
102.	4025	<i>Jacksonia restioides</i>			
103.	4044	<i>Kennedia prostrata</i> (Scarlet Runner)			
104.	4091	<i>Mirbelia floribunda</i> (Purple Mirbelia)			
105.	17551	<i>Sphaerolobium drummondii</i>			
106.	10800	<i>Sphaerolobium pulchellum</i>			

Goodeniaceae

107.	7425	<i>Dampiera carinata</i> (Summer Dampiera)			
108.	7449	<i>Dampiera juncea</i> (Rush-like Dampiera)			
109.	7454	<i>Dampiera linearis</i> (Common Dampiera)			
110.	7475	<i>Dampiera spicigera</i> (Spiked Dampiera)			
111.	7495	<i>Goodenia berardiana</i>			
112.	12520	<i>Goodenia fasciculata</i>			
113.	12522	<i>Goodenia glareicola</i>			
114.	7513	<i>Goodenia hassallii</i>			
115.	7575	<i>Lechenaultia formosa</i> (Red Leschenaultia)			
116.	7577	<i>Lechenaultia hirsuta</i> (Hairy Leschenaultia)			
117.	7619	<i>Scaevola lanceolata</i>			

Gyrostemonaceae

118.	2791	<i>Tersonia cyathiflora</i> (Button Creeper)			
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Haemodoraceae

119.	11434	<i>Anigozanthos humilis</i> subsp. <i>humilis</i>			
120.	11414	<i>Conostylis aculeata</i> subsp. <i>breviflora</i>			
121.	1420	<i>Conostylis androstemma</i> (Trumpets)			
122.	1423	<i>Conostylis aurea</i> (Golden Conostylis)			
123.	1427	<i>Conostylis candicans</i> (Grey Cottonhead)			
124.	-12810	<i>Conostylis candicans</i> x <i>aculeata</i> subsp. <i>breviflora</i>			
125.	1428	<i>Conostylis canteriata</i>			
126.	1430	<i>Conostylis crassinervia</i>			
127.	11773	<i>Conostylis crassinervia</i> subsp. <i>absens</i>			
128.	11938	<i>Conostylis crassinervia</i> subsp. <i>crassinervia</i>			
129.	1435	<i>Conostylis hiemalis</i>			
130.	1451	<i>Conostylis seminuda</i>			
131.	-11782	<i>Conostylis</i> sp.			
132.	11870	<i>Conostylis teretifolia</i> subsp. <i>teretifolia</i>			
133.	1458	<i>Conostylis teretiuscula</i>			
134.	1473	<i>Haemodorum simulans</i>			
135.	1479	<i>Phlebocarya filifolia</i>			

	Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
136.	11557	<i>Phlebocarya pilosissima</i> subsp. <i>pilosissima</i>		P3	
Hemerocallidaceae					
137.	1276	<i>Caesia micrantha</i> (Pale Grass-lily)			
138.	19632	<i>Johnsonia pubescens</i> subsp. <i>pubescens</i>			
Lamiaceae					
139.	6748	<i>Cyanostegia corifolia</i> (Tinsel Flower)			
140.	6839	<i>Hemiandra pungens</i> (Snakebush)			
141.	6841	<i>Hemiandra rutilans</i> (Colourful Snakebush)		T	
142.	19411	<i>Hemiandra</i> sp. <i>Eneabba</i> (H. Demarz 3687)		P3	
143.	14595	<i>Hemiandra</i> sp. <i>Watheroo</i> (S. Hancocks 4)		P4	
144.	6780	<i>Lachnostachys eriobotrya</i> (Lambswool)			
145.	6797	<i>Physopsis spicata</i> (Hill River Lambstail)			
Lauraceae					
146.	2952	<i>Cassytha glabella</i> (Tangled Dodder Laurel)			
147.	2956	<i>Cassytha pomiformis</i> (Dodder Laurel)			
Loganiaceae					
148.	6512	<i>Logania spermacoea</i>			
Malvaceae					
149.	5005	<i>Commersonia pulchella</i>			
150.	5036	<i>Lasiopetalum lineare</i>		P3	
151.	33485	<i>Lasiopetalum</i> sp. <i>Badgingarra</i> (E.A. Griffin 5278)		P2	
Myrtaceae					
152.	5350	<i>Baeckea grandiflora</i> (Large-flowered Baeckea)			
153.	19948	<i>Baeckea</i> sp. <i>Bunney Road</i> (S. Patrick 4059)		P2	
154.	5377	<i>Beaufortia bicolor</i>		P3	
155.	5378	<i>Beaufortia bracteosa</i>			
156.	5382	<i>Beaufortia elegans</i>			
157.	5393	<i>Beaufortia squarrosa</i> (Sand Bottlebrush)			
158.	5429	<i>Calothamnus sanguineus</i> (Silky-leaved Blood flower)			
159.	5441	<i>Calytrix aurea</i>			
160.	5447	<i>Calytrix chrysantha</i>		P4	
161.	5453	<i>Calytrix drummondii</i>			
162.	5455	<i>Calytrix eneabensis</i>		P4	
163.	5458	<i>Calytrix flavescens</i> (Summer Starflower)			
164.	5460	<i>Calytrix fraseri</i> (Pink Summer Calytrix)			
165.	5493	<i>Chamelaucium drummondii</i>			
166.	14808	<i>Chamelaucium drummondii</i> subsp. <i>drummondii</i>			
167.	5503	<i>Corynanthera flava</i>			
168.	34776	<i>Darwinia chapmaniana</i>		T	
169.	5518	<i>Darwinia neildiana</i> (Fringed Bell)			
170.	20090	<i>Darwinia</i> sp. <i>Watheroo</i> (I.R. McGill 20)			
171.	5529	<i>Darwinia speciosa</i>			
172.	13952	<i>Eremaea asterocarpa</i> subsp. <i>histoclada</i>			
173.	13962	<i>Eremaea atala</i>			
174.	14100	<i>Eremaea beaufortioides</i> var. <i>microphylla</i>			
175.	13955	<i>Eremaea ectadioclada</i>			
176.	13951	<i>Eremaea hadra</i>			
177.	5541	<i>Eremaea pauciflora</i>			
178.	13818	<i>Eremaea pauciflora</i> var. <i>lonchophylla</i>			
179.	14104	<i>Eremaea pauciflora</i> var. <i>pauciflora</i>			
180.	5543	<i>Eremaea violacea</i> (Violet Eremaea)			
181.	13953	<i>Eremaea x codonocarpa</i>			
182.	13956	<i>Eremaea x phoenicea</i>			
183.	5545	<i>Eucalyptus accedens</i> (Powderbark Wandoo)			
184.	5548	<i>Eucalyptus albida</i> (White-leaved Mallee)			
185.	5615	<i>Eucalyptus decipiens</i>			
186.	5628	<i>Eucalyptus drummondii</i> (Drummond's Gum)			
187.	18292	<i>Eucalyptus gittinsii</i> subsp. <i>illucida</i>			
188.	5680	<i>Eucalyptus johnsoniana</i> (Johnson's Mallee)		T	
189.	5741	<i>Eucalyptus pendens</i> (Badgingarra Mallee)		P4	
190.	29774	<i>Eucalyptus</i> sp. <i>Badgingarra</i> (D. Nicolle & M. French DN 3515)			
191.	5847	<i>Leptospermum erubescens</i> (Roadside Teatree)			
192.	5857	<i>Leptospermum spinescens</i>			
193.	5865	<i>Malleostemon roseus</i>			
194.	5888	<i>Melaleuca ciliosa</i>			
195.	16088	<i>Melaleuca coronicarpa</i>			
196.	5949	<i>Melaleuca platycalyx</i>			

	Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
197.	18598	<i>Melaleuca systema</i>			
198.	5983	<i>Melaleuca trichophylla</i>			
199.	15673	<i>Melaleuca tuberculata</i>			
200.	5986	<i>Melaleuca urceolaris</i>			
201.	-13046	<i>Melaleuca urceolaris</i> x <i>zonalis</i>			
202.	6039	<i>Scholtzia teretifolia</i>			
203.	6041	<i>Scholtzia umbellifera</i>			
204.	12389	<i>Verticordia albida</i>		T	
205.	12396	<i>Verticordia blepharophylla</i>			
206.	6071	<i>Verticordia brachypoda</i>			
207.	12402	<i>Verticordia chrysanthella</i>			
208.	6076	<i>Verticordia densiflora</i> (Compacted Featherflower)			
209.	15432	<i>Verticordia densiflora</i> var. <i>densiflora</i>			
210.	6083	<i>Verticordia grandis</i> (Scarlet Featherflower)			
211.	12429	<i>Verticordia huegelii</i> var. <i>decumbens</i>			
212.	-10108	<i>Verticordia insignis</i> subsp. <i>comagis</i>			
213.	12434	<i>Verticordia insignis</i> subsp. <i>eomagis</i>		P3	
214.	12437	<i>Verticordia laciniata</i>			
215.	14716	<i>Verticordia muelleriana</i> subsp. <i>muelleriana</i>		P3	
216.	10822	<i>Verticordia nobilis</i>			
217.	6103	<i>Verticordia ovalifolia</i>			
218.	6107	<i>Verticordia pennigera</i>			
219.	6109	<i>Verticordia picta</i> (Painted Featherflower)			
220.	12456	<i>Verticordia rutilastra</i>		P3	

Orchidaceae

221.	15358	<i>Caladenia longicauda</i> subsp. <i>albella</i>			
222.	15404	<i>Cyanicula sericea</i>			
223.	1643	<i>Elythranthera brunonis</i> (Purple Enamel Orchid)			
224.	13867	<i>Paracaleana dixonii</i>		T	
225.	1702	<i>Thelymitra campanulata</i> (Shirt Orchid)			

Poaceae

226.	-3593	<i>Amphipogon caricinus</i> - <i>strictus</i> complex			
227.	492	<i>Neurachne alopecuroides</i> (Foxtail Mulga Grass)			

Proteaceae

228.	1800	<i>Banksia attenuata</i> (Slender Banksia)			
229.	1807	<i>Banksia burdettii</i> (Burdett's Banksia)			
230.	1809	<i>Banksia candolleana</i> (Propeller Banksia)			
231.	32623	<i>Banksia carlinoides</i> (Pink Dryandra)			
232.	1810	<i>Banksia chamaephyton</i> (Fishbone Banksia)		P4	
233.	32596	<i>Banksia cypholoba</i>		P3	
234.	32519	<i>Banksia glaucifolia</i>			
235.	1820	<i>Banksia grossa</i>			
236.	1823	<i>Banksia incana</i>			
237.	33398	<i>Banksia incana</i> var. <i>brachyphylla</i>			
238.	32215	<i>Banksia kippistiana</i> var. <i>kippistiana</i>			
239.	32216	<i>Banksia kippistiana</i> var. <i>paenepeccata</i>		P3	
240.	1825	<i>Banksia lanata</i>			
241.	1828	<i>Banksia leptophylla</i>			
242.	-8408	<i>Banksia menziesii</i> x <i>prionotes</i>			
243.	1835	<i>Banksia micrantha</i>			
244.	32201	<i>Banksia nobilis</i> subsp. <i>fragrans</i>		P3	
245.	32163	<i>Banksia platycarpa</i>		P4	
246.	32138	<i>Banksia pteridifolia</i> subsp. <i>vernalis</i>		P3	
247.	32086	<i>Banksia sclerophylla</i>		P4	
248.	32083	<i>Banksia serratuloides</i> subsp. <i>perissa</i>		T	
249.	32074	<i>Banksia shuttleworthiana</i> (Bearded Dryandra)			
250.	33401	<i>Banksia sphaerocarpa</i> var. <i>pumilio</i>			
251.	12111	<i>Banksia sphaerocarpa</i> var. <i>sphaerocarpa</i> (Fox Banksia)			
252.	32073	<i>Banksia splendida</i> subsp. <i>macrocarpa</i>		P3	
253.	32042	<i>Banksia strictifolia</i>			
254.	32037	<i>Banksia subulata</i> (Awled Honey-pot)		P3	
255.	1852	<i>Banksia telmatiaea</i> (Swamp Fox Banksia)			
256.	32032	<i>Banksia tridentata</i> (Yellow Honey-pot)			
257.	32031	<i>Banksia vestita</i> (Summer Dryandra)			
258.	15512	<i>Conospermum boreale</i> subsp. <i>ascendens</i>			
259.	-7989	<i>Conospermum boreale</i> x <i>wycheleyi</i>			
260.	1859	<i>Conospermum brachyphyllum</i>			
261.	1864	<i>Conospermum crassinervium</i> (Summer Smokebush)			
262.	1876	<i>Conospermum incurvum</i> (Plume Smokebush)			

	Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
263.	1878	<i>Conospermum nervosum</i>			
264.	15521	<i>Conospermum unilaterale</i>			
265.	15524	<i>Conospermum wycherleyi</i> subsp. <i>glabrum</i>			
266.	15522	<i>Conospermum wycherleyi</i> subsp. <i>wycherleyi</i>			
267.	1894	<i>Dryandra carlinoides</i> (Pink Dryandra)			Y
268.	16646	<i>Dryandra catoglypta</i>			Y
269.	16679	<i>Dryandra cypholoba</i>			
270.	13832	<i>Dryandra glauca</i>			Y
271.	16672	<i>Dryandra lindleyana</i> (Couch Honeypot)			
272.	16260	<i>Dryandra nivea</i> subsp. <i>nivea</i>			
273.	13990	<i>Dryandra platycarpa</i>			
274.	1932	<i>Dryandra sessilis</i> (Parrot Bush)			
275.	1934	<i>Dryandra shuttleworthiana</i> (Bearded Dryandra)			
276.	16683	<i>Dryandra speciosa</i> subsp. <i>macrocarpa</i>			Y
277.	1939	<i>Dryandra subulata</i> (Awled Honeypot)			
278.	2013	<i>Grevillea granulosa</i>		P3	
279.	2086	<i>Grevillea rudis</i>		P4	
280.	2116	<i>Grevillea uncinulata</i> (Hook-leaf Grevillea)			
281.	2131	<i>Hakea auriculata</i>			
282.	12225	<i>Hakea brownii</i>			
283.	16908	<i>Hakea eneabba</i>			
284.	2161	<i>Hakea flabellifolia</i> (Fan-leaved Hakea)			
285.	2164	<i>Hakea gilbertii</i>			
286.	2166	<i>Hakea incrassata</i> (Marble Hakea)			
287.	2175	<i>Hakea lissocarpha</i> (Honey Bush)			
288.	2180	<i>Hakea megalosperma</i> (Lesueur Hakea)		T	
289.	12233	<i>Hakea psilorrhyncha</i>			
290.	2205	<i>Hakea smilacifolia</i>			
291.	2219	<i>Isopogon adenanthoides</i> (Spider Coneflower)			
292.	2232	<i>Isopogon linearis</i>			
293.	14357	<i>Isopogon</i> sp. <i>Watheroo</i> (D. Foreman 477)			
294.	15528	<i>Lambertia multiflora</i> var. <i>multiflora</i>			
295.	2271	<i>Persoonia rudis</i>		P3	
296.	14368	<i>Petrophile aculeata</i>			
297.	2285	<i>Petrophile biternata</i>		P3	
298.	2286	<i>Petrophile brevifolia</i>			
299.	19763	<i>Petrophile clavata</i>		P2	
300.	2294	<i>Petrophile drummondii</i>			
301.	2303	<i>Petrophile megalostegia</i>			
302.	29208	<i>Petrophile pilostyla</i> subsp. <i>austrina</i>			
303.	10784	<i>Petrophile scabriuscula</i>			
304.	2310	<i>Petrophile shuttleworthiana</i>			
305.	2317	<i>Stirlingia simplex</i>			
306.	2319	<i>Strangea cynanchicarpa</i> (Heath Strangea)			
307.	16882	<i>Synaphea aephynsa</i>		P3	
308.	2329	<i>Synaphea spinulosa</i>			
309.	15532	<i>Synaphea spinulosa</i> subsp. <i>spinulosa</i>			
Restionaceae					
310.	1056	<i>Alexgeorgea nitens</i>			
311.	1057	<i>Alexgeorgea subterranea</i>			
312.	17833	<i>Chordifex microcodon</i>			
313.	17706	<i>Chordifex sinuosus</i>			
314.	15828	<i>Desmocladius elongatus</i>		P4	
315.	17846	<i>Desmocladius parthenicus</i>			
316.	17712	<i>Desmocladius semiplanus</i>			
317.	16455	<i>Desmocladius virgatus</i>			
318.	17622	<i>Hypolaena robusta</i>		P4	
319.	1073	<i>Lepidobolus chaetocephalus</i> (Bristle-headed Chaff Rush)			
320.	17837	<i>Loxocarya gigas</i>		P2	
321.	16470	<i>Onychosepalum microcarpum</i>		P2	
Rhamnaceae					
322.	4809	<i>Cryptandra pungens</i>			
Rubiaceae					
323.	18255	<i>Opercularia vaginata</i> (Dog Weed)			
Rutaceae					
324.	16637	<i>Boronia scabra</i> subsp. <i>condensata</i>		P2	
325.	4455	<i>Diplolaena ferruginea</i>			
326.	4483	<i>Geleznovia verrucosa</i>			

	Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
327.	18535	<i>Philotheca pinoides</i>			
328.	18529	<i>Philotheca spicata</i> (Pepper and Salt)			

Sapindaceae

329.	-7799	<i>Diplopeltis huegelii</i> subsp. <i>huegelii</i> / <i>subintegra</i>			
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Stylidiaceae

330.	12846	<i>Stylidium albolilacinum</i>			
331.	7709	<i>Stylidium crossocephalum</i> (Posy Triggerplant)			
332.	7710	<i>Stylidium cygnorum</i>			
333.	7749	<i>Stylidium leptophyllum</i> (Needle-leaved Triggerplant)			
334.	7760	<i>Stylidium maitlandianum</i> (Fountain Triggerplant)			
335.	7766	<i>Stylidium nonscandens</i>		P3	
336.	7785	<i>Stylidium repens</i> (Matted Triggerplant)			
337.	25806	<i>Stylidium scariosum</i>			

Thymelaeaceae

338.	11402	<i>Pimelea imbricata</i> var. <i>piligera</i>			
339.	12041	<i>Pimelea suaveolens</i> subsp. <i>suaveolens</i>			

Violaceae

340.	-6765	<i>Hybanthus</i> sp.			
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Conservation Codes

T - Rare or likely to become extinct
X - Presumed extinct
IA - Protected under international agreement
S - Other specially protected fauna
1 - Priority 1
2 - Priority 2
3 - Priority 3
4 - Priority 4
5 - Priority 5

¹ For NatureMap's purposes, species flagged as endemic are those whose records are wholly contained within the search area. Note that only those records complying with the search criterion are included in the calculation. For example, if you limit records to those from a specific datasource, only records from that datasource are used to determine if a species is restricted to the query area.

Appendix 3

NatureMap Database Search Results- Fauna



NatureMap Species Report

Created By Guest user on 28/11/2011

Kingdom Animalia

Method 'By Circle'

Centre 115°28' 27" E,29°57' 14" S

Buffer 30km

Group By Family

Family	Species	Records
Acanthizidae	11	253
Accipitridae	8	49
Actinopodidae	1	1
Agamidae	7	38
Agelenidae	1	1
Amaurobiidae	5	7
Anatidae	7	40
Ardeidae	2	17
Artamidae	2	50
Balaenidae	1	1
Brachionidae	2	2
Cacatuidae	2	7
Campephagidae	2	71
Casuariidae	1	18
Centropagidae	1	1
Charadriidae	4	25
Chironomidae	6	6
Colletidae	1	1
Columbidae	4	77
Corixidae	2	2
Corvidae	3	111
Cracticidae	3	108
Cuculidae	5	37
Culicidae	2	2
Curculionidae	3	4
Cycloctenidae	1	1
Cyclopoidae	1	1
Cypridae	3	3
Daphniidae	1	1
Dasyuridae	2	14
Desidae	1	1
Dicaeidae	1	3
Dicruridae	3	200
Diplodactylidae	5	22
Dytiscidae	9	9
Elapidae	7	14
Estrilidae	1	3
Eylidae	1	1
Falconidae	3	45
Halcyonidae	3	14
Hemicorduliidae	1	1
Hirundinidae	5	112
Hydrachnidae	1	1
Hydrophilidae	3	3
Hylidae	1	1
Idiopidae	1	1
Lamponidae	3	3
Lecanidae	2	2
Lepadellidae	1	1
Leptoceridae	2	2
Lestidae	2	2
Limnadiidae	1	1
Limnodynastidae	4	12
Lycaenidae	2	3
Lycosidae	4	5
Lyncaeiidae	1	1
Macropodidae	1	1
Maluridae	6	89
Meliphagidae	18	432
Meropidae	1	1
Meropidae	1	17
Micropholcommatidae	1	1
Moinidae	1	1
Motacillidae	1	45
Muridae	3	11
Myobatrachidae	3	13
Nemesiidae	2	2
Notonectidae	2	2
Oonopidae	6	6
Otididae	1	3
Pachycephalidae	5	77
Parachaeidae	1	2
Pardalotidae	1	46
Pentatomidae	1	1
Petroicidae	6	42
Phalacrocoracidae	2	4
Phasianidae	2	4
Podargidae	1	1
Podicipedidae	2	3

Pomatostomidae	1	1
Psittacidae	11	250
Pteropodidae	1	1
Pygopodidae	8	12
Rallidae	1	2
Recurvirostridae	3	9
Salticidae	8	10
Scarabaeidae	1	1
Scincidae	13	69
Scolopacidae	3	10
Scorpionidae	1	3
Scutelleridae	2	4
Segestriidae	1	1
Strigidae	1	1
Sylviidae	3	21
Tarsipedidae	1	18
Tenebrionidae	1	1
Theridiidae	2	2
Threskiornithidae	1	3
Turnicidae	1	1
Typhlopidae	1	1
Vespertilionidae	2	2
Zodariidae	9	12
Zosteropidae	1	59
TOTAL	307	2710

	Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
Acanthizidae					
1.	24260	<i>Acanthiza apicalis</i> (Broad-tailed Thornbill)			
2.	24261	<i>Acanthiza chrysorrhoa</i> (Yellow-rumped Thornbill)			
3.	24262	<i>Acanthiza inornata</i> (Western Thornbill)			
4.	24265	<i>Acanthiza uropygialis</i> (Chestnut-rumped Thornbill)			
5.	24269	<i>Calamanthus campestris</i> (Rufous Fieldwren)			
6.	34000	<i>Calamanthus campestris</i> subsp. <i>montanellus</i> (Rufous Fieldwren)		P4	
7.	-360	<i>Calamanthus cautus</i>			
8.	25530	<i>Gerygone fusca</i> (Western Gerygone)			
9.	24278	<i>Pyrrholaemus brunneus</i> (Redthroat)			
10.	25534	<i>Sericornis frontalis</i> (White-browed Scrubwren)			
11.	30948	<i>Smicronis brevirostris</i> (Weebill)			
Accipitridae					
12.	25536	<i>Accipiter fasciatus</i> (Brown Goshawk)			
13.	24285	<i>Aquila audax</i> (Wedge-tailed Eagle)			
14.	24289	<i>Circus assimilis</i> (Spotted Harrier)			
15.	-353	<i>Elanus axillaris</i>			
16.	24293	<i>Haliaeetus leucogaster</i> (White-bellied Sea-Eagle)			
17.	24295	<i>Haliastur spheurnus</i> (Whistling Kite)			
18.	-354	<i>Hieraaetus morphnoides</i>			
19.	-369	<i>Lophoictinia isura</i>			
Actinopodidae					
20.		<i>Missulena</i> sp. 1			
Agamidae					
21.		<i>Ctenoph</i> sp B SAP			Y
22.	30899	<i>Ctenophorus adelaidensis</i> (Southern Heath Dragons)			
23.	24881	<i>Ctenophorus maculatus</i> subsp. <i>maculatus</i>			
24.	24904	<i>Moloch horridus</i> (Thorny Devil)			
25.	25510	<i>Pogona minor</i>			
26.	24907	<i>Pogona minor</i> subsp. <i>minor</i>			
27.	25513	<i>Rankinia adelaidensis</i>			
Agelenidae					
28.		<i>Gen.</i> 1 sp. 2			
Amaurobiidae					
29.		<i>Gen.</i> 1 sp. 2			
30.		<i>Gen.</i> 3 sp. 10			
31.		<i>Gen.</i> 3 sp. 12			
32.		<i>Gen.</i> 3 sp. 3			
33.		<i>Gen.</i> 5 sp. 1			
Anatidae					
34.	24312	<i>Anas gracilis</i> (Grey Teal)			
35.	24316	<i>Anas superciliosa</i> (Pacific Black Duck)			
36.	24319	<i>Biziura lobata</i> (Musk Duck)			
37.	24321	<i>Chenonetta jubata</i> (Australian Wood Duck)			
38.	24322	<i>Cygnus atratus</i> (Black Swan)			
39.	24326	<i>Malacorhynchus membranaceus</i> (Pink-eared Duck)			
40.	24331	<i>Tadorna tadornoides</i> (Australian Shelduck)			
Ardeidae					
41.	24341	<i>Ardea pacifica</i> (White-necked Heron)			
42.	-330	<i>Egretta novaehollandiae</i>			
Artamidae					
43.	25566	<i>Artamus cinereus</i> (Black-faced Woodswallow)			
44.	24353	<i>Artamus cyanopterus</i> (Dusky Woodswallow)			
Balaenidae					
45.	24043	<i>Eubalaena australis</i> (Southern Right Whale)		T	
Brachionidae					
46.		<i>Keratella procurva</i>			
47.		<i>Keratella slacki</i>			
Cacatuidae					
48.	-439	<i>Cacatua</i> sp.			
49.	-453	<i>Calyptorhynchus</i> sp.			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
Campephagidae				
50.	25568 <i>Coracina novaehollandiae</i> (Black-faced Cuckoo-shrike)			
51.	-394 <i>Lalage sueurii</i>			
Casuariidae				
52.	24470 <i>Dromaius novaehollandiae</i> (Emu)			
Centropagidae				
53.	<i>Boeckella triarticulata</i>			
Charadriidae				
54.	24377 <i>Charadrius ruficapillus</i> (Red-capped Plover)			
55.	-326 <i>Elseyornis melanops</i>			
56.	24379 <i>Erythronyx cinctus</i> (Red-kneed Dotterel)			
57.	24386 <i>Vanellus tricolor</i> (Banded Lapwing)			
Chironomidae				
58.	<i>Chironomus aff. alternans</i> (V24)			
59.	<i>Chironomus tepperi</i>			
60.	<i>Polypedilum nubifer</i>			
61.	<i>Procladius paludicola</i>			
62.	<i>Procladius villosimanus</i>			
63.	<i>Tanytarsus fuscithorax/semibarbitarsus</i>			
Colletidae				
64.	33977 <i>Hylaeus globuliferus</i> (bee)		P3	
Columbidae				
65.	24399 <i>Columba livia</i> (Domestic Pigeon)			
66.	24407 <i>Ocyphaps lophotes</i> (Crested Pigeon)			
67.	24409 <i>Phaps chalcoptera</i> (Common Bronzewing)			
68.	25587 <i>Phaps elegans</i> (Brush Bronzewing)			
Corixidae				
69.	<i>Agraptocorixa parvipunctata</i>			
70.	<i>Micronecta robusta</i>			
Corvidae				
71.	24416 <i>Corvus bennetti</i> (Little Crow)			
72.	25592 <i>Corvus coronoides</i> (Australian Raven)			
73.	-419 <i>Corvus sp.</i>			
Cracticidae				
74.	24420 <i>Cracticus nigrogularis</i> (Pied Butcherbird)			
75.	25595 <i>Cracticus tibicen</i> (Australian Magpie)			
76.	25596 <i>Cracticus torquatus</i> (Grey Butcherbird)			
Cuculidae				
77.	25598 <i>Cacomantis flabelliformis</i> (Fan-tailed Cuckoo)			
78.	-343 <i>Cacomantis pallidus</i>			
79.	-377 <i>Chalcites basalis</i>			
80.	-334 <i>Chalcites lucidus</i>			
81.	-368 <i>Chalcites osculans</i>			
Culicidae				
82.	<i>Anopheles annulipes</i>			
83.	<i>Culex (culex) australicus</i>			
Curculionidae				
84.	<i>Catasarcus pallidiventris</i>			Y
85.	<i>Haplonyx sp.</i>			
86.	<i>Oxyops sp.</i>			
Cycloctenidae				
87.	Gen. 1 sp. 2			
Cyclopoidae				
88.	<i>Australocyclops australis</i>			
Cyprinidae				
89.	<i>Cypretta baylyi</i>			
90.	<i>Heterocypris incongruens</i>			
91.	<i>Ilyodromus sp. 573</i>			
Daphniidae				
92.	<i>Daphnia carinata</i>			
Dasyuridae				
93.	24109 <i>Sminthopsis dolichura</i> (Little long-tailed Dunnart)			

	Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
94.	24112	<i>Sminthopsis granulipes</i> (White-tailed Dunnart)			
Desidae					
95.		Gen. 1 sp. 2			
Dicaeidae					
96.	25607	<i>Dicaeum hirundinaceum</i> (Mistletoebird)			
Dicruridae					
97.	24443	<i>Grallina cyanoleuca</i> (Magpie-lark)			
98.	-407	<i>Rhipidura albiscapa</i>			
99.	25614	<i>Rhipidura leucophrys</i> (Willie Wagtail)			
Diplodactylidae					
100.	24918	<i>Crenadactylus ocellatus</i> subsp. <i>ocellatus</i>			
101.	24938	<i>Diplodactylus ornatus</i>			
102.	24939	<i>Diplodactylus polyophthalmus</i>			
103.	25518	<i>Strophurus spinigerus</i>			
104.	24942	<i>Strophurus spinigerus</i> subsp. <i>spinigerus</i>			
Dytiscidae					
105.		<i>Allodessus bistrigatus</i>			
106.		<i>Antiporus</i> sp.			
107.		<i>Eretes australis</i>			
108.		<i>Lancetes lanceolatus</i>			
109.		<i>Megaporus howitti</i>			
110.		<i>Onychohydus scutellaris</i>			
111.		<i>Paroster niger</i>			
112.		<i>Rhantus suturalis</i>			
113.		<i>Sternopriscus</i> sp.			
Elapidae					
114.	25251	<i>Echiopsis curta</i> (Bardick)			
115.	25366	<i>Hydrophis elegans</i>			
116.	25249	<i>Neelaps calonotos</i> (Black-striped Snake)		P3	
117.	25253	<i>Parasuta gouldii</i>			
118.	25261	<i>Pseudechis australis</i> (Mulga Snake)			
119.	25264	<i>Pseudonaja nuchalis</i> (Gwardar)			
120.	25267	<i>Simoselaps littoralis</i> (West Coast Banded Snake)			
Estrilidae					
121.	30870	<i>Taeniopygia guttata</i> (Zebra Finch)			
Eylaidae					
122.		<i>Eylais</i> sp.			
Falconidae					
123.	25621	<i>Falco berigora</i> (Brown Falcon)			
124.	25622	<i>Falco cenchroides</i> (Australian Kestrel)			
125.	25623	<i>Falco longipennis</i> (Australian Hobby)			
Halcyonidae					
126.	30901	<i>Dacelo novaeguineae</i> (Laughing Kookaburra)			
127.	-366	<i>Todiramphus pyrrhopygius</i>			
128.	25549	<i>Todiramphus sanctus</i> (Sacred Kingfisher)			
Hemicorduliidae					
129.		<i>Hemicordulia tau</i>			
Hirundinidae					
130.	-355	<i>Cheramoeca leucosterna</i>			
131.	24491	<i>Hirundo neoxena</i> (Welcome Swallow)			
132.	25629	<i>Hirundo nigricans</i> (Tree Martin)			
133.	-391	<i>Petrochelidon ariel</i>			
134.	-393	<i>Petrochelidon nigricans</i>			
Hydrachnidae					
135.		<i>Hydrachna nr approximata</i>			
Hydrophilidae					
136.		<i>Berosus</i> sp.			
137.		<i>Enochrus elongatus</i>			
138.		<i>Enochrus maculiceps</i>			
Hylidae					
139.	25388	<i>Litoria moorei</i> (Motorbike Frog)			
Idiopidae					

	Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
140.	33917	<i>Idiosoma nigrum</i> (Shield-backed Trapdoor Spider)		T	
Lamponidae					
141.		<i>Lamponata daviesae</i>			
142.		<i>Lamponina</i> sp. 2			Y
143.		<i>Pseudolampona boree</i>			
Lecanidae					
144.		<i>Lecane bulla</i>			
145.		<i>Lecane hamata</i>			
Lepadellidae					
146.		<i>Lepadella</i> cf. <i>patella</i>			
Leptoceridae					
147.		<i>Oecetis</i> sp.			
148.		<i>Triplectides australis</i>			
Lestidae					
149.		<i>Austrolestes analis</i>			
150.		<i>Austrolestes io</i>			
Limnadiidae					
151.		<i>Limnadia</i> sp. a (nr <i>badia</i>)			
Limnodynastidae					
152.	25408	<i>Heleioporus albopunctatus</i> (Western Spotted Frog)			
153.	25410	<i>Heleioporus eyrei</i> (Moaning Frog)			
154.	25412	<i>Heleioporus psammophilus</i> (Sand Frog)			
155.	25426	<i>Neobatrachus pelobatoides</i> (Humming Frog)			
Lycaenidae					
156.		<i>Candalides acastus</i>			
157.		<i>Hypochrysops halyaetus</i>			
Lycosidae					
158.		<i>Artoria</i> sp. 3			
159.		<i>Gen.</i> 1 sp. 2			
160.		<i>Lycosa</i> sp. 1			
161.		<i>Lycosa</i> sp. 6			
Lyncaeiidae					
162.		<i>Lynceus</i> sp.			
Macropodidae					
163.	24135	<i>Macropus robustus</i> subsp. <i>erubescens</i> (Euro)			
Maluridae					
164.	25651	<i>Malurus lamberti</i> (Variegated Fairy-wren)			
165.	25652	<i>Malurus leucopterus</i> (White-winged Fairy-wren)			
166.	24551	<i>Malurus pulcherrimus</i> (Blue-breasted Fairy-wren)			
167.	-427	<i>Malurus</i> sp.			
168.	25654	<i>Malurus splendens</i> (Splendid Fairy-wren)			
169.	25655	<i>Stipiturus malachurus</i> (Southern Emu-wren)			
Meliphagidae					
170.	24559	<i>Acanthagenys rufogularis</i> (Spiny-cheeked Honeyeater)			
171.	24560	<i>Acanthorhynchus superciliosus</i> (Western Spinebill)			
172.	24561	<i>Anthochaera carunculata</i> (Red Wattlebird)			
173.	24562	<i>Anthochaera lunulata</i> (Western Little Wattlebird)			
174.	24564	<i>Certhionyx variegatus</i> (Pied Honeyeater)			
175.	24567	<i>Epthianura albifrons</i> (White-fronted Chat)			
176.	24570	<i>Epthianura tricolor</i> (Crimson Chat)			
177.	-349	<i>Glyciphila melanops</i>			
178.	24577	<i>Lichenostomus ornatus</i> (Yellow-plumed Honeyeater)			
179.	24578	<i>Lichenostomus penicillatus</i> (White-plumed Honeyeater)			
180.	24581	<i>Lichenostomus virescens</i> (Singing Honeyeater)			
181.	25661	<i>Lichmera indistincta</i> (Brown Honeyeater)			
182.	24583	<i>Manorina flavigula</i> (Yellow-throated Miner)			
183.	25663	<i>Melithreptus brevirostris</i> (Brown-headed Honeyeater)			
184.	24594	<i>Phylidonyris melanops</i> (Tawny-crowned Honeyeater)			
185.	-396	<i>Phylidonyris niger</i>			
186.	25669	<i>Phylidonyris nigra</i> (White-cheeked Honeyeater)			
187.	24596	<i>Phylidonyris novaehollandiae</i> (New Holland Honeyeater)			
Meropeidae					
188.	33972	<i>Austromerope poultoni</i> (scorpionfly)		P2	

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
Meropidae				
189.	24598 <i>Merops ornatus</i> (Rainbow Bee-eater)			
Micropholcommatidae				
190.	<i>Micropholcomma?</i> sp. 4			
Moinidae				
191.	<i>Moina australiensis</i>			
Motacillidae				
192.	-365 <i>Anthus novaeseelandiae</i>			
Muridae				
193.	24223 <i>Mus musculus</i> (House Mouse)			
194.	24230 <i>Pseudomys albocinereus</i> (Ash-grey Mouse)			
195.	24243 <i>Rattus fuscipes</i> (Western Bush Rat)			
Myobatrachidae				
196.	25401 <i>Crinia pseudinsignifera</i> (Bleating Froglet)			
197.	25420 <i>Myobatrachus gouldii</i> (Turtle Frog)			
198.	25433 <i>Pseudophryne guentheri</i> (Crawling Toadlet)			
Nemesiidae				
199.	<i>Merridinia</i> sp. 2			
200.	<i>Teyl</i> sp. 16			
Notonectidae				
201.	<i>Anisops hyperion</i>			
202.	<i>Anisops thienemanni</i>			
Oonopidae				
203.	<i>Gamasomorpha</i> sp. 4			Y
204.	<i>Myrmopopaea</i> sp.			
205.	<i>Opopaea</i> sp. 1			
206.	<i>Opopaea</i> sp. 17			Y
207.	<i>Opopaea</i> sp. 18			
208.	<i>Opopaea</i> sp. 5			
Otididae				
209.	24610 <i>Ardeotis australis</i> (Australian Bustard)		P4	
Pachycephalidae				
210.	25675 <i>Colluricincla harmonica</i> (Grey Shrike-thrush)			
211.	24618 <i>Oreoica gutturalis</i> (Crested Bellbird)			
212.	34011 <i>Oreoica gutturalis</i> subsp. <i>gutturalis</i> (Crested Bellbird)		P4	
213.	25679 <i>Pachycephala pectoralis</i> (Golden Whistler)			
214.	25680 <i>Pachycephala rufiventris</i> (Rufous Whistler)			
Pararchaeidae				
215.	<i>Pararchaea</i> sp. 2			
Pardalotidae				
216.	25682 <i>Pardalotus striatus</i> (Striated Pardalote)			
Pentatomidae				
217.	<i>Arniscus humeralis</i>			
Petroicidae				
218.	24652 <i>Eopsaltria georgiana</i> (White-breasted Robin)			
219.	-382 <i>Eopsaltria griseogularis</i>			
220.	-323 <i>Melanodryas cucullata</i>			
221.	25693 <i>Microeca fascinans</i> (Jacky Winter)			
222.	-403 <i>Petroica boodang</i>			
223.	24659 <i>Petroica goodenovii</i> (Red-capped Robin)			
Phalacrocoracidae				
224.	-389 <i>Microcarbo melanoleucos</i>			
225.	25699 <i>Phalacrocorax varius</i> (Pied Cormorant)			
Phasianidae				
226.	24671 <i>Coturnix pectoralis</i> (Stubble Quail)			
227.	25701 <i>Coturnix ypsilophora</i> (Brown Quail)			
Podargidae				
228.	25703 <i>Podargus strigoides</i> (Tawny Frogmouth)			
Podicipedidae				
229.	24681 <i>Poliocephalus poliocephalus</i> (Hoary-headed Grebe)			
230.	25705 <i>Tachybaptus novaehollandiae</i> (Australasian Grebe)			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
Pomatostomidae				
231.	24683 <i>Pomatostomus superciliosus</i> (White-browed Babbler)			
Psittacidae				
232.	-386 <i>Barnardius zonarius</i>			
233.	25714 <i>Cacatua pastinator</i> (Western Long-billed Corella)			
234.	25716 <i>Cacatua sanguinea</i> (Little Corella)			
235.	25717 <i>Calyptorhynchus banksii</i> (Red-tailed Black-Cockatoo)			
236.	24733 <i>Calyptorhynchus baudinii</i> (Baudin's Cockatoo)		T	
237.	24734 <i>Calyptorhynchus latirostris</i> (Carnaby's Cockatoo)		T	
238.	-3794 <i>Calyptorhynchus</i> sp			
239.	-322 <i>Eolophus roseicapillus</i>			
240.	24736 <i>Melopsittacus undulatus</i> (Budgerigar)			
241.	24742 <i>Nymphicus hollandicus</i> (Cockatiel)			
242.	25722 <i>Polytelis anthopeplus</i> (Regent Parrot)			
Pteropodidae				
243.	24173 <i>Pteropus scapulatus</i> (Little Red Flying-fox)			
Pygopodidae				
244.	24991 <i>Aprasia repens</i>			
245.	30905 <i>Delma concinna</i> subsp. <i>concinna</i>			
246.	25766 <i>Delma fraseri</i>			
247.	24999 <i>Delma grayii</i>			
248.	25005 <i>Lialis burtonis</i>			
249.	25509 <i>Pletholax gracilis</i> (Keeled Legless Lizard)			
250.	25007 <i>Pletholax gracilis</i> subsp. <i>gracilis</i>			
251.	25008 <i>Pygopus lepidopodus</i> (Common Scaly Foot)			
Rallidae				
252.	-370 <i>Tribonyx ventralis</i>			
Recurvirostridae				
253.	24774 <i>Cladorhynchus leucocephalus</i> (Banded Stilt)			
254.	25734 <i>Himantopus himantopus</i> (Black-winged Stilt)			
255.	24776 <i>Recurvirostra novaehollandiae</i> (Red-necked Avocet)			
Salticidae				
256.	<i>Adoxotoma chinopogon</i>			
257.	Gen. 1 sp. 2			
258.	Gen. 3 sp. 3			
259.	Gen. 5 sp. 1			
260.	<i>Grayenulla australensis</i>			
261.	<i>Holoplatys chudalupensis</i>			
262.	<i>Lycidas</i> sp. 4			
263.	<i>Paraplatoides</i> sp. 1			
Scarabaeidae				
264.	<i>Heteronyx</i> sp.			
Scincidae				
265.	25039 <i>Ctenotus fallens</i>			
266.	25047 <i>Ctenotus impar</i>			
267.	25463 <i>Ctenotus pantherinus</i> (Leopard Ctenotus)			
268.	25065 <i>Ctenotus pantherinus</i> subsp. <i>pantherinus</i>			
269.	25074 <i>Ctenotus schomburgkii</i>			
270.	25099 <i>Egernia multiscutata</i>			
271.	25128 <i>Lerista christinae</i>			
272.	25131 <i>Lerista distinguenda</i>			
273.	25165 <i>Lerista praepedita</i>			
274.	25184 <i>Menetia greyii</i>			
275.	25191 <i>Morethia lineocellata</i>			
276.	25192 <i>Morethia obscura</i>			
277.	25207 <i>Tiliqua rugosa</i> subsp. <i>rugosa</i>			
Scolopacidae				
278.	-329 <i>Actitis hypoleucos</i>			
279.	24788 <i>Calidris ruficollis</i> (Red-necked Stint)			
280.	-437 <i>Genus</i> sp.			
Scorpionidae				
281.	<i>Cercophonius</i> sp.			
Scutelleridae				
282.	<i>Choerocoris</i> sp.			Y

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
283.	<i>Choerocoris variegatus</i>			
Segestriidae				
284.	<i>Gen. 1 sp. 2</i>			
Strigidae				
285.	25747 <i>Ninox connivens</i> (Barking Owl)			
Sylviidae				
286.	25755 <i>Acrocephalus australis</i> (Australian Reed Warbler)			
287.	24833 <i>Cincloramphus cruralis</i> (Brown Songlark)			
288.	24834 <i>Cincloramphus mathewsi</i> (Rufous Songlark)			
Tarsipedidae				
289.	24167 <i>Tarsipes rostratus</i> (Honey Possum)			
Tenebrionidae				
290.	<i>Helaeus</i> sp.			
Theridiidae				
291.	<i>Gen. 1 sp. 2</i>			
292.	<i>Gen. 5 sp. 1</i>			
Threskiornithidae				
293.	24845 <i>Threskiornis spinicollis</i> (Straw-necked Ibis)			
Turnicidae				
294.	24851 <i>Turnix velox</i> (Little Button-quail)			
Typhlopidae				
295.	25288 <i>Ramphotyphlops waitii</i>			
Vespertilionidae				
296.	24194 <i>Nyctophilus geoffroyi</i> (Lesser Long-eared Bat)			
297.	24206 <i>Vespadelus regulus</i> (Southern Forest Bat)			
Zodariidae				
298.	<i>Australutica</i> sp. 1			
299.	<i>Cavasteron</i> sp. 1			
300.	<i>Gen. 1 sp. 2</i>			
301.	<i>Habronestes australiensis</i>			
302.	<i>Neostorena</i> sp. 14			
303.	<i>Neostorena</i> sp. 21			
304.	<i>Neostorena</i> sp. 3			
305.	<i>Nostera</i> sp. 5			
306.	<i>Phenasteron longiconductor</i>			
Zosteropidae				
307.	25765 <i>Zosterops lateralis</i> (Grey-breasted White-eye)			

Conservation Codes
T - Rare or likely to become extinct
X - Presumed extinct
IA - Protected under international agreement
S - Other specially protected fauna
1 - Priority 1
2 - Priority 2
3 - Priority 3
4 - Priority 4
5 - Priority 5

¹ For NatureMap's purposes, species flagged as endemic are those whose records are wholly contained within the search area. Note that only those records complying with the search criterion are included in the calculation. For example, if you limit records to those from a specific datasource, only records from that datasource are used to determine if a species is restricted to the query area.

Appendix 4

EPBC Act 1999 Protected Matters Report



Matters of National Environmental Significance		
Threatened Species	Status	Type of Presence
Birds		
<i>Calyptorhynchus latirostris</i> (Carnaby's Black-Cockatoo)	Endangered	Breeding likely to occur within area
<i>Leipoa ocellata</i> (Malleefowl)	Vulnerable; Migratory	Species or species habitat likely to occur within area
Plants		
<i>Andersonia gracilis</i> Slender Andersonia	Endangered	Species or species habitat may occur within area
<i>Banksia serratuloides</i> subsp. <i>perissa</i> Northern Serrate Dryandra	Vulnerable	Species or species habitat likely to occur within area
<i>Centrolepis caespitosa</i>	Endangered	Species or species habitat may occur within area
<i>Darwinia chapmaniana</i> Chapman's Bell	Endangered	Species or species habitat likely to occur within area
<i>Eucalyptus absita</i> Badgingarra Box	Endangered	Species or species habitat may occur within area
<i>Eucalyptus balanites</i> Cadda Mallee	Endangered	Species or species habitat may occur within area
<i>Eucalyptus impensa</i> Eneabba Mallee	Endangered	Species or species habitat likely to occur within area
<i>Eucalyptus johnsoniana</i> Johnson's Mallee	Vulnerable	Species or species habitat likely to occur within area
<i>Grevillea curviloba</i> subsp. <i>incurva</i> Narrow curved-leafed Grevillea	Endangered	Species or species habitat may occur within area
<i>Hakea megalosperma</i> Lesueur Hakea	Vulnerable	Species or species habitat likely to occur within area
<i>Hemiandra gardneri</i> Red Snakebush	Endangered	Species or species habitat may occur within area
<i>Leucopogon obtectus</i> Hidden Beard-heath	Endangered	Species or species habitat likely to occur within area
<i>Spirogardnera rubescens</i> Spiral Bush	Endangered	Species or species habitat likely to occur within area

Migratory Species	Status	Type of Presence
Migratory Marine Birds		
<i>Apus pacificus</i> (Fork-tailed Swift)	Migratory	Species or species habitat may occur within area
<i>Ardea alba</i> (Great Egret, White Egret)	Migratory	Species or species habitat may occur within area
<i>Ardea ibis</i> (Cattle Egret)	Schedule 3; Migratory	Species or species habitat may occur within area
Migratory Terrestrial Species		
<i>Haliaeetus leucogaster</i> (White-bellied Sea-Eagle)	Schedule 3; Migratory	Species or species habitat likely to occur within area
<i>Leipoa ocellata</i> (Malleefowl)	Vulnerable; Migratory	Species or species habitat likely to occur within area
<i>Merops ornatus</i> (Rainbow Bee-eater)	Schedule 3; Migratory	Species or species habitat may occur within area
Migratory Wetland Species		
<i>Ardea alba</i> (Great Egret, White Egret)	Migratory	Species or species habitat may occur within area
<i>Ardea ibis</i> (Cattle Egret)	Migratory	Species or species habitat may occur within area

Extra Information		
Invasive Species	Status	Type of Presence
Mammals		
Capra hircus (Goat)	Invasive	Species or species habitat likely to occur within area
Felis catus (Cat, House/Domestic Cat)	Invasive	Species or species habitat likely to occur within area
Oryctolagus cuniculus (Rabbit, European Rabbit)	Invasive	Species or species habitat likely to occur within area
Sus scrofa (Pig)	Invasive	Species or species habitat likely to occur within area
Vulpes vulpes (Red Fox, Fox)	Invasive	Species or species habitat likely to occur within area
Plants		
Asparagus asparagoides Bridal Creeper	Invasive	Species or species habitat likely to occur within area
Cenchrus ciliaris Buffel-grass	Invasive	Species or species habitat may occur within area
Lycium ferocissimum African Boxthorn	Invasive	Species or species habitat may occur within area
Tamarix aphylla Athel Pine	Invasive	Species or species habitat likely to occur within area

Appendix 5

Vegetation Structural Classification and Condition Ranking Scale



Vegetation Structural Classes*

Vegetation Structural Classes used for BushForever*

Life Form / Height Class	Canopy Cover (percentage)			
	100-70%	70-30%	30-10%	10-2%
Trees over 30 m	Tall closed forest	Tall open forest	Tall woodland	Tall open woodland
Trees 10-30 m	Closed forest	Open forest	Woodland	Open woodland
Trees under 10 m	Low closed forest	Low open forest	Low woodland	Low open woodland
Tree Mallee	Closed tree mallee	Tree mallee	Open tree mallee	Very open tree mallee
Shrub Mallee	Closed shrub mallee	Shrub mallee	Open shrub mallee	Very open shrub mallee
Shrubs over 2 m	Tall closed scrub	Tall open scrub	Tall shrubland	Tall open shrubland
Shrubs 1-2 m	Closed heath	Open heath	Shrubland	Open shrubland
Shrubs under 1 m	Low closed heath	Low open heath	Low shrubland	Low open shrubland
Grasses	Closed grassland	Grassland	Open grassland	Very open grassland
Herbs	Closed herbland	Herbland	Open herbland	Very open herbland
Sedges	Closed sedgeland	Sedgeland	Open sedgeland	Very open sedgeland

* Keighery, B.J. (1994); adapted from Muir (1977) and Aplin (1979).

NB. We have termed any strata under 2% in cover as being "scattered".

Vegetation Condition Scale used for BushForever†

Pristine (1)	Pristine or nearly so, no obvious signs of disturbance
Excellent (2)	Vegetation structure intact; disturbance affecting individual species, and weeds are non-aggressive species
Very Good (3)	Vegetation structure altered, obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.
Good (4)	Vegetation structure significantly altered by very obvious signs of multiple disturbance. Retains basic vegetation structure or ability to regenerate it. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing.
Degraded (5)	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.
Completely Degraded (6)	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees or shrubs.

† Keighery, B.J. (1994).

Appendix 6

Quadrat and Relevé Data



Warradarge Site WWF01
 Described by RWSW Date 20/11/2011 Type Quadrat 10 x 10 m
 MGA Zone 50 354420mE 6686098mN
 Habitat East facing gentle slope
 Soil: White grey sand
 Rock Type Laterite boulders
 Vegetation *Eucalyptus gittinsii* open tree mallee over *Banksia glaucifolia*, *Banksia kippistiana* var. *kippistiana* open heath over *Hakea auriculata*, *Xanthorrhoea drummondii* scattered low shrubs over *Opercularia vaginata* scattered herbs, *Schoenus pleiostemoneus* scattered sedges, *Neurachne alopecuroides* scattered grasses.
 Veg Condition Excellent
 Fire Age No sign of recent fire

Species List:

Species	Cover (%)	Height (cm)	Specimen
<i>Allocasuarina humilis</i>	0.1	40	WWF01-25
<i>Arctotheca calendula</i>	0.1	10	WWF01-15
<i>Astroloma</i> sp. Cataby (E.A. Griffin 1022)	0.1	30	WWF01-33
<i>Baeckea grandiflora</i>	0.1	40	WWF01-05
<i>Banksia carlinoides</i>	0.1	120	WWF01-11
<i>Banksia glaucifolia</i>	50	150	WWF01-27
<i>Banksia kippistiana</i> var. <i>kippistiana</i>	8	150	WWF01-26
<i>Banksia sphaerocarpa</i> var. <i>pumilio</i>	0.1	60	WWF01-24
<i>Conostylis</i> sp.	0.1	30	WWF01-16
<i>Dampiera spicigera</i>	0.1	25	WWF01-07
<i>Daviesia decurrens</i>	0.1	15	WWF01-28
<i>Desmocladius elongatus</i>	0.1	30	WWF01-30
<i>Desmocladius virgatus</i>	0.1	10	WWF01-14
<i>Drosera porrecta</i>	0.1	15	WWF01-06
<i>Eucalyptus gittinsii</i> subsp. <i>illucida</i>	35	400	WWF01-18
<i>Glischrocaryon aureum</i>	0.1	45	WWF01-20
<i>Gompholobium knightianum</i>	0.1	20	WWF01-13
<i>Goodenia coerulea</i>	0.1	35	WWF01-21
<i>Hakea auriculata</i>	1.5	100	WWF01-32
<i>Hibbertia hypericoides</i>	0.1	40	WWF01-17
<i>Lechenaultia biloba</i>	0.1	30	WWF01-03
<i>Neurachne alopecuroides</i>	1	30	WWF01-19
<i>Opercularia vaginata</i>	1	15	WWF01-01
<i>Petrophile shuttleworthiana</i>	0.1	30	WWF01-22
<i>Philothea pinoides</i>	0.1	25	WWF01-12
<i>Schoenus pleiostemoneus</i>	1	10	WWF01-02
<i>Stylidium miniatum</i>	0.1	15	WWF01-09
<i>Tetraria octandra</i>	0.1	20	WWF01-04
<i>Thysanotus manglesianus</i>	0.1	40	WWF01-08
<i>Tricoryne elatior</i>	0.1	35	WWF01-29
<i>Ursinia anthemoides</i>	0.1	10	WWF01-10
<i>Xanthorrhoea drummondii</i>	1	120	WWF01-23
Herb	0.1	10	WWF01-31

Warradarge Site WWF02
 Described by RWSW Date 21/10/2011 Type Quadrat 10 x 10 m
 MGA Zone 50 357519mE 6687302mN
 Habitat Crest of low rise, sloping east
 Soil White sand
 Rock Type Scattered cobbles and pebbles of laterite
 Vegetation *Eucalyptus accedens*, *Eucalyptus drummondii* tree mallee over *Banksia armata* var. *armata*, *Banksia sessilis* var. *flabellifolia*, *Melaleuca trichophylla*, *Banksia kippistiana* var. *kippistiana*, *Banksia strictifolia*, and *Petrophile megalostegia* open heath over *Loxocarya striata* scattered sedges.
 Veg Condition Excellent
 Fire Age No sign of recent fire

Species List:

Species	Cover (%)	Height (cm)	Specimen
<i>Austrostipa macalpinei</i>	0.1	10	WWF02-05
<i>Baeckea grandiflora</i>	0.1	20	WWF02-15
<i>Banksia armata</i> var. <i>armata</i>	15	200	=WWF03-09

Species	Cover (%)	Height (cm)	Specimen
<i>Banksia kippistiana</i> var. <i>kippistiana</i>	5	100	=WFF01-26
<i>Banksia sessilis</i> var. <i>flabellifolia</i>	10	200	WWF02-21
<i>Banksia strictifolia</i>	5	180	WWF02-12
<i>Conostylis aculeata</i> subsp. <i>breviflora</i>	0.1	15	WWF02-01
<i>Dampiera lavandulacea</i>	0.1	10	WWF02-10
<i>Eucalyptus accedens</i>	8	550	WWF02-23
<i>Eucalyptus drummondii</i>	15	300	WWF02-22
<i>Hakea auriculata</i>	0.1	30	WWF02-14
<i>Hakea gilbertii</i>	-	-	WWF02-20
<i>Hakea lissocarpha</i>	0.1	30	WWF02-17
<i>Hibbertia hypericoides</i>	0.1	40	WWF02-03
<i>Hibbertia subvaginata</i>	0.1	30	WWF02-11
<i>Hovea pungens</i>	0.1	20	WWF02-19
<i>Hypochaeris glabra</i>	0.1	15	WWF02-09
<i>Lepidosperma tenue</i>	0.1	20	WWF02-02
<i>Loxocarya striata</i>	1	15	WWF02-04
<i>Melaleuca trichophylla</i>	8	130	WWF02-16
<i>Monotaxis grandiflora</i> var. <i>grandiflora</i>	0.1	20	WWF02-13
<i>Neurachne alopecuroides</i>	0.1	20	=WFF01-19
<i>Opercularia vaginata</i>	0.1	20	WWF02-06
<i>Petrophile megalostegia</i>	1	100	WWF02-18
<i>Thysanotus manglesianus</i>	0.1	25	=WFF01-08
<i>Trachymene pilosa</i>	0.1	2	WWF02-07
<i>Ursinia anthemoides</i>	0.1	5	WWF02-08

Warradarge Site WWF03
 Described by RWSW Date 21/10/2011 Type Quadrat 10 x 10 m
 MGA Zone 50 357075 mE 6688044 mN
 Habitat Crest and upper slope of medium rise
 Soil White grey (orange) sand
 Rock Type Laterite cobbles and pebbles
 Vegetation *Eucalyptus gittinsii* open tree mallee over *Banksia armata* var. *armata*, *Banksia strictifolia*, *Banksia kippistiana* var. *kippistiana*, *Petrophile shuttleworthiana*, *Hakea lissocarpha* open heath.
 Veg Condition Excellent
 Fire Age No sign of recent fire

Species List:

Species	Cover (%)	Height (cm)	Specimen
<i>Acacia applanata</i>	0.1	40	-
<i>Banksia armata</i> var. <i>armata</i>	30	200	WWF03-09
<i>Banksia kippistiana</i> var. <i>kippistiana</i>	1	100	=WFF01-26
<i>Banksia strictifolia</i>	2	180	=WWF02-12
<i>Dampiera lavandulacea</i>	0.1	30	WWF03-07
<i>Eucalyptus gittinsii</i> subsp. <i>illucida</i>	25	500	WWF03-01
<i>Hakea gilbertii</i>	0.1	50	=WFF02-20
<i>Hakea lissocarpha</i>	1	150	=WWF02-17
<i>Hibbertia subvaginata</i>	0.1	40	=WFF02-11
<i>Lepidosperma squamatum</i>	0.1	35	WWF03-02
<i>Monotaxis grandiflora</i> var. <i>grandiflora</i>	0.1	30	=WFF02-13
<i>Opercularia vaginata</i>	0.1	10	WWF03-08
<i>Opercularia vaginata</i>	0.1	10	=WFF02-06
<i>Petrophile shuttleworthiana</i>	1	180	=WFF01-22
<i>Schoenus</i> sp. smooth culms (K.R. Newbey 7823)	0.1	15	WWF03-05
<i>Stylidium miniatum</i>	0.1	30	WWF03-04
<i>Tetratheca confertifolia</i>	0.1	20	WWF03-06
<i>Thysanotus manglesianus</i>	0.1	30	WWF03-03

Warradarge Site WWF04
 Described by RWSW Date 21/10/2011 Type Quadrat 10 x 10 m
 MGA Zone 50 356403 mE 6686689 mN
 Habitat Gentle east sloping sandplain
 Soil White sand
 Rock Type No surface rock type/form visible

Vegetation Banksia attenuata low woodland over Leptospermum sp., Eremaea beaufortioides var. microphylla, Conostephium magnum, Jacksonia hakeoides shrubland over Hibbertia subvaginata scattered low shrubs.

Veg Condition Excellent

Fire Age Very long unburnt

Species List:

Species	Cover (%)	Height (cm)	Specimen
Alexgeorgea nitens	0.1	15	WWF04-02
Amphipogon turbinatus	0.1	30	WWF04-11
Austrostipa macalpinei	0.1	40	WWF04-24
Austrostipa macalpinei	0.1	20	WWF04-07
Banksia attenuata	12	160	WWF04-23
Banksia attenuata	4	500	WWF04-22
Cassytha flava	0.1	50	WWF04-12
Conostephium magnum	2	100	WWF04-19
Drosera eneabba	0.1	2	WWF04-05
Drosera humilis	0.1	5	WWF04-04
Eremaea beaufortioides var. microphylla	3	100	WWF04-20
Gompholobium tomentosum	-	-	WWF04-06
Hakea incrassata	-	-	WWF04-15B
Hibbertia subvaginata	1	30	WWF04-10
Hypochaeris glabra	0.1	15	WWF04-14
Jacksonia hakeoides	1	120	WWF04-21
Lepidosperma squamatum	0.1	15	=WWF03-02
Leptospermum oligandrum	0.1	40	WWF04-15
Leptospermum sp.	20	200	WWF04-17
Levenhookia stipitata	0.1	5	WWF04-03
Neurachne alopecuroidea	0.1	40	WWF04-16
Podotheca angustifolia	0.1	5	WWF04-08
Schoenus sp. smooth culms (K.R. Newbey 7823)	0.1	50	WWF04-18
Trachymene pilosa	0.1	10	WWF04-01
Ursinia anthemoides	0.1	15	WWF04-13
Verticordia sp.	0.1	70	WWF04-09

Warradarge Site WWF05

Described by RWSW Date 22/10/2011 Type Quadrat 10 x 10 m

MGA Zone 50 350803mE 6684780mN

Habitat Very gentle west-sloping low rise

Soil White grey sand

Rock Type Nil

Vegetation Eucalyptus tottiana low open woodland over Adenanthos cygnorum subsp. cygnorum, Xanthorrhoea drummondii, Leptospermum oligandrum open shrubland over Eremaea pauciflora, Jacksonia floribunda, Daviesia pauciflora low shrubland over Mesomelaena pseudostygia very open sedgeland.

Veg Condition Excellent

Fire Age No sign of recent fire

Species List:

Species	Cover (%)	Height (cm)	Specimen
Acacia auronitens	0.1	30	WWF05-24
Adenanthos cygnorum subsp. cygnorum	5	140	WWF05-25
Alexgeorgea nitens	0.1	30	WWF05-31
Amphipogon turbinatus	0.1	70	WWF05-13
Andersonia heterophylla	0.1	30	WWF05-38
Anigozanthos humilis subsp. humilis	0.1	25	WWF05-09
Astroloma xerophyllum	0.1	60	WWF05-42
Baeckea grandiflora	0.1	35	WWF05-47
Banksia dallanneyi subsp. media	0.1	35	WWF05-37
Burchardia sp.	0.1	50	WWF05-32
Centrolepis pilosa	-	-	WWF05-11B
Comesperma virgatum	0.1	30	WWF05-45
Conostylis teretifolia subsp. teretifolia	0.1	20	WWF05-12
Conostylis tomentosa	0.1	35	WWF05-13
Daviesia podophylla	1	50	WWF05-28
Desmocladus virgatus	0.1	30	WWF05-43
Drosera echinoblastus	0.1	20	WWF05-23

Species	Cover (%)	Height (cm)	Specimen
<i>Drosera menziesii</i> subsp. <i>penicillaris</i>	0.1	20	WWF05-21
<i>Drosera porrecta</i>	0.1	20	WWF05-08
<i>Eremaea asterocarpa</i>	0.1	40	-
<i>Eremaea beaufortioides</i> var. <i>microphylla</i>	0.1	60	WWF05-36
<i>Eremaea pauciflora</i>	11	70	-
<i>Eucalyptus tottiana</i>	4	300	WWF05-34
<i>Haemodorum spicatum</i>	0.1	110	WWF05-10
<i>Hibbertia acerosa</i>	0.1	20	WWF05-07
<i>Hibbertia hypericoides</i>	0.1	40	WWF05-50
<i>Hibbertia leucocrossa</i>	0.1	25	WWF05-41
<i>Hibbertia</i> sp. Mt Lesueur (M. Hislop 174)	0.1	30	WWF05-04
<i>Hypolaena robusta</i>			WWF05-51
<i>Jacksonia floribunda</i>	2	40	WWF05-20
<i>Jacksonia lehmannii</i>	0.1	30	WWF05-02
<i>Johnsonia pubescens</i>	0.1	30	WWF05-03
<i>Leptospermum oligandrum</i>	0.1	150	WWF05-06
<i>Leptospermum oligandrum</i>	1	130	WWF05-18
<i>Leptospermum spinescens</i>	0.1	50	WWF05-29
<i>Leucopogon</i> sp.	-	-	-
<i>Levenhookia pusilla</i>	0.1	2	WWF05-16
<i>Lomandra</i> sp.	0.1	40	WWF05-33
<i>Lysinema pentapetalum</i>	0.1	35	=WWF-BM65
<i>Melaleuca leuropoma</i>	0.1	60	WWF05-51
<i>Mesomelaena pseudostygia</i>	4	120	=WWF06-33
<i>Neurachne alopecuroidea</i>	0.1	50	=WWF04-16
<i>Petrophile linearis</i>	0.1	30	WWF05-26
<i>Phyllangium</i> sp.	0.1	3	WWF05-17
<i>Schoenus breviculmis</i>	0.1	40	WWF05-44
<i>Schoenus clandestinus</i>	0.1	10	WWF05-01
<i>Schoenus insolitus</i>	0.1	60	WWF05-35
<i>Stenanthemum humile</i>	0.1	15	WWF05-14
<i>Stirlingia latifolia</i>	0.1	25	WWF05-48
<i>Stylidium</i> sp.	0.1	20	=WWF16-05
<i>Stylidium</i> sp.	0.1	15	WWF05-11A
<i>Stylidium</i> sp.	-	-	=WWF16-05
<i>Synaphea endothrix</i>	0.1	30	WWF05-27
<i>Trachymene pilosa</i>	0.1	5	WWF05-30
<i>Tricoryne elatior</i>	0.1	12	WWF05-39
<i>Verticordia</i> sp.	0.1	80	WWF05-46
<i>Xanthorrhoea drummondii</i>	2	100	WWF05-40
<i>Xanthosia huegelii</i>	0.1	12	WWF05-40B
Shrub	0.1	25	WWF05-05
Shrub	0.1	130	WWF05-49
Myrtaceae	0.1	50	WWF05-19

Warradarge Site WWF06
 Described by RWSW Date 22/10/2011 Type Quadrat 10 x 10 m
 MGA Zone 50 350640mE 6684370mN
 Habitat Plain in broader undulating area
 Soil White sand
 Rock Type Nil
 Vegetation *Eucalyptus tottiana* low woodland over *Banksia candolleana*, *Leptospermum oligandrum*, *Banksia sphaerocarpa* var. *pumilio*, *Leptospermum oligandrum*, *Allocasuarina humilis*, *Leucopogon oldfieldii* open heath over *Lomandra hastilis* very open sedgeland over *Hibbertia leucocrossa* scattered low shrubs, *Desmocladius virgatus* scattered sedges.
 Veg Condition Excellent
 Fire Age No sign of recent fire

Species List:

Species	Cover (%)	Height (cm)	Specimen
<i>Acacia barbinervis</i> subsp. <i>borealis</i>	0.1	40	WWF06-10
<i>Allocasuarina humilis</i>	1	160	WWF06-22
<i>Amphipogon turbinatus</i>	0.1	30	WWF06-15
<i>Anigozanthos humilis</i> subsp. <i>humilis</i>	0.1	30	=WWF05-09
<i>Astroloma xerophyllum</i>	0.1	80	WWF06-04
<i>Austrostipa macalpinei</i>	0.1	30	WWF06-06
<i>Baeckea grandiflora</i>	0.1	30	=WWF09-26

Species	Cover (%)	Height (cm)	Specimen
<i>Banksia candolleana</i>	35	120	WWF06-29
<i>Banksia shuttleworthiana</i>	0.1	50	WWF06-20
<i>Banksia sphaerocarpa</i> var. <i>pumilio</i>	4	100	WWF06-17
<i>Beaufortia elegans</i>	0.1	100	WWF06-35
<i>Crassula colorata</i> var. <i>acuminata</i>	0.1	2	=WWF08-18
<i>Desmocladius virgatus</i>	2.5	20	WWF06-18
<i>Drosera echinoblastus</i>	0.1	10	=WWF05-23
<i>Drosera pallida</i>	0.1	25	WWF06-16
<i>Eremaea beaufortioides</i> var. <i>microphylla</i>	0.1	50	WWF06-09
<i>Eremaea pauciflora</i>	0.1	120	-
<i>Eucalyptus tottiana</i>	25	300	WWF06-31
<i>Gompholobium tomentosum</i>	0.1	110	WWF06-07
<i>Gompholobium tomentosum</i>	0.1	25	WWF06-11
<i>Gompholobium tomentosum</i>	0.1	30	WWF06-27
<i>Goodenia coerulea</i>	0.1	35	WWF06-21
<i>Hibbertia hypericoides</i>	0.1	35	WWF06-28
<i>Hibbertia leucocrossa</i>	2	10	WWF06-19
<i>Jacksonia floribunda</i>	0.1	70	=WWF05-20
<i>Jacksonia lehmannii</i>	0.1	50	WWF06-13
<i>Lasiopetalum drummondii</i>	0.1	100	WWF06-08
<i>Leptospermum oligandrum</i>	5	130	=WWF05-18
<i>Leptospermum spinescens</i>	0.1	60	WWF06-26
<i>Leucopogon oldfieldii</i>	1	120	WWF06-25
<i>Levenhookia</i> sp.	0.1	5	WWF05-16
<i>Lomandra hastilis</i>	3	130	WWF06-30
<i>Lomandra hermaphrodita</i>	0.1	25	WWF06-12
<i>Melaleuca leuropoma</i>	0.1	30	WWF06-03
<i>Melaleuca leuropoma</i>	0.1	100	WWF06-24
<i>Mesomelaena pseudostygia</i>	0.1	30	WWF06-33
<i>Neurachne alopecuroides</i>	0.1	40	WWF06-23
<i>Pentameris airoides</i>	0.1	15	WWF06-05
<i>Petrophile linearis</i>	0.1	50	=WWF05-26
<i>Petrophile linearis</i>	0.1	110	=WWF05-26
<i>Petrophile linearis</i>	0.1	30	WWF06-34
<i>Proteaceae</i> sp.	0.1	25	WWF06-14
<i>Schoenus brevisetis</i>	0.1	40	WWF06-32
<i>Schoenus clandestinus</i>	0.1	20	WWF06-01
<i>Schoenus curvifolius</i>	0.1	35	WWF06-02
<i>Trachymene pilosa</i>	0.1	5	-
<i>Ursinia anthemoides</i>	0.1	10	=WWF04-13
<i>Myrtaceae</i>	0.1	100	=WWF05-19

Warradarge Site WWF07

Described by SW Date 23/10/2011 Type Quadrat 10 x 10 m

MGA Zone 50 351524mE 6684410mN

Habitat Moderately steep rocky slope on north facing side of low mesa

Soil Dark brown surface layer of sandy loam

Rock Type Continuous laterite boulders, rocks, gravel with scattered outcropping

Vegetation *Melaleuca uncinata*, *Melaleuca coronicarpa* closed heath over *Calandrinia calypttrata* very open herbland.

Veg Condition Excellent

Fire Age No sign of recent fire

Species List:

Species	Cover (%)	Height (cm)	Specimen
<i>Austrostipa macalpinei</i>	0.1	20	WWF07-04
<i>Baeckea</i> sp. Bunney Road (S. Patrick 4059)	0.1	-	WWF07-06b
<i>Calandrinia calypttrata</i>	10	5	WWF07-02
<i>Ehrharta longiflora</i>	0.1	20	WWF07-07
<i>Melaleuca aspalathoides</i>	0.1	125	WWF07-06
<i>Melaleuca coronicarpa</i>	15	110	WWF07-03
<i>Melaleuca uncinata</i>	70	150	WWF07-01
<i>Pentameris airoides</i>	0.1	10	WWF07-09
<i>Stylidium caricifolium</i>	0.1	20	WWF07-08
<i>Trachymene pilosa</i>	0.1	10	WWF07-05

Warradarge Site WWF08

Described by RW Date 23/10/2011 Type Quadrat 10 x 10 m

MGA 50 351518mE 6684366mN
Habitat Crest of medium rise
Soil Brown sandy loam
Rock Type Pebbles, cobbles of orange sand/siltstone
Vegetation *Eucalyptus* sp. Badgingarra (D. Nicolle & M. French DN 3515) very open tree mallee over *Banksia sessilis* var. *flabellifolia*, *Petrophile shuttleworthiana*, *Xanthorrhoea drummondii*, *Calothamnus quadrifidus*, *Hakea auriculata*, *Hakea anadenia*, *Allocasuarina humilis* open heath over *Hakea lissocarpha*, *Hibbertia hypericoides*, *Daviesia epiphyllum* low open shrubland over *Lepidosperma tenue* scattered sedges.
Veg Condition Excellent
Fire Age No sign of recent fire
Notes Hillcrest has small linear stand of *Eucalypts* in which quadrat was established (on eastern side of crest).

Species List:

Species	Cover (%)	Height (cm)	Specimen
<i>Allocasuarina humilis</i>	1	110	WWF08-29
<i>Amphipogon caricinus</i> var. <i>caricinus</i>	0.1	30	WWF08-13
<i>Austrostipa macalpinei</i>	0.1	20	WWF08-02
<i>Banksia carlinoides</i>	0.1	120	WWF08-27
<i>Banksia sessilis</i> var. <i>flabellifolia</i>	50	150	WWF08-31
<i>Calothamnus quadrifidus</i>	1	130	WWF08-22
<i>Commersonia pulchella</i>	0.1	10	WWF08-05
<i>Crassula colorata</i> var. <i>acuminata</i>	0.1	5	WWF08-18
<i>Cryptandra pungens</i>	0.1	40	WWF08-26
<i>Daviesia epiphyllum</i>	1	50	WWF08-19
<i>Dodonaea ericoides</i>	0.1	25	WWF08-04
<i>Eucalyptus</i> sp. Badgingarra (D. Nicolle & M. French DN 3515)	9	300	WWF08-17
<i>Glischrocaryon aureum</i>	0.1	30	WWF08-15
<i>Hakea anadenia</i>	1	120	WWF08-20
<i>Hakea auriculata</i>	1	130	WWF08-30
<i>Hakea incrassata</i>	0.1	40	WWF08-25
<i>Hakea lissocarpha</i>	1	30	WWF08-28
<i>Hibbertia hypericoides</i>	1	30	WWF08-01
<i>Hovea trisperma</i>	0.1	25	WWF08-21
<i>Hypochaeris glabra</i>	0.1	2	WWF08-07
<i>Lepidosperma tenue</i>	1	30	WWF08-03
<i>Loxocarya striata</i>	0.1	15	WWF08-09
<i>Marianthus bicolor</i>	0.1	120	WWF08-14
<i>Monotaxis grandiflora</i> var. <i>grandiflora</i>	0.1	30	WWF08-23
<i>Neurachne alopecuroidea</i>	0.1	35	=WWF04-16
<i>Pentameris airoides</i>	0.1	5	WWF08-06
<i>Petrophile shuttleworthiana</i>	2	120	WWF08-24
<i>Podotheca angustifolia</i>	0.1	5	WWF08-11
<i>Podotheca gnaphalioides</i>	0.1	25	WWF08-08
<i>Stylidium miniatum</i>	0.1	25	WWF08-16
<i>Trachymene pilosa</i>	0.1	5	-
<i>Ursinia anthemoides</i>	0.1	25	-
<i>Wahlenbergia</i> sp.	0.1	10	WWF08-10
<i>Xanthorrhoea drummondii</i>	1.5	100	=OPP RW122
Poaceae	0.1	15	WWF08-12

Warradarge Site WWF09
Described by RWSW Date 23/10/2011 Type Quadrat 10 x 10 m
MGA Zone 50 351728mE 6684273mN
Habitat Lower and middle slope of medium rise
Soil Brown grey, sandy loam
Rock Type Pebbles and cobbles of orange sand/siltstone
Vegetation *Calothamnus longissimus*, *Melaleuca aspalathoides*, *Hakea auriculata* low open shrubland over *Tetraria octandra*, *Mesomelaena pseudostygia*, *Neurachne alopecuroidea*, *Amphipogon caricinus* open sedgeland/grassland.
Veg Condition Excellent
Fire Age No sign of recent fire

Species List:

Species	Cover (%)	Height (cm)	Specimen
<i>Acacia lasiocarpa</i> var. <i>lasiocarpa</i>	0.1	30	WWF09-17
<i>Acacia wilsonii</i>	0.1	20	WWF09-23

<i>Amphipogon caricinus</i> var. <i>caricinus</i>	1	20	WWF09-04
<i>Baeckea crispiflora</i> var. <i>tenuior</i>	0.1	30	WWF09-29
<i>Baeckea grandiflora</i>	0.1	25	WWF09-26
<i>Bromus diandrus</i>	0.1	25	WWF09-11
<i>Calothamnus longissimus</i>	4	50	WWF09-05
<i>Calytrix</i> sp.	0.1	20	WWF09-14
<i>Cassytha glabella</i> forma <i>casuarinae</i>	0.1	5	WWF09-10
<i>Daviesia chapmanii</i>	0.1	30	WWF09-18
<i>Dodonaea ericoides</i>	0.1	30	WWF09-21
<i>Glischrocaryon aureum</i>	1	50	=WWF08-15
<i>Goodenia coerulea</i>	0.1	25	WWF09-20
<i>Goodenia glareicola</i>	0.1	10	WWF09-03
<i>Goodenia glareicola</i>	0.1	20	WWF09-28
<i>Goodenia trichophylla</i>	0.1	20	WWF09-27
<i>Hakea auriculata</i>	1	80	=WWF08-30
<i>Hakea lissocarpa</i>	0.1	40	=WWF08-28
<i>Hibbertia hypericoides</i>	0.1	25	WWF09-24
<i>Leucopogon phyllostachys</i>	0.1	45	WWF09-13
<i>Levenhookia stipitata</i>	0.1	3	WWF09-15
<i>Melaleuca aspalathoides</i>	2	20	WWF09-01
<i>Melaleuca trichophylla</i>	0.1	35	WWF09-22
<i>Melaleuca trichophylla</i>	0.1	35	WWF09-02
<i>Mesomelaena pseudostygia</i>	1	50	WWF09-25
<i>Monotaxis grandiflora</i> var. <i>grandiflora</i>	0.1	10	=WWF08-23
<i>Neurachne alopecuroides</i>	2	30	=WWF04-16
<i>Opercularia vaginata</i>	0.1	30	WWF09-19
<i>Podolepis canescens</i>	0.1	5	WWF09-09
<i>Schoenus brevisetis</i>	0.1	30	WWF09-31
<i>Schoenus clandestinus</i>	0.1	5	WWF09-30
<i>Stenanthemum reissekii</i>	0.1	15	WWF09-12
<i>Stylidium diuroides</i> subsp. <i>paucifolium</i>	0.1	35	WWF09-16
<i>Tetraria octandra</i>	10	30	WWF09-06
<i>Tetraria octandra</i>	0.1	35	WWF09-07
<i>Trachymene pilosa</i>	0.1	10	-
<i>Verticordia</i> sp.	0.1	30	WWF09-08

Warradarge Site WWF10
 Described by RWSW Date 23/10/2011 Type Quadrat 10 x 10 m
 MGA Zone 50 353364mE 6684706mN
 Habitat South east facing slope in undulating plain
 Soil: Nil
 Rock Type Laterite pebbles, cobbles, boulders
 Vegetation *Banksia sessilis* var. *flabellifolia*, (*Banksia kippistiana* var. *kippistiana*) open heath over *Hakea auriculata*, *Banksia sphaerocarpa* var. *pumilio*, *Hibbertia hypericoides* low open shrubland over *Tetraria octandra* scattered sedges.
 Veg Condition Excellent
 Fire Age No sign of recent fire

Species List:

Species	Cover (%)	Height (cm)	Specimen
<i>Baeckea grandiflora</i>	0.1	30	=WWF09
<i>Banksia carlinoides</i>	0.1	40	WWF10-19
<i>Banksia kippistiana</i> var. <i>kippistiana</i>	10	100	=WWF01-26
<i>Banksia nana</i>	0.1	30	WWF10-21
<i>Banksia sclerophylla</i>	0.1	60	WWF10-24
<i>Banksia sessilis</i> var. <i>flabellifolia</i>	60	140	=WWF02-21
<i>Banksia sphaerocarpa</i> var. <i>pumilio</i>	1	100	WWF10-20
<i>Beaufortia bracteosa</i>	0.1	20	WWF10-18
<i>Calothamnus</i> sp.	0.1	20	WWF10-23
<i>Cassytha glabella</i> forma <i>casuarinae</i>	0.1	25	WWF10-15
<i>Caustis dioica</i>	0.1	35	WWF10-06
<i>Conothamnus trinervis</i>	0.1	25	WWF10-09
<i>Dampiera spicigera</i>	0.1	35	WWF10-04
<i>Drosera barbigera</i>	0.1	2	WWF10-17
<i>Gastrolobium polystachyum</i>	0.1	20	WWF10-12
<i>Haemodorum venosum</i>	0.1	15	WWF10-16
<i>Hakea auriculata</i>	1	80	WWF10-22
<i>Hakea gilbertii</i>	0.1	35	WWF10-03
<i>Hibbertia fasciculiflora</i>	0.1	25	WWF10-02

Species	Cover (%)	Height (cm)	Specimen
<i>Hibbertia hypericoides</i>	1	30	=WWF09-24
<i>Hypocalymma hirsutum</i>	0.1	30	WWF10-07
<i>Leucopogon phyllostachys</i>	0.1	100	=WWF09-13
<i>Levenhookia stipitata</i>	0.1	3	=WWF09-15
<i>Melaleuca platycalyx</i>	0.1	30	WWF10-08
<i>Mesomelaena pseudostygia</i>	0.1	30	=WWF09-25
<i>Neurachne alopecuroidea</i>	0.1	30	=WWF04-16
<i>Petrophile megalostegia</i>	0.1	80	=WWF02-18
<i>Petrophile shuttleworthiana</i>	0.1	120	=WWF08-24
Restionaceae, inadequate material	0.1	10	WWF10-13
<i>Schoenus brevisetis</i>	0.1	20	WWF10-01
<i>Stylidium caricifolium</i>	0.1	10	WWF10-10
<i>Stylidium cygnorum</i>	0.1	15	WWF10-11
<i>Tetraria octandra</i>	1	40	WWF10-14
<i>Vulpia myuros</i> forma <i>megalura</i>	0.1	15	WWF10-05
<i>Xanthorrhoea drummondii</i>	0.1	60	=RW122

Warradarge Site WWF11
 Described by RWSW Date 24/10/2011 Type Quadrat 10 x 10 m
 MGA Zone 50 351992mE 6683898mN
 Habitat Level top of medium rise east of breakaway
 Soil White grey sand
 Rock Type No visible rock type
 Vegetation *Eucalyptus tottiana* low woodland over *Xanthorrhoea drummondii*, *Eremaea pauciflora* open shrubland over *Mesomelaena pseudostygia*, *Austrostipa macalpinei* very open sedgeland/grassland.
 Veg Condition Very Good
 Fire Age No sign of recent fire

Species List:

Species	Cover (%)	Height (cm)	Specimen
<i>Allocasuarina humilis</i>	0.1	140	WWF11-23
<i>Anigozanthos humilis</i> subsp. <i>humilis</i>	0.1	20	WWF11-20
<i>Aristida holathera</i> var. <i>holathera</i>	0.1	30	WWF11-26
<i>Austrostipa hemipogon</i>	0.1	40	WWF11-25
<i>Austrostipa macalpinei</i>	1	60	WWF11-01
<i>Baeckea grandiflora</i>	0.1	50	WWF11-22
<i>Caustis dioica</i>	0.1	10	WWF11-14
<i>Conostylis teretifolia</i> subsp. <i>teretifolia</i>	0.1	25	WWF11-17
<i>Crassula colorata</i> var. <i>colorata</i>	0.1	5	WWF11-04
<i>Drosera</i> sp.	0.1	10	WWF11-16
<i>Eremaea pauciflora</i>	2	110	-
<i>Erodium botrys</i>	0.1	5	WWF11-06
<i>Eucalyptus tottiana</i>	20	250	=WWF06-31
<i>Haemodorum spicatum</i>	0.1	80	=WWF05-10
<i>Hibbertia hypericoides</i>	0.1	30	WWF11-24
<i>Hibbertia leucocrossa</i>	0.1	80	WWF11-18
<i>Hypochaeris glabra</i>	0.1	10	WWF11-05
<i>Hypochaeris glabra</i>	0.1	10	WWF11-09
<i>Hypochaeris glabra</i>	0.1	20	WWF11-21
<i>Hypochaeris radicata</i>	0.1	5	WWF11-10B
<i>Laxmannia sessiliflora</i> subsp. <i>drummondii</i>	0.1	7	WWF11-13
<i>Lepidosperma scabrum</i>	0.1	40	WWF11-11
<i>Levenhookia stipitata</i>	0.1	3	=WWF09-15
<i>Mesomelaena pseudostygia</i>	2	60	=WWF09-25
<i>Pentameris airoides</i>	0.1	10	WWF11-07
<i>Quinetia urvillei</i>	-	5	WWF11-10A
<i>Rytidosperma setaceum</i>	0.1	20	WWF11-15
<i>Stylidium</i> sp.	0.1	10	WWF11-12
<i>Trachymene pilosa</i>	0.1	5	-
<i>Trifolium arvense</i> var. <i>arvense</i>	0.1	15	WWF11-02
<i>Ursinia anthemoides</i>	0.1	20	WWF11-19
<i>Wahlenbergia capensis</i>	0.1	10	WWF11-08
<i>Wahlenbergia capensis</i>	0.1	25	WWF11-03
<i>Xanthorrhoea drummondii</i>	3	120	=RW122

Warradarge Site WWF12

Described by RWSW Date 24/10/2011 Type Quadrat 10 x 10 m
 MGA Zone 50 352345mE 6684019mN
 Habitat Gentle northeast facing slope within broader undulating plain
 Soil Grey to light brown sandy loam
 Rock Type Laterite pebbles, cobbles and boulders
 Vegetation *Hakea anadenia*, *Hakea auriculata*, *Petrophile shuttleworthiana*, *Hibbertia* sp. Mt Lesueur (M. Hislop 174) open shrubland over *Calothamnus torulosus*, *Daviesia epiphyllum*, *Banksia shuttleworthiana*, *Melaleuca trichophylla*, *Beaufortia bracteosa*, *Leucopogon* sp. Warradarge (M. Hislop 1908) low shrubland.
 Veg Condition Excellent
 Fire Age No sign of recent fire

Species List:

Species	Cover (%)	Height (cm)	Specimen
<i>Acacia auronitens</i>	0.1	25	WWF12-22
<i>Allocasuarina grevilleoides</i>	0.1	40	WWF12-01
<i>Allocasuarina humilis</i>	0.1	80	WWF12-29
<i>Allocasuarina ramosissima</i>	0.1	100	WWF12-26
<i>Astroloma glaucescens</i>	0.1	30	WWF12-34
<i>Baeckea grandiflora</i>	0.1	35	=WWF11-22
<i>Banksia bipinnatifida</i> subsp. <i>multifida</i>	0.1	20	WWF12-09
<i>Banksia carlinoides</i>	0.1	100	WWF12-06
<i>Banksia cypholoba</i>	0.1	30	WWF12-15
<i>Banksia shuttleworthiana</i>	5	80	=WWF06-20
<i>Beaufortia bracteosa</i>	1	35	WWF12-18
<i>Calothamnus torulosus</i>	3	40	WWF12-28
<i>Calytrix chrysantha</i>	0.1	100	WWF12-23
<i>Cassytha flava</i>	0.1	35	WWF12-12
<i>Caustis dioica</i>	0.1	30	WWF12-20
<i>Dampiera spicigera</i>	0.1	20	WWF12-32
<i>Daviesia epiphyllum</i>	1.5	80	WWF12-25
<i>Desmocladius virgatus</i>	0.1	30	WWF12-19
<i>Drosera menziesii</i> subsp. <i>penicillaris</i>	0.1	5	WWF12-13
<i>Gastrolobium plicatum</i>	0.1	30	WWF12-30
<i>Glischrocaryon aureum</i>	0.1	40	=RW167
<i>Goodenia coerulea</i>	0.1	35	WWF12-31
<i>Hakea anadenia</i>	6	120	=SW34
<i>Hakea auriculata</i>	1	120	WWF12-33
<i>Hakea incrassata</i>	0.1	30	WWF12-11
<i>Hibbertia fasciculiflora</i>	0.1	30	WWF12-37
<i>Hibbertia leucocrossa</i>	0.1	30	=WWF13-20
<i>Hibbertia</i> sp. Mt Lesueur (M. Hislop 174)	1	110	WWF12-38
<i>Jacksonia restioides</i>	0.1	30	WWF12-04
<i>Lepidosperma tenue</i>	0.1	30	WWF12-31
<i>Leucopogon phyllostachys</i>	0.1	35	WWF12-27
<i>Leucopogon</i> sp. Warradarge (M. Hislop 1908)	1	20	WWF12-17
<i>Leucopogon</i> sp. Warradarge (M. Hislop 1908)	0.1	20	WWF12-03
<i>Levenhookia pusilla</i>	0.1	2	=WWF05-16
<i>Lobelia rarifolia</i>	0.1	10	WWF12-05
<i>Melaleuca aspalathoides</i>	0.1	35	WWF12-36
<i>Melaleuca trichophylla</i>	1	30	WWF12-02
<i>Melaleuca trichophylla</i>	2	50	WWF12-21
<i>Mesomelaena pseudostygia</i>	0.1	35	=WWF09-25
<i>Neurachne alopecuroidea</i>	0.1	40	=WWF04-16
<i>Petrophile megalostegia</i>	0.1	15	WWF12-10
<i>Petrophile shuttleworthiana</i>	1	100	WWF01-22
<i>Ptilotus</i> sp.	0.1	20	WWF12-14
<i>Schoenus</i> sp. smooth culms (K.R. Newbey 7823)	0.1	15	WWF12-07
<i>Sphaerolobium</i> sp.	0.1	30	=RW165
<i>Stylidium diuroides</i> subsp. <i>paucifoliatum</i>	0.1	30	WWF12-16
<i>Stylidium stenosepalum</i>	0.1	25	WWF12-08
<i>Tetraria octandra</i>	0.1	35	WWF12-35
<i>Thysanotus spiniger</i>	0.1	60	WWF12-24
<i>Xanthorrhoea drummondii</i>	0.1	80	=RW122

Warradarge Site WWF13
 Described by RWSW Date 24/10/2011 Type Quadrat 10 x 10 m
 MGA Zone 50 352949mE 6684281mN

Habitat	Plain in undulating area
Soil	White grey sand
Rock Type	Nil
Vegetation	<i>Adenanthos cygnorum</i> subsp. <i>cygnorum</i> (<i>Astroloma xerophyllum</i>) open heath over <i>Daviesia nudiflora</i> subsp. <i>hirtella</i> , <i>Hibbertia acerosa</i> scattered low shrubs.
Veg Condition	Excellent
Fire Age	No sign of recent fire
Notes	Broader vegetation has <i>Eucalyptus tottiana</i> (none sampled in quadrat)

Species List:

Species	Cover (%)	Height (cm)	Specimen
<i>Adenanthos cygnorum</i> subsp. <i>cygnorum</i>	60	150	WWF13-17
<i>Astroloma xerophyllum</i>	1	120	WWF13-21
<i>Austrostipa hemipogon</i>	0.1	45	WWF13-02
<i>Baeckea grandiflora</i>	0.1	40	=WWF11-22
<i>Bossiaea eriocarpa</i>	0.1	30	WWF13-10
<i>Conospermum nervosum</i>	0.1	110	WWF13-01
<i>Conostylis tomentosa</i>	0.1	30	WWF13-11
<i>Daviesia nudiflora</i> subsp. <i>hirtella</i>	1	90	WWF13-25
<i>Desmoclados virgatus</i>	0.1	70	WWF13-18
<i>Desmoclados virgatus</i>	0.1	35	WWF13-16
<i>Drosera parvula</i>	0.1	10	WWF13-05
<i>Haemodorum spicatum</i>	0.1	5	=WWF11
<i>Hemiandra pungens</i>	0.1	20	WWF13-23
<i>Hibbertia acerosa</i>	0.1	25	WWF13-08
<i>Hibbertia acerosa</i>	1	25	WWF13-06
<i>Hibbertia leucocrossa</i>	0.1	40	WWF13-20
<i>Hibbertia</i> sp. Mt Lesueur (M. Hislop 174)	0.1	25	WWF13-19
<i>Hovea trisperma</i>	0.1	25	WWF13-29
<i>Hypochaeris glabra</i>	0.1	30	WWF13-27
<i>Jacksonia floribunda</i>	0.1	40	WWF13-26
<i>Lepidosperma scabrum</i>	0.1	50	WWF13-03
<i>Levenhookia stipitata</i>	0.1	5	WWF13-15
<i>Podotheca angustifolia</i>	0.1	5	WWF13-12
<i>Rytidosperma setaceum</i>	0.1	10	WWF13-09
<i>Schoenus pedicellatus</i>	0.1	45	WWF13-28
<i>Stirlingia latifolia</i>	0.1	40	WWF13-22
<i>Synaphea spinulosa</i> subsp. <i>spinulosa</i>	0.1	35	WWF13-24
<i>Trachymene pilosa</i>	0.1	5	WWF13-14
<i>Ursinia anthemoides</i>	0.1	25	=WWF11
<i>Wahlenbergia capensis</i>	0.1	10	WWF13-13

Warradarge	Site	WWF14			
Described by	RWSW	Date	25/10/2011	Type	Quadrat 10 x 10 m
MGA Zones	50	355840 mE	6686327 mN		
Habitat	Crest of low rise in gently undulating area				
Soil	Grey brown sand				
Rock Type	Scattered pebbles (few cobbles) of laterite				
Vegetation	<i>Eucalyptus gittinsii</i> open tree mallee over <i>Banksia armata</i> var. <i>armata</i> , <i>Banksia splendida</i> subsp. <i>macrocarpa</i> , <i>Hakea gilbertii</i> , <i>Petrophile shuttleworthiana</i> , <i>Allocasuarina humilis</i> , <i>Banksia glaucifolia</i> , <i>Gastrolobium polystachyum</i> , <i>Banksia kippistiana</i> var. <i>kippistiana</i> , <i>Melaleuca trichophylla</i> shrubland over <i>Conostylis androstemma</i> scattered small shrubs, <i>Tetraria octandra</i> scattered sedges.				
Veg Condition	Excellent				
Fire Age	No sign of recent fire				

Species List:

Species	Cover (%)	Height (cm)	Specimen
<i>Allocasuarina humilis</i>	2	140	WWF14-34
<i>Andersonia lehmanniana</i>	0.1	30	WWF14-28
<i>Astroloma glaucescens</i>	0.1	45	WWF14-20
<i>Astroloma microdonta</i>	0.1	20	WWF14-41
<i>Baeckea grandiflora</i>	0.1	30	WWF14-21
<i>Banksia armata</i> var. <i>armata</i>	6.5	190	WWF14-37
<i>Banksia carlinoides</i>	0.1	120	WWF14-40
<i>Banksia glaucifolia</i>	2	190	WWF14-35
<i>Banksia kippistiana</i> var. <i>kippistiana</i>	1	110	=WWF01-26
<i>Banksia shuttleworthiana</i>	0.1	25	WWF14-39

<i>Banksia splendida</i> subsp. <i>macrocarpa</i>	6	130	WWF14-26
<i>Beaufortia bracteosa</i>	0.1	50	WWF14-17
<i>Calytrix angulata</i>	0.1	30	WWF14-43
<i>Calytrix flavescens</i>	0.1	30	WWF14-45
<i>Calytrix flavescens</i>	0.1	35	WWF14-18
<i>Caustis dioica</i>	0.1	35	WWF14-02
<i>Caustis dioica</i>	0.1	60	WWF14-33
<i>Conostylis androstemma</i>	1	30	WWF14-25
<i>Conothamnus trinervis</i>	0.1	40	WWF14-44
<i>Dampiera spicigera</i>	0.1	20	WWF14-11
<i>Daviesia daphnoides</i>	0.1	150	WWF14-04
<i>Eucalyptus drummondii</i>	0.1	200	WWF14-36
<i>Eucalyptus gittinsii</i> subsp. <i>illucida</i>	17	350	WWF14-07
<i>Gastrolobium plicatum</i>	0.1	40	WWF14-23
<i>Gastrolobium polystachyum</i>	1	140	WWF14-22
<i>Gompholobium knightianum</i>	0.1	70	WWF14-08
<i>Goodenia coerulea</i>	0.1	20	WWF14-27
<i>Hakea anadenia</i>	0.1	120	WWF14-16
<i>Hakea gilbertii</i>	5.5	140	WWF14-38
<i>Hakea incrassata</i>	0.1	50	WWF14-31
<i>Hakea stenocarpa</i>	0.1	50	WWF14-29
<i>Hibbertia fasciculiflora</i>	0.1	25	WWF14-01
<i>Hibbertia hypericoides</i>	0.1	30	WWF14-42
<i>Loxocarya striata</i>	0.1	20	WWF14-30
<i>Melaleuca trichophylla</i>	1	190	WWF14-13
<i>Neurachne alopecuroidea</i>	0.1	45	-
<i>Petrophile megalostegia</i>	0.1	40	WWF14-19
<i>Petrophile shuttleworthiana</i>	4	130	-
<i>Petrophile striata</i>	0.1	120	WWF14-32
<i>Polianthion wichurae</i>	0.1	60	WWF14-06
<i>Pterostylis recurva</i>	0.1	15	WWF14-09
<i>Schoenus brevisetis</i>	0.1	25	WWF14-05
<i>Stylidium cygnorum</i>	0.1	10	WWF14-14
<i>Stylidium miniatum</i>	0.1	15	WWF14-12
<i>Stylidium</i> sp.	0.1	40	WWF14-10
<i>Stylidium stenosepalum</i>	0.1	30	WWF14-15
<i>Tetraria octandra</i>	1	45	WWF14-24
<i>Xanthosia huegelii</i>	0.1	20	WWF14-03

Warradarge Site WWF15
 Described by RWSW Date 25/10/2011 Type Quadrat 10 x 10 m
 MGA Zone 50 357006mE 6686927mN
 Habitat Gently undulating plain
 Soil Orange-white sand
 Rock Type Laterite pebbles, cobbles, boulders
 Vegetation *Eucalyptus accedens* low open forest over *Banksia shuttleworthiana*, *Allocasuarina humilis* shrubland over *Opercularia vaginata* (*Lepidosperma tenue*) open sedgeland.
 Veg Condition Very Good
 Fire Age No sign of recent fire

Species List:

Species	Cover (%)	Height (cm)	Specimen
<i>Allocasuarina humilis</i>	4	200	WWF15-16
<i>Austrostipa elegantissima</i>	0.1	50	WWF15-07
<i>Austrostipa macalpinei</i>	0.1	20	WWF15-13
<i>Banksia shuttleworthiana</i>	8.5	160	WWF15-18
<i>Banksia strictifolia</i>	0.1	200	WWF15-17
<i>Caustis dioica</i>	0.1	60	WWF15-03
<i>Conostylis aculeata</i> subsp. <i>breviflora</i>	0.1	25	WWF15-04
<i>Eucalyptus accedens</i>	45	550	WWF15-01
<i>Hakea lissocarpa</i>	0.1	60	WWF15-12
<i>Hibbertia huegelii</i>	0.1	50	WWF15-11
<i>Hypochaeris glabra</i>	0.1	10	WWF15-09
<i>Lepidosperma tenue</i>	1	40	WWF15-10
<i>Neurachne alopecuroidea</i>	0.1	40	WWF15-05
<i>Neurachne alopecuroidea</i>	0.1	30	WWF15-06
<i>Opercularia vaginata</i>	20	15	WWF15-15
<i>Podotheca angustifolia</i>	0.1	2	WWF15-08
<i>Schoenus pedicellatus</i>	0.1	25	WWF15-19
<i>Trachymene pilosa</i>	0.1	10	-

Species	Cover (%)	Height (cm)	Specimen
<i>Ursinia anthemoides</i>	0.1	30	-
<i>Vulpia muralis</i>	0.1	20	WWF15-02
<i>Wahlenbergia</i> sp.	0.1	10	WWF15-14

Warradarge Site WWF16
 Described by RWSW Date 25/10/2011 Type Quadrat 10 x 10 m
 MGA Zone 50 356640mE 6686289mN
 Habitat Undulating plain, sloping to the north
 Soil White over brown sand
 Rock Type No rocks
 Vegetation *Banksia menziesii*, *Banksia attenuata* low woodland over *Leptospermum* sp. tall open shrubland over *Lachnostachys eriobotrya*, *Acacia pulchella* var. *glaberrima*, *Jacksonia nutans* open shrubland over *Eremaea beaufortioides* var. *microphylla* scattered low shrubs over *Alexgeorgea nitens* very open sedgeland.
 Veg Condition Excellent
 Fire Age No sign of recent fire

Species List:

Species	Cover (%)	Height (cm)	Specimen
<i>Acacia pulchella</i> var. <i>glaberrima</i>	2	130	WWF16-17
<i>Alexgeorgea nitens</i>	2	20	WWF16-10
<i>Amphipogon turbinatus</i>	0.1	35	WWF16-21
<i>Austrostipa macalpinei</i>	0.1	15	WWF16-06
<i>Austrostipa macalpinei</i>	0.1	40	WWF16-12
<i>Banksia attenuata</i>	7	250	WWF16-20
<i>Banksia menziesii</i>	17.5	400	-
<i>Conostephium magnum</i>	0.1	30	WWF16-13
<i>Conostephium magnum</i>	0.1	140	WWF16-24
<i>Cryptandra pungens</i>	0.1	-	WWF16-11
<i>Drosera humilis</i>	0.1	5	WWF16-01
<i>Eremaea beaufortioides</i> var. <i>microphylla</i>	1	65	WWF16-08
<i>Gompholobium tomentosum</i>	0.1	25	WWF16-16
<i>Grevillea erinacea</i>	0.1	160	WWF16-12
<i>Haemodorum spicatum</i>	0.1	40	WWF16-04
<i>Hibbertia leucocrossa</i>	0.1	40	WWF16-09
<i>Hibbertia subvaginata</i>	0.1	80	WWF16-19
<i>Hypochaeris glabra</i>	0.1	20	WWF16-02
<i>Jacksonia nutans</i>	1	130	WWF16-15
<i>Lachnostachys eriobotrya</i>	3	120	WWF16-07
<i>Leptospermum</i> sp.	6	300	=WWF05-18
<i>Levenhookia stipitata</i>	0.1	5	WWF16-09
<i>Melaleuca leuropoma</i>	0.1	30	WWF16-22
<i>Opercularia vaginata</i>	0.1	20	=WWF15
<i>Pentameris airoides</i>	0.1	5	WWF16-03
<i>Schoenus</i> sp. smooth culms (K.R. Newbey 7823)	0.1	45	WWF16-23
<i>Stylidium</i> sp.	0.1	15	WWF16-05
<i>Trachymene pilosa</i>	0.1	10	-
<i>Ursinia anthemoides</i>	0.1	10	=WWF11
<i>Vulpia myuros</i> forma <i>megalura</i>	0.1	15	WWF16-18
<i>Wahlenbergia</i> sp.	0.1	20	=WWF15
Shrub	0.1	30	WWF16-14

Warradarge Site WWF17
 Described by BRMS Date 26/10/2011 Type Quadrat 10 x 10 m
 MGA Zone 50 356139mE 6688065mN
 Habitat Slope of low broad dome on valley floor
 Soil Dark red to brown loamy sand
 Rock Type Laterite rocks, gravel, pebbles. 25% outcropping
 Vegetation *Banksia strictifolia*, *Baekkea* sp. Bunney Road (S. Patrick 4059) tall open shrubland over *Melaleuca seriata*, *Hakea anadenia* shrubland over *Petrophile megalostegia*, *Allocasuarina microstachya*, *Astroloma glaucescens* low shrubland over *Alexgeorgea nitens*, *Lepidosperma tenue* open sedgeland.
 Veg Condition Excellent
 Fire Age No sign of recent fire

Species List:

Species	Cover (%)	Height (cm)	Specimen
<i>Acacia lasiocarpa</i> var. <i>bracteolata</i>	0.1	45	WWF17-19
<i>Acacia stenoptera</i>	0.1	35	WWF17-13
<i>Alexgeorgea nitens</i>	9	30	=WWF16-10
<i>Allocasuarina microstachya</i>	1	90	WWF17-14
<i>Astroloma glaucescens</i>	1	30	WWF17-25
<i>Baeckea</i> sp. Bunney Road (S. Patrick 4059)	5	200	WWF17-17
<i>Banksia strictifolia</i>	5	220	WWF17-09
<i>Beaufortia elegans</i>	0.1	60	WWF17-23
<i>Blennospora drummondii</i>	0.1	2	WWF17-06
<i>Cyperaceae</i> sp.	0.1	4	WWF17-05
<i>Dampiera lavandulacea</i>	0.1	20	WWF17-26
<i>Drosera humilis</i>	0.1	10	WWF17-02
<i>Hakea anadenia</i>	4	130	WWF17-24
<i>Hakea ruscifolia</i>	0.1	20	WWF17-12
<i>Hibbertia acerosa</i>	0.1	12	WWF17-18
<i>Hibbertia subvaginata</i>	0.1	20	WWF17-11
<i>Hypocalymma angustifolium</i>	0.1	80	WWF17-20
<i>Hypochaeris glabra</i>	0.1	10	-
<i>Jacksonia hakeoides</i>	-	-	WWF17-X1
<i>Lachnostachys eriobotrya</i>	0.1	120	WWF17-15
<i>Lepidosperma tenue</i>	1	15	WWF17-10
<i>Levenhookia pusilla</i>	0.1	4	WWF17-04
<i>Levenhookia stipitata</i>	0.1	4	WWF17-03
<i>Melaleuca serata</i>	10	130	WWF17-21
<i>Millotia tenuifolia</i>	0.1	5	WWF17-07
<i>Neurachne alopecuroides</i>	0.1	40	-
<i>Opercularia vaginata</i>	0.1	10	=WWF16
<i>Petrophile megalostegia</i>	10	50	WWF17-22
<i>Petrophile shuttleworthiana</i>	0.1	210	WWF17-16
<i>Pterochaeta paniculata</i>	0.1	4	=SW43
<i>Thysanotus manglesianus</i>	0.1	140	WWF17-08
<i>Vulpia muralis</i>	0.1	20	WWF17-27

Warradarge Site WWF18
 Described by BRMS Date 26/10/2011 Type Quadrat 10 x 10 m
 MGA Zone 50 355624 mE 6687867 mN
 Habitat Gentle east facing slope of low ridge
 Soil Light grey to brown sandy loam
 Rock Type Continuous surface layer of laterite rocks, gravel, pebbles (few boulders). 5%
 Vegetation *Eucalyptus accedens* low woodland over *Banksia armata* var. *armata*, *Petrophile shuttleworthiana* tall open scrub.
 Veg Condition Excellent
 Fire Age No sign of recent fire

Species List:

Species	Cover (%)	Height (cm)	Specimen
<i>Baeckea grandiflora</i>	0.1	40	WWF18-17
<i>Banksia armata</i> var. <i>armata</i>	40	250	WWF18-11
<i>Banksia kippistiana</i> var. <i>kippistiana</i>	0.1	120	=24/10/11
<i>Conostylis androstemma</i>	0.1	12	WWF18-05
<i>Dampiera lavandulacea</i>	0.1	10	=WWF17-26
<i>Drosera porrecta</i>	0.1	5	WWF18-04
<i>Eucalyptus accedens</i>	30	800	-
<i>Glischrocaryon aureum</i>	0.1	40	=WWF
<i>Goodenia coerulea</i>	0.1	4	WWF18-20
<i>Goodenia coerulea</i>	0.1	20	WWF18-16
<i>Hakea lissocarpha</i>	0.1	40	WWF18-09
<i>Hibbertia fasciculiflora</i>	0.1	15	WWF18-15
<i>Hibbertia hypericoides</i>	0.1	20	WWF18-08
<i>Lepidosperma tenue</i>	0.1	40	WWF18-19
<i>Lepidosperma tenue</i>	0.1	30	WWF18-18
<i>Levenhookia pusilla</i>	0.1	4	WWF18-02
<i>Levenhookia pusilla</i>	-	-	WWF18-20b
<i>Monotaxis grandiflora</i> var. <i>grandiflora</i>	0.1	20	WWF18-06
<i>Neurachne alopecuroides</i>	0.1	4	-
<i>Opercularia vaginata</i>	0.1	15	=WWF17-16
<i>Petrophile shuttleworthiana</i>	5	200	=WWF17-16
<i>Poranthera microphylla</i>	0.1	5	WWF18-03

Species	Cover (%)	Height (cm)	Specimen
<i>Pterostylis sargentii</i>	0.1	15	WWF18-13
<i>Schoenus</i> sp. smooth culms (K.R. Newbey 7823)	0.1	5	WWF18-14
<i>Stylidium miniatum</i>	0.1	20	WWF18-12
<i>Tetratheca confertifolia</i>	0.1	8	WWF18-10
<i>Thysanotus patersonii/manglesianus</i>	0.1	10	-
<i>Velleia trinervis</i>	0.1	12	WWF18-07
<i>Wahlenbergia capensis</i>	0.1	11	WWF18-01

Warradarge Site WWF20
 Described by PLDK Date 17/11/2011 Type Quadrat 10 x 10 m
 MGA Zone 50 355105 mE 6684325 mN
 Habitat Gently sloping north
 Soil White cream sand with some outcropping laterite.
 Rock Type Laterite
 Vegetation *Eucalyptus gittinsii* very open tree mallee over *Petrophile shuttleworthiana*, *Hakea anadenia*, *Hakea gilbertii*, *Banksia* sp. open shrubland over *Banksia shuttleworthiana*, *Banksia kippistiana* var. *kippistiana*, *Calothamnus hirsutus*, *Melaleuca aspalathoides* low shrubland.
 Veg Condition Excellent
 Fire Age Very long unburnt

Species List:

Species	Cover (%)	Height (cm)	Specimen
<i>Allocasuarina humilis</i>	0.1	160	WWF20-24
<i>Amphipogon debilis</i> var. <i>debilis</i>	0.1	25	WWF20-38
<i>Banksia carlinoides</i>	0.1	80	WWF20-20
<i>Banksia cypholoba</i>	0.1	20	WWF20-18
<i>Banksia glaucifolia</i>	0.1	130	WWF20-43
<i>Banksia kippistiana</i> var. <i>kippistiana</i>	3	60	WWF20-09
<i>Banksia shuttleworthiana</i>	3	50	WWF20-05
<i>Banksia</i> sp.	2	120	WWF20-02
<i>Banksia splendida</i> subsp. <i>macrocarpa</i>	-	-	WWF20-12B
<i>Beaufortia bracteosa</i>	0.5	40	WWF20-04
<i>Calothamnus hirsutus</i>	4	25	WWF20-19
<i>Calytrix flavescens</i>	0.1	30	WWF20-13
<i>Caustis dioica</i>	0.1	30	WWF20-39
<i>Caustis dioica</i>	0.1	20	WWF20-14
<i>Caustis dioica</i>	0.1	30	WWF20-42
<i>Comesperma griffinii</i>	0.1	5	WWF20-32
<i>Conothamnus trinervis</i>	0.1	40	WWF20-06
<i>Dampiera spicigera</i>	0.1	20	WWF20-23
<i>Daviesia daphnoides</i>	0.1	60	WWF20-34
<i>Eucalyptus gittinsii</i> subsp. <i>illucida</i>	4	320	WWF20-01
<i>Glischrocaryon aureum</i>	0.1	40	-
<i>Goodenia coerulea</i>	0.1	30	WWF20-1125
<i>Hakea anadenia</i>	1	110	WWF20-11
<i>Hakea conchifolia</i>	0.1	50	-
<i>Hakea gilbertii</i>	2	150	WWF20-12A
<i>Hakea stenocarpa</i>	0.1	50	WWF20-10
<i>Hibbertia fasciculiflora</i>	-	-	WWF20-25
<i>Hibbertia hypericoides</i>	0.1	25	WWF20-21
<i>Hypocalymma hirsutum</i>	0.1	30	WWF20-29
<i>Lambertia multiflora</i> var. <i>multiflora</i>	0.1	30	WWF20-22
<i>Lechenaultia biloba</i>	0.1	25	WWF20-16
<i>Lepidosperma leptostachyum</i>	0.1	45	WWF20-28
<i>Melaleuca aspalathoides</i>	1	40	WWF20-07
<i>Melaleuca trichophylla</i>	0.1	40	WWF20-31
<i>Mesomelaena pseudostygia</i>	0.1	35	WWF20-37
<i>Mesomelaena pseudostygia</i>	0.1	35	WWF20-36
<i>Neurachne alopecuroidea</i>	0.1	40	WWF20-30
<i>Petrophile megalostegia</i>	0.1	45	WWF20-08
<i>Petrophile shuttleworthiana</i>	3	140	WWF20-03
<i>Petrophile striata</i>	0.1	70	WWF20-27
<i>Schoenus brevisetis</i>	0.1	30	WWF20-41
<i>Schoenus clandestinus</i>	0.1	5	WWF20-33
<i>Stylidium</i> sp.	0.1	25	-
<i>Tetraria octandra</i>	0.1	25	-

Species	Cover (%)	Height (cm)	Specimen
<i>Thysanotus spiniger</i>	0.1	40	WWF20-40
<i>Xanthorrhoea drummondii</i>	0.1	40	WWF20-17

Warradarge Site WWFRB01
 Described by BRM Date 22/10/2011 Type Relevé
 MGA Zone 50 351092mE 6684630mN
 Habitat Small basin on slope
 Soil White clay
 Rock Type
 Vegetation *Melaleuca uncinata* open to closed heath over *Melaleuca coroncarpa* open shrubland over *Baeckea crispiflora* var. *tenuior*, *Beaufortia elegans* scattered low shrubs over *Neurachne alopecuroidea* scattered grasses.
 Veg Condition Very Good
 Fire Age

Species List:

Species	Cover (%)	Height (cm)	Specimen
<i>Baeckea crispiflora</i> var. <i>tenuior</i>	-	-	WWFRB01-3
<i>Baeckea</i> sp. Bunney Road (S. Patrick 4059)	-	180	WWFRB01-13
<i>Beaufortia elegans</i>	-	-	WWFRB01-4
<i>Calothamnus quadrifidus</i>	-	-	-
<i>Commersonia pulchella</i>	-	-	WWFRB01-7
<i>Conostylis</i> sp.	-	-	-
<i>Dampiera linearis</i>	-	-	WWFRB01-12
<i>Goodenia micrantha</i>	-	5	WWFRB01-14
<i>Hakea lissocarpa</i>	-	110	WWFRB01-9
<i>Isotoma hypocrateriformis</i> var. <i>trichogramma</i>	-	-	WWFRB01-5
<i>Lobelia rhytidosperra</i>	-	-	WWFRB01-8
<i>Melaleuca coroncarpa</i>	-	-	WWFRB01-2
<i>Melaleuca uncinata</i>	70	200	WWFRB01-1
<i>Neurachne alopecuroidea</i>	-	-	-
<i>Pimelea imbricata</i> var. <i>piliger</i>	-	-	WWFRB01-11
<i>Podolepis canescens</i>	-	-	WWFRB01-10
<i>Verticordia blepharophylla</i>	-	-	WWFRB01-6

Warradarge Site WWFRB02
 Described by BRM Date 22/10/2011 Type Relevé
 MGA Zone 50 350689mE 6684782mN
 Habitat Gently sloping northwest facing low stony rise
 Soil Gravelly, pebbly grey-brown sand
 Rock Type Brown conglomerate with white ?quartz
 Vegetation *Allocasuarina humilis*, *Hakea auriculata*, *Banksia glaucifolia* scattered shrubs over *Gastrolobium plicatum*, *Eremaea pauciflora*, *Baeckea grandiflora*, *Banksia shuttleworthiana*, *Hibbertia* sp. low open heath over *Mesomelaena pseudostygia* open sedgeland.
 Veg Condition Excellent
 Fire Age: No sign of recent fire

Species List:

Species	Cover (%)	Height (cm)	Specimen
<i>Allocasuarina humilis</i>	-	-	WWFRB02-1
<i>Allocasuarina microstachya</i>	-	-	WWFRB02-11
<i>Andersonia lehmanniana</i>	-	-	WWFRB02-9
<i>Baeckea grandiflora</i>	-	-	WWFRB02-5
<i>Banksia glaucifolia</i>	-	-	WWFRB02-3
<i>Banksia shuttleworthiana</i>	-	-	=WWFBM-88
<i>Calothamnus torulosus</i>	-	-	=WWFBM-76
<i>Dodonaea divaricata</i>	-	30	WWFRB02-7
<i>Eremaea pauciflora</i>	-	-	-
<i>Gastrolobium plicatum</i>	-	-	WWFRB02-4
<i>Goodenia coerulea</i>	-	-	WWFRB02-12
<i>Hakea auriculata</i>	-	-	WWFRB02-2
<i>Hakea auriculata</i>	-	-	WWFRB02-14
<i>Hakea conchifolia</i>	-	-	=WWFBM-66
<i>Hakea incrassata</i>	-	-	-
<i>Hibbertia fasciculiflora</i>	-	-	WWFRB02-10

Species	Cover (%)	Height (cm)	Specimen
<i>Melaleuca platycalyx</i>	-	-	WWFRB02-13
<i>Melaleuca trichophylla</i>	-	20	WWFRB02-8
<i>Mesomelaena pseudostygia</i>	-	-	-
<i>Verticordia blepharophylla</i>	-	-	=WWFRB01-6
<i>Verticordia</i> sp.	-	-	=WWFBM-01
<i>Hibbertia</i>	-	-	WWFRB02-6

Warradarge Site WWFRB03
 Described by BRM Date 22/10/2011 Type Relevé
 MGA Zone 50 351408 mE 6684446 mN
 Habitat Very gentle northwest facing lower slope at base of mesa
 Soil Pale grey-brown sand, probably over clay
 Rock Type N/A
 Vegetation *Eucalyptus accedens* low woodland to low open forest over *Baeckea* sp. Bunney Road (S. Patrick 4059), *Gompholobium pungens* low open shrubland over *Neurachne alopecuroidea* scattered grasses.
 Veg Condition Very Good
 Fire Age Very long unburnt

Species List:

Species	Cover (%)	Height (cm)	Specimen
<i>Baeckea</i> sp. Bunney Road (S. Patrick 4059)	-	-	WWFRB03-1
<i>Eucalyptus accedens</i>	-	-	-
<i>Gompholobium pungens</i>	-	40	WWFRB03-2
<i>Hibbertia fasciculiflora</i>	-	-	WWFRB03-3
<i>Lepidosperma squamatum</i>	-	-	WWFRB03-4
<i>Neurachne alopecuroidea</i>	-	-	-

Warradarge Site WWFRB04
 Described by BRM Date 23/10/2011 Type Relevé
 MGA Zone 50 351392 mE 6684376 mN
 Habitat Gentle, north facing crest of low narrow spur of low mesa
 Soil Very gravelly, pebbly pale brown sand
 Rock Type Brown conglomerate (?laterite) cobbles and gravel
 Vegetation *Banksia kippistiana* var. *kippistiana*, *Gastrolobium plicatum*, *Allocasuarina ramosissima*, *Beaufortia bracteosa*, *Petrophile megalostegia* low shrubland over *Lepidosperma tenue*, *Schoenus clandestinus* very open sedgeland.
 Veg Condition Excellent
 Fire Age Very long unburnt

Species List:

Species	Cover (%)	Height (cm)	Specimen
<i>Allocasuarina grevilleoides</i>	-	35	WWFRB04-12
<i>Allocasuarina ramosissima</i>	-	60	WWFRB04-2
<i>Banksia kippistiana</i> var. <i>kippistiana</i>	-	-	WWFRB04-1
<i>Beaufortia bracteosa</i>	-	-	WWFRB04-3
<i>Calothamnus longissimus</i>	-	40	WWFRB04-6
<i>Gastrolobium plicatum</i>	-	-	=WWFBM-93
<i>Goodenia glareicola</i>	-	-	WWFRB04-11
<i>Lepidosperma tenue</i>	-	-	WWFRB04-5
<i>Melaleuca trichophylla</i>	-	20	WWFRB04-7
<i>Petrophile megalostegia</i>	-	-	WWFRB04-4
<i>Schoenus clandestinus</i>	-	-	WWFRB04-9
<i>Stenanthemum reissekii</i>	-	-	WWFRB04-10
<i>Stylidium eriopodum</i>	-	-	=WWFBM-99
Shrub	-	-	WWFRB04-8

Warradarge Site WWFRB05
 Described by BRM Date 23/10/2011 Type Relevé
 MGA Zone 50 351534 mE 6684227 mN
 Habitat Moderate southwest facing slope of low mesa
 Soil Grey brown sand
 Rock Type Gravel, pebbles and cobbles of brown conglomerate rock (?laterite)
 Vegetation *Allocasuarina grevilleoides*, *Hakea anadenia*, *Beaufortia bracteosa*, *Melaleuca trichophylla*, *Calytrix chrysantha*, *Calothamnus longissimus*, *Banksia kippistiana* var.

kippistiana low heath over *Lepidosperma* aff. *costale*, *Neurachne alopecuroidea* very open sedgeland/grassland.

Veg Condition Excellent

Fire Age

Species List:

Species	Cover (%)	Height (cm)	Specimen
<i>Allocasuarina grevilleoides</i>	-	40	=WWFRB4-12
<i>Banksia kippistiana</i> var. <i>kippistiana</i>	-	-	=WWFRB04-1
<i>Calothamnus longissimus</i>	-	-	=WWFRB04-6
<i>Calytrix chrysantha</i>	-	-	=WWFBM-96
<i>Daviesia epiphyllum</i>	-	45	WWFRB05-2
<i>Glischrocaryon aureum</i>	-	-	=WWF
<i>Hakea anadenia</i>	-	-	=WWFBM-103
<i>Hibbertia polystachya</i>	-	-	WWFRB05-4
<i>Lepidosperma</i> aff. <i>costale</i>	-	-	WWFRB05-1
<i>Melaleuca trichophylla</i>	-	-	WWFRB05-3
<i>Melaleuca trichophylla</i>	-	-	=WWFRB04-7
<i>Neurachne alopecuroidea</i>	-	-	-
<i>Opercularia vaginata</i>	-	-	-
<i>Stylidium eriopodum</i>	-	-	=WWFBM-99
Shrub	-	-	=WWFRB04-8

Warradarge Site WWFRB06

Described by BRM Date 23/10/2011 Type Relevé

MGA Zone 50 351584 mE 6684243 mN

Habitat Flat crest of low mesa

Soil Grey-brown loamy sand

Rock Type Gravel and pebbles (conglomerate)

Vegetation *Banksia glaucifolia*, *Banksia sessilis* var. *flabellifolia* scattered shrubs with patches of shrubland over *Banksia kippistiana* var. *kippistiana*, *Banksia carlinoides*, *Calothamnus longissimus*, *Baeckea crispiflora* var. *tenuior*, *Melaleuca aspalathoides* closed heath over *Lepidosperma tenue* very open sedgeland.

Veg Condition Excellent

Fire Age

Species List:

Species	Cover (%)	Height (cm)	Specimen
<i>Baeckea crispiflora</i> var. <i>tenuior</i>	-	-	WWFRB06-3
<i>Banksia carlinoides</i>	-	-	WWFRB06-2
<i>Banksia glaucifolia</i>	-	-	WWFRB06-1
<i>Banksia kippistiana</i> var. <i>kippistiana</i>	-	-	=WWFRB04-1
<i>Banksia sessilis</i> var. <i>flabellifolia</i>	-	-	WWFRB06-10
<i>Beaufortia bracteosa</i>	-	-	WWFRB06-8
<i>Calothamnus longissimus</i>	-	-	=WWFRB04-6
<i>Commersonia pulchella</i>	-	-	WWFRB06-4
<i>Daviesia epiphyllum</i>	-	-	=WWFRB05-2
<i>Goodenia coerulea</i>	-	-	WWFRB06-06
<i>Hakea conchifolia</i>	-	-	=WWFBM66
<i>Lechenaultia biloba</i>	-	-	WWFRB06-11
<i>Lepidosperma tenue</i>	-	-	WWFRB06-5
<i>Loxocarya striata</i>	-	-	WWFRB06-9
<i>Melaleuca aspalathoides</i>	-	-	=WWFBM113
<i>Scaevola repens</i> subsp. Northern Sandplains (R.J. Cranfield & P.J. Spencer 8445)	-	-	WWFRB06-7

Warradarge Site WWFRB07

Described by BRM Date 23/10/2011 Type Relevé

MGA Zone 50 352236 mE 6683548 mN

Habitat Gentle, southwest facing, upper slope of broad low ridge

Soil Gravelly grey brown sand

Rock Type Gravel, cobbles of brown ?laterite conglomerate

Vegetation *Eremaea pauciflora*, *Allocasuarina humilis* scattered shrubs to open shrubland over *Hakea auriculata*, *Daviesia daphnoides*, *Petrophile shuttleworthiana*, *Banksia sphaerocarpa* var. *pumilio*, *Hibbertia hypericoides*, *Melaleuca aspalathoides* low shrubland to low open heath over *Caustis dioica*, *Lepidosperma tenue*, *Schoenus brevisetis*, *Mesomelaena pseudostygia*, *Neurachne alopecuroidea* very open sedgeland/grassland.

Veg Condition Excellent
Fire Age Very long unburnt

Species List:

Species	Cover (%)	Height (cm)	Specimen
<i>Allocasuarina humilis</i>	-	-	WWFRB07-1
<i>Allocasuarina microstachya</i>	-	45	WWFRB07-11
<i>Banksia sphaerocarpa</i> var. <i>pumilio</i>	-	50	=WWFBM118
<i>Caustis dioica</i>	-	-	WWFRB07-7
<i>Conostylis tomentosa</i>	-	175	WWFRB07-15
<i>Darwinia neildiana</i>	-	-	WWFRB07-18
<i>Daviesia daphnoides</i>	-	-	WWFRB07-03
<i>Daviesia daphnoides</i>	-	95	WWFRB07-3
<i>Eremaea pauciflora</i>	-	-	=WWFBM133
<i>Gnephosis tenuissima</i>	-	8	WWFRB07-16
<i>Hakea auriculata</i>	-	100	WWFRB07-02
<i>Hibbertia hypericoides</i>	-	40	WWFRB07-5
<i>Hypocalymma hirsutum</i>	-	-	WWFRB07-10
<i>Jacksonia restioides</i>	-	30	WWFRB07-19
<i>Lachnagrostis plebeia</i>	-	30	WWFRB07-20
<i>Lechenaultia biloba</i>	-	-	-
<i>Lepidosperma tenue</i>	-	-	WWFRB07-8
<i>Levenhookia pusilla</i>	-	-	-
<i>Melaleuca aspalathoides</i>	-	-	WWFRB07-6
<i>Mesomelaena pseudostygia</i>	-	-	-
<i>Mesomelaena pseudostygia</i>	-	-	-
<i>Neurachne alopecuroidea</i>	-	-	-
<i>Petrophile shuttleworthiana</i>	-	80	WWFRB07-4
<i>Schoenus brevisetis</i>	-	-	WWFRB07-9
<i>Schoenus pleiostemoneus</i>	-	-	WWFRB07-17
<i>Stylidium stenosepalum</i>	-	-	WWFRB07-13
<i>Thysanotus thyrsoides</i>	-	40	WWFRB07-14
<i>Trachymene pilosa</i>	-	-	-
<i>Vulpia myuros</i> forma <i>megalura</i>	-	-	WWFRB07-12

Warradarge Site WWFRB08
Described by BRM Date 24/10/2011 Type Relevé
MGA Zone 50 352004 mE 6684021 mN
Habitat Very gentle, west facing upper slope of broad low ridge
Soil Fine grey silty sand with gravel, pebbles and cobbles
Rock Type Conglomerate (?laterite)
Vegetation Eucalyptus sp. Badgingarra (D. Nicolle & M. French DN 3515) low woodland over
Xanthorrhoea drummondii, Daviesia epiphyllum, Gastrolobium plicatum, Acacia pulchella
var. reflexa, Hibbertia hypericoides, Polianthion wichurae low open shrubland over Tetraria
octandra, Loxocarya striata, Neurachne alopecuroidea very open sedgeland/grassland.
Veg Condition Excellent

Species List:

Species	Cover (%)	Height (cm)	Specimen
<i>Acacia pulchella</i> var. <i>reflexa</i>	-	35	WWFRB08-2
<i>Astroloma glaucescens</i>	-	-	WWFRB08-8
<i>Daviesia epiphyllum</i>	-	-	=WWFBM-151
<i>Eucalyptus drummondii</i>	-	250	WWFRB08-1
<i>Gastrolobium plicatum</i>	-	-	WWFRB08-7
<i>Glischrocaryon aureum</i>	-	-	=WWF
<i>Hibbertia hypericoides</i>	-	30	WWFRB08-3
<i>Logania spermacoea</i>	-	-	=WWFBM189
<i>Loxocarya striata</i>	-	-	WWFRB08-6
<i>Neurachne alopecuroidea</i>	-	-	-
<i>Polianthion wichurae</i>	-	30	WWFRB08-4
<i>Tetraria octandra</i>	-	-	WWFRB08-5
<i>Thysanotus thyrsoides</i>	-	-	WWFRB07-14
<i>Xanthorrhoea drummondii</i>	-	-	=WWFBM-91

Warradarge Site WWFRB09
Described by BRM Date 24/10/2011 Type Relevé
MGA Zone 50 353128 mE 6683659 mN

Habitat	Gentle east facing mid slope
Soil	Yellow-brown sand
Rock Type	N/A
Vegetation	<i>Eucalyptus todtiana</i> scattered low trees over <i>Acacia saligna</i> tall shrubland over <i>Adenanthos cygnorum</i> subsp. <i>cygnorum</i> scattered shrubs over <i>Jacksonia hakeoides</i> scattered low shrubs over <i>Hypochaeris glabra</i> , <i>Trifolium arvense</i> var. <i>arvense</i> very open herbland and <i>Vulpia</i> sp., <i>Austrostipa</i> sp. Cairn Hill (M.E. Trudgen 21176) open grassland.
Veg Condition	Degraded- Good
Fire Age	Very long unburnt

Species List:

Species	Cover (%)	Height (cm)	Specimen
<i>Acacia saligna</i>	-	300	WWFRB09-1
<i>Adenanthos cygnorum</i> subsp. <i>cygnorum</i>	-	-	-
<i>Austrostipa</i> sp. Cairn Hill (M.E. Trudgen 21176)	-	-	WWFRB09-3
<i>Eucalyptus drummondii</i>	-	300	WWFRB09-6
<i>Eucalyptus todtiana</i>	-	-	-
<i>Hemiandra</i> sp. Watheroo (S. Hancocks 4)	-	-	WWFRB09-5
<i>Hypochaeris glabra</i>	-	-	-
<i>Jacksonia hakeoides</i>	-	-	WWFRB09-2
<i>Ptilotus polystachyus</i>	-	-	-
<i>Trifolium arvense</i> var. <i>arvense</i>	-	-	-
<i>Verticordia</i> sp.	-	90	WWFRB09-4

Warradarge	Site	WWFRB10			
Described by	BRM	Date	25/10/2011	Type	Relevé
MGA Zone	50	356044mE	6686335mN		
Habitat	Very gentle south facing upper slope of low ridge				
Soil	Grey sand with pebbles and cobbles				
Rock Type	Lateritic conglomerate, brown outcropping present				
Vegetation	<i>Eucalyptus</i> sp. Badgingarra (D. Nicolle & M. French DN 3515), <i>Eucalyptus accedens</i> scattered low trees to low open woodland over <i>Banksia sessilis</i> var. <i>flabellifolia</i> , <i>Melaleuca trichophylla</i> , <i>Petrophile shuttleworthiana</i> open to closed scrub over <i>Banksia kippistiana</i> var. <i>kippistiana</i> open shrubland over <i>Grevillea</i> sp. scattered low shrubs over <i>Loxocarya striata</i> , <i>Caustis dioica</i> , <i>Tetraria octandra</i> very open sedgeland.				
Veg Condition	Excellent				
Fire Age	Very long unburnt				

Species List:

Species	Cover (%)	Height (cm)	Specimen
<i>Acacia pulchella</i> var. <i>reflexa</i>	-	-	WWFRB10-14
<i>Banksia kippistiana</i> var. <i>kippistiana</i>	-	-	WWFRB10-4
<i>Banksia sessilis</i> var. <i>flabellifolia</i>	-	-	WWFRB10-1
<i>Calytrix oldfieldii</i>	-	45	WWFRB10-13
<i>Caustis dioica</i>	-	-	WWFRB10-7
<i>Dampiera spicigera</i>	-	-	WWFRB10-12
<i>Diplolaena cinerea</i>	-	-	WWFRB10-1b
<i>Eucalyptus accedens</i>	-	700	=WWFBM-209
<i>Eucalyptus</i> sp. Badgingarra (D. Nicolle & M. French DN 3515)	-	325	=WWFBM-211
<i>Grevillea</i> sp.	-	-	WWFRB10-5
<i>Hakea</i> sp.	-	-	WWFRB10-3
<i>Hibbertia hypericoides</i>	-	-	WWFRB10-8
<i>Loxocarya striata</i>	-	-	WWFRB10-6
<i>Melaleuca ciliosa</i>	-	170	WWFRB10-9
<i>Melaleuca trichophylla</i>	-	-	WWFRB10-2
<i>Mesomelaena pseudostygia</i>	-	-	-
<i>Neurachne alopecuroidea</i>	-	-	-
<i>Opercularia vaginata</i>	-	-	-
<i>Polianthion wichurae</i>	-	-	=WWFRB08-4
<i>Pterostylis</i> sp.	-	-	-
<i>Schoenus clandestinus</i>	-	-	-
<i>Tetraria octandra</i>	-	-	=WWFRB08-5
<i>Verticordia</i> sp.	-	-	WWFRB10-10

Warradarge	Site	WWFRB11			
Described by	BRM	Date	25/10/2011	Type	Relevé
MGA Zone	50	355876mE	6686512mN		

Habitat	East facing breakaway of low ridge
Soil	Gravelly grey brown sand
Rock Type	Laterite
Vegetation	<i>Eucalyptus accedens</i> low open forest over <i>Petrophile shuttleworthiana</i> , <i>Banksia sessilis</i> var. <i>flabellifolia</i> scattered tall shrubs over <i>Hibbertia hibernioides</i> var. <i>hibbertioides</i> scattered low shrubs over <i>Neurachne alopecuroidea</i> scattered grasses.
Veg Condition	Excellent
Fire Age	Very long unburnt

Species List:

Species	Cover (%)	Height (cm)	Specimen
<i>Banksia sessilis</i> var. <i>flabellifolia</i>	-	-	=WWFRB10-1
<i>Eucalyptus accedens</i>	-	-	=WWFBM-209
<i>Hibbertia hibernioides</i> var. <i>hibbertioides</i>	-	-	=WWFBM-205
<i>Neurachne alopecuroidea</i>	-	-	-
<i>Olearia rudis</i>	-	-	=WWFBM-210
<i>Opercularia vaginata</i>	-	-	-
<i>Petrophile shuttleworthiana</i>	-	-	=WWFRB10-11
<i>Velleia trinervis</i>	-	-	WWFRB11-2
<i>Diplolaena</i> sp.	-	55	WWFRB11-1

Warradarge	Site	WWFRB12			
Described by	BRM	Date	25/10/2011	Type	Relevé
MGA Zone	50	355564 mE	6686334 mN		
Habitat	Gentle, south facing slope of low ridge				
Soil	Gravelly grey sand				
Rock Type	Lateritic outcroppings				
Vegetation	<i>Eucalyptus</i> sp. Badgingarra (D. Nicolle & M. French DN 3515) scattered low trees to low open woodland over <i>Banksia sessilis</i> var. <i>flabellifolia</i> scattered tall shrubs over <i>Banksia glaucifolia</i> , <i>Banksia kippistiana</i> var. <i>kippistiana</i> , <i>Banksia carlinoides</i> , <i>Petrophile shuttleworthiana</i> closed heath over <i>Banksia sphaerocarpa</i> var. <i>pumilio</i> , <i>Isopogon asper</i> , <i>Hibbertia hypericoides</i> , <i>Gastrolobium plicatum</i> low open shrubland over <i>Caustis dioica</i> , <i>Tetraria octandra</i> , <i>Neurachne alopecuroidea</i> scattered sedges/grasses.				
Veg Condition	Excellent				

Species List:

Species	Cover (%)	Height (cm)	Specimen
<i>Banksia carlinoides</i>	-	-	=WWFRB6-2
<i>Banksia glaucifolia</i>	-	-	WWFRB12-1
<i>Banksia kippistiana</i> var. <i>kippistiana</i>	-	-	=WWFRB10-4
<i>Banksia sessilis</i> var. <i>flabellifolia</i>	-	-	=WWFRB10-1
<i>Banksia sphaerocarpa</i> var. <i>pumilio</i>	-	-	=WWFBM118
<i>Banksia sphaerocarpa</i> var. <i>pumilio</i>	-	-	WWFRB12-3
<i>Caustis dioica</i>	-	-	=WWFRB10-7
<i>Eucalyptus</i> sp. Badgingarra (D. Nicolle & M. French DN 3515)	-	-	=WWFBM-211
<i>Gastrolobium plicatum</i>	-	-	WWFRB12-4
<i>Hibbertia hypericoides</i>	-	-	=WWFRB10-8
<i>Isopogon asper</i>	-	70	WWFRB12-2
<i>Neurachne alopecuroidea</i>	-	-	-
<i>Petrophile shuttleworthiana</i>	-	-	WWFRB10-11
<i>Tetraria octandra</i>	-	-	-
<i>Tricoryne elatior</i>	-	-	=WWFBM-230

Warradarge	Site	WWFRB13			
Described by	BRM	Date	25/10/2011	Type	Relevé
MGA Zone	50	356378 mE	6686595 mN		
Habitat	Crest of low rise				
Soil	Grey brown sand				
Rock Type					
Vegetation	<i>Banksia menziesii</i> , <i>B. attenuata</i> low woodland over <i>Leptospermum oligandrum</i> scattered tall shrubs to tall open shrubland over <i>Scholtzia</i> sp., <i>Hibbertia leucocrossa</i> low open shrubland over <i>Austrostipa macalpinei</i> scattered grasses.				
Veg Condition	Very Good				

Species List:

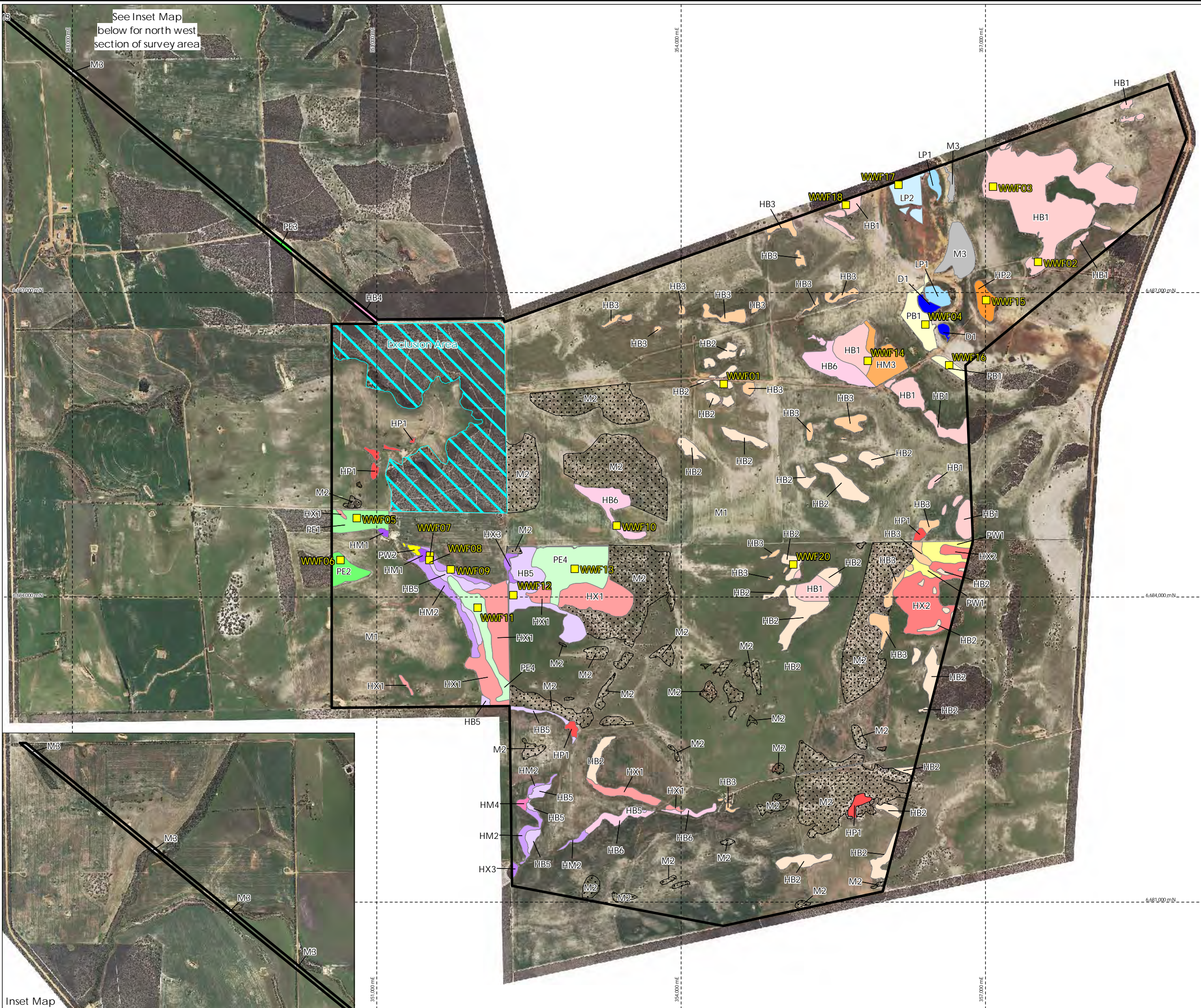
Species	Cover (%)	Height (cm)	Specimen
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<i>Austrostipa macalpinei</i>	-	-	WWFRB13-4
<i>Banksia attenuata</i>	-	-	-
<i>Banksia menziesii</i>	-	-	-
<i>Calytrix fraseri</i>	-	-	=WWFRB-237
<i>Hibbertia leucocrossa</i>	-	-	WWFRB13-3
<i>Leptospermum oligandrum</i>	-	-	WWFRB13-1
<i>Petrophile brevifolia</i>	-	35	WWFRB13-5
<i>Scholtzia</i> sp.	-	45	WWFRB13-2
<i>Verticordia</i> sp.	-	-	WWFRB13-6

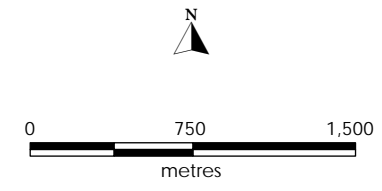
Appendix 7

Vegetation Mapping





■ Quadrat location



Author: R Warner Drawn: M Robinson Dwg No.: 728
Date: 07 Feb 2012 Revised: 22 Mar 2012
Projection: MGA Z50 (GDA94) Scale: 1:35,000

Warradarge Wind Farm Vegetation Mapping

Vegetation of Warradarge Wind Farm

Vegetation of Drainage Areas (D)



D1

Eucalyptus accedens, *E. wandoo* woodland over *Kunzea micrantha* subsp. *petiolata* tall open shrubland

Vegetation of Loam/Clay Plains (LP)



LP1

Acacia microbotrya tall open shrubland over *Regelia ciliata* shrubland



LP2

Banksia strictifolia, *Baeckea* sp. Bunney Road (S. Patrick 4059) tall open shrubland over *Melaleuca seriata*, *Hakea anadenia* shrubland over *Petrophile megalostegia* low shrubland over *Alexgeorgea nitens* open sedgeland

Vegetation of Stony Hills and Slopes (H)

Low Hillslopes and Plains Dominated by Powderbark Wandoo (*Eucalyptus accedens*) (HP)



HP1

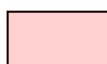
Eucalyptus accedens, *E. wandoo* low closed to low open forest



HP2

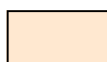
Eucalyptus accedens low woodland over *Banksia shuttleworthiana*, *Allocasuarina humilis* open heath over *Opercularia vaginata* open sedgeland

Hills and Slopes dominated by *Banksia* heaths (HB)



HB1

Eucalyptus gittinsii (*E. drummondii*) open tree mallee over *Banksia armata* var. *armata* open heath



HB2

Eucalyptus drummondii low open woodland over *E. gittinsii* open tree mallee over *Banksia* spp. open heath



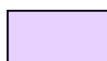
HB3

Eucalyptus drummondii, *E. accedens* low woodland over *Banksia* spp. open heath



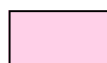
HB4

Banksia glaucifolia, *Hakea incrassata*, *Beaufortia bracteosa*, *Petrophile shuttleworthiana*, *Banksia leptophylla* var. *melletica* open heath



HB5

Hakea anadenia, *Xanthorrhoea drummondii* open shrubland over *Banksia* spp., *Melaleuca trichophylla* low open heath



HB6




Banksia sessilis var. *flabellifolia* tall open shrubland over *B. glaucifolia*, *B. kippistiana* var. *kippistiana*, *B. carlinoides* closed heath







Vegetation of Warradarge Wind Farm

Vegetation of Stony Hills and Slopes (H)

Rocky Hillcrests and Plains with *Xanthorrhoea drummondii* Low Shrublands (HX)

	HX1	<i>Eremaea pauciflora</i> , <i>Allocasuarina humilis</i> tall open shrubland over <i>Hakea auriculata</i> , <i>Petrophile shuttleworthiana</i> , <i>Xanthorrhoea drummondii</i> , <i>Banksia sphaerocarpa</i> var. <i>pumilio</i> , <i>Hibbertia hypericoides</i> low shrubland to low open heath
	HX2	<i>Eucalyptus gittinsii</i> open tree mallee over <i>Daviesia daphnoides</i> , <i>Xanthorrhoea drummondii</i> open shrubland
	HX3	<i>Hakea anadenia</i> , <i>H. auriculata</i> , <i>Xanthorrhoea drummondii</i> low shrubland over <i>Mesomelaena pseudostygia</i> very open sedgeland

Hillslopes with *Melaleuca* (HM)

	HM1	<i>Melaleuca uncinata</i> , <i>M. coronicarpa</i> closed heath
	HM2	<i>Calothamnus longissimus</i> , <i>Melaleuca aspalathoides</i> , <i>Beaufortia bracteosa</i> low shrubland to low open heath over <i>Lepidosperma</i> aff. <i>costale</i> , <i>Neurachne alopecuroides</i> open sedgeland/grassland
	HM3	<i>Eucalyptus accedens</i> low open woodland over <i>E. sp.</i> Badgingarra (D. Nicolle & M. French DN 3515) very open tree mallee over <i>Banksia sessilis</i> var. <i>flabellifolia</i> , <i>Melaleuca trichophylla</i> tall open scrub over <i>Banksia kippistiana</i> var. <i>kippistiana</i> open shrubland
	HM4	<i>Baeckea</i> sp. Bunney Road (S. Patrick 4059), <i>Melaleuca trichophylla</i> shrubland over <i>Lepidosperma squamatum</i> open sedgeland



Vegetation of Warradarge Wind Farm

Vegetation of Sandy Plains and Low Hills (P)

Vegetation dominated by *Eucalyptus tottiana* (Coastal Blackbutt) Low Woodlands (PE)



PE1

Eucalyptus tottiana low open woodland over *Adenanthos cygnorum* subsp. *cygnorum*, *Xanthorrhoea drummondii* open shrubland over *Eremaea pauciflora*, *Jacksonia floribunda* low shrubland over *Mesomelaena pseudostygia* very open sedgeland



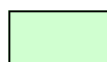
PE2

Eucalyptus tottiana low woodland over *Banksia candolleana*, *Leptospermum oligandrum*, *Banksia sphaerocarpa* var. *pumilio* open heath over *Lomandra hastilis* very open sedgeland



PE3

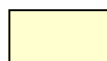
Eucalyptus tottiana low open woodland over *Banksia candolleana*, *Allocasuarina humilis* shrubland



PE4

Eucalyptus tottiana low open woodland over *Adenanthos cygnorum* subsp. *cygnorum*, *Xanthorrhoea drummondii* shrubland

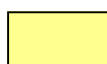
Sandy Hills and Plains with *Banksia* Low Woodlands (PB)



PB1

Banksia attenuata, *B. menziesii* low woodland over *Leptospermum oligandrum* tall open shrubland

Sandy Plains dominated by Powderbark wandoo (PW)



PW1

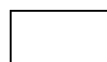
Eucalyptus accedens low open woodland over *E. drummondii* very open tree mallee over *Eremaea pauciflora*, *Hibbertia subvaginata* low shrubland



PW2

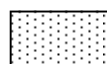
Eucalyptus accedens low open forest over *Baeckea* sp. Bunney Road (S. Patrick 4059), *Gompholobium pungens* low open shrubland

Modified Vegetation (M)



M1

Cleared land (paddocks and some tracks)



M2

Eucalyptus tottiana low open woodland



M3

Planted areas



Appendix 8

Vascular Flora List



Note: * denotes an introduced species.

Family: Amaranthaceae

Ptilotus polystachyus
Ptilotus sp. nov. (newly identified, to be named
Ptilotus sp. Warradarge)

Family: Anarthriaceae

Lyginia imberbis

Family: Apiaceae

Actinotus humilis
Platysace xerophila
Xanthosia huegelii

Family: Araliaceae

Trachymene cyanopetala
Trachymene pilosa

Family: Asparagaceae

Laxmannia sessiliflora subsp. *drummondii*
Lomandra hastilis
Lomandra hermaphrodita
Thysanotus manglesianus
Thysanotus patersonii/manglesianus
Thysanotus sparteus
Thysanotus spiniger
Thysanotus thyrsoides

Family: Asteraceae

**Arctotheca calendula*
Asteridea pulverulenta
Blennospora drummondii
Gnephosis tenuissima
Hyalosperma demissum
**Hypochaeris glabra*
**Hypochaeris radicata*
Millotia tenuifolia
Olearia revoluta
Olearia rudis
Pithocarpa pulchella var. *pulchella*
Podolepis canescens
Podotheca angustifolia
Podotheca gnaphalioides
Pterochaeta paniculata
Quinetia urvillei
**Ursinia anthemoides*
Waitzia acuminata var. *acuminata*
Waitzia acuminata var. *albicans*
Waitzia podolepis

Family: Boraginaceae

**Echium plantagineum*

Family: Brassicaceae

**Brassica barrelieri* subsp. *oxyrrhina*
**Diplotaxis muralis*
**Raphanus raphanistrum*

Family: Campanulaceae

Isotoma hypocrateriformis var. *trichogramma*
Lobelia rarifolia
Lobelia rhombifolia

Lobelia rhytidosperra

**Wahlenbergia capensis*

Family: Casuarinaceae

Allocasuarina acutivalvis
Allocasuarina grevilleoides
Allocasuarina humilis
Allocasuarina microstachya
Allocasuarina ramosissima

Family: Celastraceae

Tripterococcus brunonis

Family: Centrolepidaceae

Centrolepis pilosa

Family: Colchicaceae

Burchardia sp.

Family: Crassulaceae

Crassula colorata var. *acuminata*
Crassula colorata var. *colorata*

Family: Cupressaceae

Callitris arenaria

Family: Cyperaceae

Caustis dioica
**Isolepis marginata*
Lepidosperma aff. *costale*
Lepidosperma leptostachyum
Lepidosperma scabrum
Lepidosperma squamatum
Lepidosperma tenue
Mesomelaena pseudostygia
Schoenus andrewsii
Schoenus breviculmis
Schoenus brevisetis
Schoenus clandestinus
Schoenus curvifolius
Schoenus insolitus
Schoenus nanus
Schoenus pedicellatus
Schoenus pleiostemoneus
Schoenus sp. smooth culms (K.R. Newbey 7823)
Tetraria octandra

Family: Dilleniaceae

Hibbertia acerosa
Hibbertia fasciculiflora
Hibbertia hibbertioides var. *hibbertioides*
Hibbertia huegelii
Hibbertia hypericoides
Hibbertia leucocrossa
Hibbertia polystachya
Hibbertia sp. Mt Lesueur (M. Hislop 174)
Hibbertia subvaginata

Family: Droseraceae

Drosera barbigera

Drosera echinoblastus
Drosera eneabba
Drosera humilis
Drosera menziesii subsp. *penicillaris*
Drosera pallida
Drosera parvula
Drosera porrecta

Family: Ecdeiocoleaceae
Ecdeiocolea monostachya

Family: Elaeocarpaceae
Tetralthea confertifolia

Family: Ericaceae
Andersonia heterophylla
Andersonia lehmanniana
Astroloma glaucescens
Astroloma microdonta
Astroloma pedicellatum
Astroloma sp. Cataby (E.A. Griffin 1022) (P4)
Astroloma xerophyllum
Conostephium magnum
Leucopogon oldfieldii
Leucopogon phyllostachys
Leucopogon sp. Bifid Eneabba (M. Hislop 1927)
Leucopogon sp. Warradarge (M. Hislop 1908)
Lissanthe powelliae
Lysinema pentapetalum

Family: Euphorbiaceae
Beyeria sulcata var. *gracilis*
Monotaxis grandiflora var. *grandiflora*
Stachystemon axillaris

Family: Fabaceae
Acacia alata var. *tetrantha*
Acacia applanata
Acacia auronitens
Acacia barbinervis subsp. *borealis*
**Acacia iteaphylla*
Acacia lasiocarpa var. *bracteolata*
Acacia lasiocarpa var. *lasiocarpa*
Acacia microbotrya
Acacia obovata
Acacia pulchella var. *glaberrima*
Acacia pulchella var. *pulchella*
Acacia pulchella var. *reflexa*
Acacia saligna
Acacia sessilis
Acacia stenoptera
Acacia wilsonii
Bossiaea eriocarpa
Daviesia benthamii subsp. *benthamii*
Daviesia chapmanii
Daviesia daphnoides
Daviesia decurrens
Daviesia epiphyllum
Daviesia nudiflora subsp. *hirtella*
Daviesia podophylla
Gastrolobium plicatum
Gastrolobium polystachyum

Gompholobium aristatum
Gompholobium knightianum
Gompholobium muticum
Gompholobium pungens
Gompholobium tomentosum
Hovea pungens
Hovea stricta
Hovea trisperma
Jacksonia floribunda
Jacksonia hakeoides
Jacksonia lehmannii
Jacksonia nutans
Jacksonia restioides
Kennedia prostrata
**Trifolium arvense* var. *arvense*

Family: Geraniaceae
**Erodium botrys*

Family: Goodeniaceae
Dampiera carinata
Dampiera lavandulacea
Dampiera lindleyi
Dampiera linearis
Dampiera spicigera
Goodenia coerulea
Goodenia glareicola
Goodenia micrantha
Goodenia trichophylla
Lechenaultia biloba
Lechenaultia floribunda
Lechenaultia hirsuta
Lechenaultia stenosepala
Scaevola anchusifolia
Scaevola phlebopetala
Scaevola repens subsp. Northern Sandplains
(R.J. Cranfield & P.J. Spencer 8445)
Velleia trinervis

Family: Gyrostemonaceae
Gyrostemon subnudus

Family: Haemodoraceae
Anigozanthos humilis subsp. *humilis*
Conostylis aculeata subsp. *aculeata*
Conostylis aculeata subsp. *breviflora*
Conostylis androstemma
Conostylis crassinervia subsp. *absens*
Conostylis teretifolia subsp. *teretifolia*
Conostylis tomentosa
Haemodorum simulans
Haemodorum spicatum
Haemodorum venosum
Macropidia fuliginosa

Family: Haloragaceae
Glischrocaryon aureum
Gonocarpus cordiger
Gonocarpus pithyoides

Family: Hemerocallidaceae
Arnocrinum gracillimum
Johnsonia pubescens

<i>Tricoryne elatior</i>	<i>Eucalyptus macrocarpa</i> subsp. <i>macrocarpa</i>
Family: Iridaceae	<i>Eucalyptus pruiniramis</i>
<i>Patersonia occidentalis</i> var. <i>latifolia</i>	<i>Eucalyptus</i> sp. Badgingarra (D. Nicolle & M. French DN 3515)
<i>Patersonia occidentalis</i> var. <i>occidentalis</i>	<i>Eucalyptus todtiana</i>
Family: Lamiaceae	<i>Eucalyptus wandoo</i> subsp. <i>pulverea</i>
<i>Cyanostegia corifolia</i>	<i>Hypocalymma angustifolium</i>
<i>Hemiandra pungens</i>	<i>Hypocalymma hirsutum</i>
<i>Hemiandra</i> sp. Watheroo (S. Hancocks 4)	<i>Kunzea micrantha</i> subsp. <i>petiolata</i>
<i>Lachnostachys eriobotrya</i>	<i>Leptospermum oligandrum</i>
<i>Physopsis spicata</i>	<i>Leptospermum spinescens</i>
<i>Pityrodia bartlingii</i>	<i>Melaleuca aspalathoides</i>
<i>Pityrodia verbascina</i>	<i>Melaleuca ciliosa</i>
Family: Lauraceae	<i>Melaleuca coronicarpa</i>
<i>Cassytha</i> ? <i>racemosa</i> forma <i>pilosa</i> (sterile material)	<i>Melaleuca fulgens</i> subsp. <i>steadmanii</i>
<i>Cassytha flava</i>	<i>Melaleuca leuropoma</i>
<i>Cassytha glabella</i> forma <i>casuarinae</i>	<i>Melaleuca nesophila</i>
Family: Loganiaceae	<i>Melaleuca platycalyx</i>
<i>Logania spermacoea</i>	<i>Melaleuca seriata</i>
Family: Loranthaceae	<i>Melaleuca trichophylla</i>
<i>Amyema miquelii</i>	<i>Melaleuca uncinata</i>
<i>Nuytsia floribunda</i>	<i>Pileanthus filifolius</i>
Family: Malvaceae	<i>Regelia ciliata</i>
<i>Commersonia pulchella</i>	<i>Scholtzia laxiflora</i>
<i>Guichenotia sarotes</i>	<i>Scholtzia</i> sp. Eneabba (S. Maley 8)
<i>Keraudrenia velutina</i>	<i>Verticordia blepharophylla</i>
<i>Lasiopetalum drummondii</i>	<i>Verticordia densiflora</i> var. <i>cespitosa</i>
Family: Myrtaceae	<i>Verticordia densiflora</i> var. <i>densiflora</i>
<i>Baeckea crispiflora</i> var. <i>tenuior</i>	<i>Verticordia grandis</i>
<i>Baeckea grandiflora</i>	<i>Verticordia huegelii</i> var. <i>decumbens</i>
<i>Baeckea</i> sp. Bunney Road (S. Patrick 4059)	<i>Verticordia laciniata</i>
<i>Beaufortia bracteosa</i>	<i>Verticordia ovalifolia</i>
<i>Beaufortia elegans</i>	<i>Verticordia pennigera</i>
<i>Calothamnus hirsutus</i>	Family: Orchidaceae
<i>Calothamnus longissimus</i>	? <i>Elythranthera brunonis</i> (inadequate material)
<i>Calothamnus quadrifidus</i>	<i>Microtis media</i> subsp. <i>media</i>
<i>Calothamnus sanguineus</i>	<i>Prasophyllum elatum</i>
<i>Calothamnus torulosus</i>	<i>Pterostylis recurva</i>
<i>Calytrix angulata</i>	<i>Pterostylis sargentii</i>
<i>Calytrix chrysantha</i>	<i>Pterostylis</i> sp. (sterile material)
<i>Calytrix depressa</i>	<i>Thelymitra stellata</i>
<i>Calytrix flavescens</i>	Family: Phyllanthaceae
<i>Calytrix fraseri</i>	<i>Poranthera microphylla</i>
<i>Calytrix oldfieldii</i>	Family: Pittosporaceae
<i>Conothamnus trinervis</i>	<i>Billardiera venusta</i>
<i>Darwinia neildiana</i>	<i>Cheiranthra preissiana</i>
<i>Darwinia speciosa</i>	<i>Marianthus bicolor</i>
<i>Eremaea asterocarpa</i>	Family: Poaceae
<i>Eremaea beaufortoides</i> var. <i>microphylla</i>	<i>Amphipogon caricinus</i> var. <i>caricinus</i>
<i>Eremaea pauciflora</i>	<i>Amphipogon debilis</i> var. <i>debilis</i>
<i>Eremaea violacea</i> subsp. <i>violacea</i>	<i>Amphipogon turbinatus</i>
<i>Eucalyptus accedens</i>	<i>Aristida holathera</i> var. <i>holathera</i>
<i>Eucalyptus camaldulensis</i> subsp. <i>obtusata</i>	<i>Austrostipa elegantissima</i>
<i>Eucalyptus conveniens</i>	<i>Austrostipa hemipogon</i>
<i>Eucalyptus drummondii</i>	<i>Austrostipa macalpinei</i>
<i>Eucalyptus gittinsii</i> subsp. <i>illucida</i>	<i>Austrostipa nitida</i>
	<i>Austrostipa</i> sp. Cairn Hill (M.E. Trudgen 21176)
	* <i>Bromus diandrus</i>

**Bromus rubens*
 **Ehrharta longiflora*
Lachnagrostis plebeia
Neurachne alopecuroidea
Pentameris airoides
Rytidosperma setaceum
 **Vulpia fasciculata*
 **Vulpia muralis*
 **Vulpia myuros* forma *megalura*

Family: Polygalaceae

Comesperma griffinii
Comesperma virgatum

Family: Portulacaceae

Calandrinia calyptrata
Calandrinia granulifera

Family: Proteaceae

Adenanthos cygnorum subsp. *cygnorum*
Banksia armata var. *armata*
Banksia attenuata
Banksia bipinnatifida subsp. *multifida*
Banksia candolleana
Banksia carlinoides
Banksia cataglypta
Banksia cypholoba
Banksia dallanneyi subsp. *media*
Banksia glaucifolia
Banksia grossa
Banksia kippistiana var. *kippistiana*
Banksia leptophylla var. *leptophylla*
Banksia menziesii
Banksia nana
Banksia nobilis subsp. *fragrans*
Banksia platycarpa
Banksia sclerophylla
Banksia sessilis var. *flabellifolia*
Banksia shuttleworthiana
Banksia sphaerocarpa var. *pumilio*
Banksia splendida subsp. *macrocarpa*
Banksia strictifolia
Conospermum brachyphyllum
Conospermum nervosum
Grevillea crithmifolia
Grevillea erinacea
Grevillea obliquistigma subsp. *obliquistigma*
Grevillea stenogyne
Hakea anadenia
Hakea auriculata
Hakea conchifolia
Hakea flabellifolia
Hakea gilbertii
Hakea incrassata
Hakea lissocarpa
Hakea prostrata
Hakea psilorrhyncha
Hakea ruscifolia
Hakea smilacifolia
Hakea spathulata
Hakea stenocarpa
Hakea trifurcata
Isopogon adenanthoides

Isopogon asper
Isopogon dubius
Isopogon linearis
Isopogon panduratus subsp. *panduratus*
Lambertia multiflora var. *multiflora*
Persoonia comata
Petrophile brevifolia
Petrophile linearis
Petrophile megalostegia
Petrophile chrysantha subsp. *Watheroo* (K.M. Allan 57) (*Petrophile septemfida*)
Petrophile shuttleworthiana
Petrophile striata
Stirlingia abrotanoides
Stirlingia latifolia
Synaphea endothrix
Synaphea interioris
Synaphea spinulosa subsp. *spinulosa*
Xylomelum angustifolium

Family: Restionaceae

Alexgeorgea nitens
Alexgeorgea subterranea
Desmocladius elongatus
Desmocladius parthenicus
Desmocladius virgatus
Hypolaena robusta
Lepidobolus quadratus
Loxocarya striata

Family: Rhamnaceae

Cryptandra myriantha
Cryptandra pungens
Polianthion wichuriae
Stenanthemum humile
Stenanthemum reissekii
Trymalium angustifolium

Family: Rubiaceae

Opercularia vaginata

Family: Rutaceae

Diplolaena cinerea
Diplolaena geraldtonensis
Philotheca pinoides

Family: Santalaceae

Exocarpos sparteus

Family: Sapindaceae

Dodonaea divaricata
Dodonaea ericoides

Family: Scrophulariaceae

**Zaluzianskya divaricata*

Family: Stylidiaceae

Levenhookia pusilla
Levenhookia stipitata
Stylidium caricifolium
Stylidium crossoccephalum
Stylidium cygnorum
Stylidium diuroides subsp. *paucifoliatum*

Stylidium eriopodum
Stylidium maitlandianum
Stylidium miniatum
Stylidium purpureum
Stylidium scariosum
Stylidium sp. (inadequate material)
Stylidium stenosepalum

Family: Thymelaeaceae

Pimelea angustifolia
Pimelea imbricata var. *piliger*
Pimelea leucantha
Pimelea sulphurea

Family: Violaceae

Hybanthus floribundus subsp. *floribundus*

Family: Xanthorrhoeaceae

Xanthorrhoea drummondii

Family: Zamiaceae

Macrozamia fraseri

Appendix 9

Locations of Flora of Conservation Significance



Species	Location		
	Site	Easting (mE)	Northing (mN)
Threatened			
<i>Acacia wilsonii</i>	WWF09	351728	6684273
<i>Banksia catoglypta</i>	Opportunistic	356339	6687948
<i>Eucalyptus pruiniramis</i>	Opportunistic	353534	6682041
<i>Thelymitra stellata</i>	Opportunistic	351519	6684244
Priority 1			
<i>Grevillea stenogyne</i>	Opportunistic	356095	6688024
<i>Ptilotus</i> sp. nov.	WWF12	352345	6684019
Priority 2			
<i>Arnocrinum gracillimum</i>	Opportunistic	350803	6684780
<i>Baeckea</i> sp. Bunney Road (S. Patrick 4059)	Opportunistic	355798	6684475
	Opportunistic	352468	6681973
	WWF07	351524	6684410
	WWF17	356139	6688065
	WWFRB01	351092	6684630
	WWFRB03	351408	6684446
	Opportunistic	357422	6687891
	Opportunistic	356589	6684859
	Opportunistic	356347	6684584
<i>Comesperma griffinii</i>	WWF20	355105	6684325
<i>Synaphea endothrix</i>	WWF05	350803	6684780
Priority 3			
<i>Allocasuarina grevilleoides</i>	WWF12	352345	6684019
	WWFRB04	351392	6684376
	WWFRB05	351534	6684227
<i>Allocasuarina ramosissima</i>	Opportunistic	352665	6682144
	WWF11	351992	6683898
	WWF12	352345	6684019
	WWFRB04	351392	6684376
<i>Austrostipa</i> sp. Cairn Hill (M.E. Trudgen 21176)	Opportunistic	353246	6684913
	WWFRB09	353128	6683659
	Opportunistic	350803	6684891
	Opportunistic	352947	6684281
<i>Banksia cypholoba</i>	WWF12	352345	6684019
	WWF20	355105	6684325
	Opportunistic	352171	6683295
<i>Banksia nobilis</i> subsp. <i>fragrans</i>	Opportunistic	356600	6684252
	Opportunistic	355961	6686309
<i>Banksia splendida</i> subsp. <i>macrocarpa</i>	WWF14	355840	6686327
	Opportunistic	353343	6684754
	WWF20	355105	6684325
<i>Grevillea erinacea</i>	Opportunistic	356566	6684442
	WWF16	356640	6686289
	Opportunistic	353135	6684386
<i>Lepidobolus quadratus</i>	Opportunistic	351513	6684251
	Opportunistic	352014	6683282
	Opportunistic	352346	6684140
<i>Petrophile chrysantha</i> subsp. <i>Watheroo</i> (K.M. Allan 57) [#]	Opportunistic	350157	6687432
Priority 4			
<i>Astroloma</i> sp. Cataby (E.A. Griffin 1022)	WWF01	354420	6686098

Species	Location		
	Site	Easting (mE)	Northing (mN)
<i>Banksia platycarpa</i>	Opportunistic	353246	6684913
<i>Banksia sclerophylla</i>	WWF10	353364	6684706
	Opportunistic	551959	6683933
<i>Calytrix chrysantha</i>	Opportunistic	351407	6684397
	WWFRB05	351534	6684227
	Opportunistic	351618	6684288
	WWF12	352345	6684019
<i>Conostephium magnum</i>	WWF04	356403	6686689
	WWF16	356640	6686289
	WWF16	356640	6686289
	Opportunistic	356387	6686759
<i>Desmocladius elongatus</i>	WWF01	354420	6686098
	Opportunistic	352171	6683295
<i>Hemiandra</i> sp. Watheroo (S. Hancocks 4)	WWFRB09	353128	6683659
	Opportunistic	356339	6687948
<i>Hypolaena robusta</i>	Opportunistic	350157	6687432
	WWF05	350803	6684780
	Opportunistic	350806	6684824

#more recently known as *Petrophile septemfida* Rye & K.A. Sheph (see Rye et al. 2011).

Appendix 10

List of Fauna Potentially Occurring in the Study Area



Family: Acanthizidae	<i>Acanthiza apicalis</i> <i>Acanthiza chrysorrhoa</i> <i>Acanthiza inornata</i> <i>Acanthiza uropygialis</i> <i>Calamanthus campestris</i> <i>Gerygone fusca</i> <i>Pyrrholaemus brunneus</i> <i>Sericornis frontalis</i> <i>Smicornis brevirostris</i>
Family: Accipitridae	<i>Accipiter fasciatus</i> <i>Aquila audax</i> <i>Circus assimilis</i> <i>Elanus axillaris</i> <i>Haliaeetus leucogaster</i> <i>Haliastur sphenurus</i> <i>Hieraaetus morphnoides</i> <i>Lophoictinia isura</i>
Family: Acrocephalidae	<i>Acrocephalus australis</i>
Family: Agamidae	<i>Ctenophorus adelaidensis</i> <i>Ctenophorus maculatus</i> subsp. <i>maculatus</i> <i>Moloch horridus</i> <i>Pagona minor</i> subsp. <i>minor</i> <i>Rankinia adelaidensis</i>
Family: Anatidae	<i>Anas gracilis</i> <i>Anas superciliosa</i> <i>Biziura lobata</i> <i>Chenonetta jubata</i> <i>Cygnus atratus</i> <i>Malacorhynchus membranaceus</i> <i>Tadorna tadornoides</i>
Family: Ardeidae	<i>Ardea alba</i> <i>Ardea ibis</i> <i>Ardea pacifica</i> <i>Egretta novaehollandiae</i>
Family: Artamidae	<i>Artamus cinereus</i> <i>Artamus cyanopterus</i>
Family: Cacatuidae	<i>Cacatua pastinator</i> <i>Cacatua sanguinea</i> <i>Calyptorhynchus banksii</i> <i>Calyptorhynchus baudinii</i> <i>Calyptorhynchus latirostris</i> <i>Eolophus roseicapillus</i> <i>Nymphicus hollandicus</i>

Family: Campephagidae	<i>Coracina novaehollandiae</i> <i>Lalage sueurii</i>
Family: Casuariidae	<i>Dromaius novaehollandiae</i>
Family: Charadriidae	<i>Charadrius ruficapillus</i> <i>Elseya melanops</i> <i>Erythrogonys cinctus</i> <i>Vanellus tricolour</i>
Family: Columbidae	<i>Columba livia</i> <i>Ocyphaps lophotes</i> <i>Phaps chalcoptera</i> <i>Phaps elegans</i>
Family: Corvidae	<i>Corvus bennetti</i> <i>Corvus coronoides</i>
Family: Cracticidae	<i>Cracticus nigrogularis</i> <i>Cracticus tibicen</i> <i>Cracticus torquatus</i>
Family: Cuculidae	<i>Cacomantis flabelliformis</i> <i>Cacomantis pallidus</i> <i>Chalcites basalis</i> <i>Chalcites lucidus</i> <i>Chalcites osculans</i>
Family: Dasyuridae	<i>Sminthopsis dolichura</i> <i>Sminthopsis granulipes</i>
Family: Diplodactylidae	<i>Crenadactylus ocellatus</i> subsp. <i>ocellatus</i> <i>Diplodactylus ornatus</i> <i>Diplodactylus polyophthalmus</i> <i>Strophurus spinigerus</i> subsp. <i>spinigerus</i>
Family: Elapidae	<i>Echiopsis curta</i> <i>Hydrophis elegans</i> <i>Neelaps calonotos</i> <i>Parasuta gouldii</i> <i>Pseudechis australis</i> <i>Pseudechis nuchalis</i> <i>Simoselaps littoralis</i>
Family: Estrilidae	<i>Taeniopygia guttata</i>
Family: Falconidae	<i>Falco berigora</i> <i>Falco cenchroides</i> <i>Falco longipennis</i>

Family: Halcyonidae	<i>Dacelo novaeguineae</i> <i>Todiramphus pyrrhopygius</i> <i>Todiramphus sanctus</i>
Family: Hirundinidae	<i>Cheramoeca leucosterna</i> <i>Hirundo neoxena</i> <i>Petrochelidon ariel</i> <i>Pterochelidon nigricans</i>
Family: Hylidae	<i>Litoria moorei</i>
Family: Limnodynastidae	<i>Heleioporus albopunctatus</i> <i>Heleioporus eyrei</i> <i>Heleioporus psammophilus</i> <i>Neobatrachus pelobatoides</i>
Family: Macropodidae	<i>Macropus robustus</i> subsp. <i>erubescens</i>
Family: Maluridae	<i>Malurus lamberti</i> <i>Malurus leucopterus</i> <i>Malurus pulcherrimus</i> <i>Malurus splendens</i> <i>Stipiturus malachurus</i>
Family: Megaluridae	<i>Cincloramphus cruralis</i> <i>Cincloramphus mathewsi</i>
Family: Megapodiidae	<i>Leipoa ocellata</i>
Family: Meliphagidae	<i>Acanthagenys rufogularis</i> <i>Acanthorhynchus superciliosus</i> <i>Anthochaera carunculata</i> <i>Anthochaera lunulata</i> <i>Certhionyx variegatus</i> <i>Epthianura albifrons</i> <i>Epthianura tricolor</i> <i>Glyciphila melanops</i> <i>Lichenostomus ornatus</i> <i>Lichenostomus penicillatus</i> <i>Lichenostomus virescens</i> <i>Lichmera indistincta</i> <i>Manorina flavigula</i> <i>Melithreptus brevirostris</i> <i>Phylidonyris niger</i> <i>Phylidonyris novaehollandiae</i>
Family: Meropidae	<i>Merops ornatus</i>
Family: Monarchidae	<i>Grallina cyanoleuca</i>

Family: Motacillidae	<i>Anthus novaeseelandiae</i>
Family: Muridae	<i>Mus musculus</i> <i>Pseudomys albocinereus</i> <i>Rattus fuscipes</i>
Family: Myobatrachidae	<i>Crinia pseudinsignifera</i> <i>Myobatrachus gouldii</i> <i>Pseudophryne guentheri</i>
Family: Nectariniidae	<i>Dicaeum hirundinaceum</i>
Family: Otididae	<i>Ardeotis australis</i>
Family: Pachycephalidae	<i>Colluricincla harmonica</i> <i>Oreoica gutturalis</i> <i>Pachycephala pectoralis</i> <i>Pachycephala rufiventris</i>
Family: Pardalotidae	<i>Pardalotus striatus</i>
Family: Petroicidae	<i>Eopsaltria georgiana</i> <i>Eopsaltria griseogularis</i> <i>Melanodryas cucullata</i> <i>Microeca fascians</i> <i>Petroica boodang</i> <i>Petroica goodenovii</i>
Family: Phalacrocoracidae	<i>Microcarbo melanoleucos</i> <i>Phalacrocorax varius</i>
Family: Phasianidae	<i>Coturnix pectoralis</i> <i>Coturnix ypsilophora</i>
Family: Podargidae	<i>Podargus strigoides</i>
Family: Podicipedidae	<i>Poliocephalus poliocephalus</i> <i>Tachybaptus novaehollandiae</i>
Family: Pomatostomidae	<i>Pomatostomus superciliosus</i>
Family: Psittacidae	<i>Barnardius zonarius</i> <i>Melopsittacus undulatus</i> <i>Polytelis scapulatus</i>
Family: Pteropodidae	<i>Pteropus scapulatus</i>
Family: Pygopodidae	<i>Aprasia repens</i> <i>Delma concinna</i> subsp. <i>concinna</i>

	<i>Delma fraseri</i>
	<i>Delma grayii</i>
	<i>Lialis burtonis</i>
	<i>Pletholax gracilis</i>
	<i>Pygopus lepidopodus</i>
Family: Rallidae	<i>Tribonyx ventralis</i>
Family: Recurvirostridae	<i>Cladorhynchus leucocephalus</i>
	<i>Himantopus himantopus</i>
	<i>Recurvirostra novaehollandiae</i>
Family: Rhipiduridae	<i>Rhipidura albiscapa</i>
	<i>Rhipidura leucophrys</i>
Family: Scincidae	<i>Ctenotus fallens</i>
	<i>Ctenotus impar</i>
	<i>Ctenotus pantherinus</i> subsp. <i>pantherinus</i>
	<i>Ctenotus schomburgkii</i>
	<i>Egernia multisculata</i>
	<i>Lerista christinae</i>
	<i>Lerista distinguenda</i>
	<i>Lerista praepedita</i>
	<i>Menetia greyii</i>
	<i>Morethia lineoocellata</i>
	<i>Morethia obscura</i>
	<i>Tiliqua rugosa</i> subsp. <i>rugosa</i>
Family: Scolopacidae	<i>Actitis hypoleucos</i>
	<i>Calidris ruficollis</i>
Family: Strigidae	<i>Ninox connivens</i>
Family: Tarsipedidae	<i>Tarsipes rostratus</i>
Family: Threskiornithidae	<i>Threskiornis spinicollis</i>
Family: Timaliidae	<i>Zosterops lateralis</i>
Family: Turnicidae	<i>Turnix velox</i>
Family: Typhlopidae	<i>Ramphotyphlops waitii</i>
Family: Vespertilionidae	<i>Nyctophilus geoffroyi</i>
	<i>Vespadelus regulus</i>

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VERVE ENERGY WARRADARGE WIND FARM NOISE IMPACT ASSESSMENT

MARCH 2012

OUR REFERENCE:14014-9-11250



DOCUMENT CONTROL PAGE

**NOISE IMPACT ASSESSMENT
WARRADARGE**

Job No: 11250

Document Reference : 14014-9-11250

FOR

VERVE ENERGY

DOCUMENT INFORMATION				
Author:	George Watts	Checked By:	Tim Reynolds	
Date of Issue :	16 March 2012			
REVISION HISTORY				
Revision	Description	Date	Author	Checked
1	Incorporating comments from Verve Energy	13/01/2012	GW	TR
2	Incorporating comments from Verve Energy	23/01/2012	GW	TR
3	Incorporating new turbine type	08/02/2012	GW	TR
4	Incorporating background noise monitoring criteria	16/03/2012	GW	TR
5	Incorporating comments from Verve Energy	21/03/2012	GW	TR
6	Incorporating comments from Verve Energy	30/03/2012	HS	TR
7	Incorporating comments from Verve Energy	17/04/2012	GW	TR
8	Incorporating comments from Verve Energy	17/04/2012	GW	TR
DOCUMENT DISTRIBUTION				
Copy No.	Version No.	Destination	Hard Copy	Electronic Copy
1	1	Verve Energy		✓
1	2	Verve Energy		✓
1	3	Verve Energy		✓
1	4	Verve Energy		✓
1	5	Verve Energy		✓
1	6	Verve Energy		✓
1	7	Verve Energy		✓
1	8	Verve Energy		✓
1	9	Verve Energy		✓

CONTENTS

1.	INTRODUCTION	1
2.	SUMMARY	1
3.	CRITERIA	2
4.	MODELLING	3
5.	RESULTS	4
6.	ASSESSMENT	4
7.	CONCLUSION	6

APPENDICIES

A	Residential and Wind Turbine Locations
B	Predicted Noise Level Contours
C	Low Frequency and Infrasound Assessment
D	Compliance Checklist

1. INTRODUCTION

Herring Storer Acoustics was commissioned by Verve Energy to carry out a noise impact assessment for the proposed Warradarge Wind Farm development.

The proposed development site is located on private farming land in Warradarge, approximately 240km north of Perth and 18km east of Eneabba.

The proposed wind farm consists of up to 100 wind turbines, with a maximum generating capacity of 250 MW.

See Appendix A for locations of turbines and noise sensitive premises.

The noise impact assessment has been carried out in accordance with the EPA of South Australia "*Wind Farms – Environmental noise guidelines – July 2009*" (Guidelines) which is the guidelines recognised by the Department of Environment and Conservation for the assessment of wind farms.

2. SUMMARY

Noise levels were assessed at 13 identified receiver points, with these locations shown in Appendix A.

Noise emissions at domestic receiver points have been calculated to comply with the background noise criteria under all wind conditions.

Noise levels at one "non-domestic" receiver point have been calculated to exceed the background noise criteria. It is noted that the criteria is unlikely to be applicable at this location.

The following property lot numbers are understood to be owned by non-participants of the proposed development. The 39 dB(A) noise contour, being the minimum background noise criteria at this wind speed, encroaches on these properties for the noisiest operating condition (8m/s) as shown in Appendix B, Map 3A. There is a risk that residences, or other noise sensitive premises, may be constructed at a later date in the areas within the 39 dB(A) contour. The affected lot numbers are:

10849
10854
10877

It is recommended that Verve Energy consider if measures need to be put in place to minimise this risk.

Although not required under the EPA of South Australia "*Wind Farms – Environmental Noise Guidelines – July 2009*" (Guidelines), an assessment of low frequency and infrasound content has been conducted and included in Appendix C. Based on the assessment, low frequency noise and infrasound are considered highly unlikely to represent a problem in the vicinity of the proposed wind farm.

3. CRITERIA

According to the Western Australian Planning bulletin number 67 “Guidelines for Wind Farm Development” – May 2004, the noise impact of proposed wind farms in Western Australia should be assessed in accordance with the criteria and approach of assessing wind farms described in the EPA of South Australia “*Wind Farms – Environmental noise guidelines – July 2009*” (Guidelines).

The Guidelines recommend the following criteria for the assessment of noise levels associated with proposed wind farms;

The predicted equivalent noise level ($L_{Aeq, 10 \text{ minutes}}$), adjusted for tonality in accordance with the Guidelines, should not exceed :

- *35 dB(A) at relevant receivers in localities which are primarily intended for rural living, or*
- *40 dB(A) at relevant receivers in localities in other zones, or*
- *the background noise ($L_{A90, 10 \text{ minutes}}$) by more than 5 dB(A).*

Whichever is the greater at all the relevant receivers for wind speeds from cut-in to rated power of the wind turbine and each integer speed in between.

The criteria for background noise levels will vary with wind speed, as will wind turbine generated noise.

In accordance with the Guidelines, 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.

If there is any uncertainty about the zone, and whether the rural living criteria should be applied, the question should be resolved in consultation with the relevant environmental protection authority and council for the area concerned.

Through discussions with John MacPherson, Principal Environmental Noise Officer of the Department of Environment and Conservation, it is understood that the Department of Environment and Conservation has the expectation that the “rural living” zone is applicable for the receivers in the proposed development area.

This assessment has been based on the background noise monitoring criteria, which is presented in an accompanying report (Our Ref: 14290-2-11250-01).

It is noted that the Guidelines have been developed to minimise the impact on the amenity of premises that do not have an agreement with wind farm developers. Our assessment includes all identified residential premises in the surrounding area, some of which may have such an agreement.

4. MODELLING

Noise immissions at residential premises, due to the proposed wind farm, were determined by noise modelling, using the computer program “SoundPlan” version 7.1.

SoundPlan uses the theoretical sound power levels determined from measured sound pressure levels to calculate the noise level at any location.

The following input data was used in the SoundPlan model:

- a) Topographical Information – Ground contours of the development area
- b) Residential and Wind Turbine Locations – See Appendix A for location map and table of wind turbine locations and receiver point locations.
- c) Sound Power Levels, varying with wind speed, of the wind turbines which are understood to be the noisiest turbines under consideration (Siemens SWT-3.0-101), at the highest hub height under consideration (100m) – See Table 4.1 below.

Table 4.1 – Siemens SWT-3.0-101, 100m hub, Sound Power Levels

Wind Speed (10m above ground), m/s	Sound Power Level, dB(A)
6	105.1
7	107.0
8	108.0
9	108.0
10	108.0

The Guidelines indicate that noise immissions should be modelled to reflect typical, (but not extreme) “worst case” meteorological conditions for sound propagation towards the receiver.

After a review of the literature available on the subject, noise level emissions were modelled using the ISO 9613-2:1996 algorithm, with the conditions listed in Table 4.2. These conditions, and calculating noise levels utilising a “G=0” ground absorption have been found to provide a generally realistic and conservative assessment of noise levels associated with wind turbines, generally over predicting (i.e. a conservative calculation) in the order of 2 – 3 dB.

Table 4.2 – Meteorological Conditions

Condition	Value
Temperature	15 °C
Relative humidity	70%
Atmospheric Pressure	101.325 kPa

Noise levels attributable to the proposed wind farm were calculated for integer wind speeds 6 – 8m/s at a height of 100m (hub height). The sound power levels of the turbines at wind speeds above 8m/s are the same as at 8m/s and are therefore represented by this wind speed. Noise levels for integer wind speeds below 6m/s are lower than those at 6m/s, hence noise emissions at 6m/s can be considered a conservative representation of lower wind speed noise levels.

The sound power level of the turbines were varied for each integer wind speed, however the weather conditions within the model remained constant at the conditions stipulated in Table 4.1 above.

5. RESULTS

Noise contour plots are attached in Appendix B.

The predicted noise levels at each identified receiver point are listed in Table 5.1 below for each of the wind speeds considered.

Table 5.1 – Predicted Noise Levels at Identified Receiver Locations

Receiver Point #	Domestic / Non – Domestic Building	Development Participant / Non-participant	Predicted Noise Level, L _{Aeq} [dB(A)]		
			6m/s	7m/s	8m/s
1	Domestic	Non - Participant	10	12	22
2	Domestic	Non - Participant	14	16	18
3	Domestic	Non - Participant	30	31	33
4	Domestic	Participant	21	23	26
5	Domestic	Participant	35	37	38
6	Domestic	Non - Participant	30	32	33
7	Domestic	Participant	27	29	31
8	Domestic	Participant	27	28	30
9	Domestic	Non - Participant	23	25	28
10	Non - Domestic	Participant	52	54	55
11	Domestic	Non - Participant	0	0	0
12	Non - Domestic	Non - Participant	26	28	30
13	Domestic	Non - Participant	13	15	22

6. ASSESSMENT

Table 6.1 summarises the background noise at each location for each integer wind speed.

TABLE 6.1 – BACKGROUND NOISE LEVELS, L_{A90,10 minutes} [dB(A)]

Location	WIND SPEED AT 10m ABOVE GROUND LEVEL (m/s)						
	3	4	5	6	7	8	9
1	32	32	32	33	35	37	39
2	32	32	33	33	34	34	35
3	33	34	34	35	36	37	39

The background noise criteria are listed for the three locations monitored below in Table 6.2.

Table 6.2 – Noise Criteria Based on Background Noise Levels, dB(A)

Background Noise Monitoring Location	Wind Speed at 10m Above Ground Level (m/s)						
	3	4	5	6	7	8	9
1	37	37	37	38	40	42	44
2	35	35	35	35	37	39	41
3	38	39	39	40	41	42	44

The nearest background noise monitoring location to the identified receiver locations has been utilised for our assessment, and are as listed in Table 6.3 below. The background noise monitoring locations were selected as representative of the receiver point locations that were calculated to receive noise emissions associated with the wind-farm closest to the base 35 dB(A) criteria during the initial noise impact assessment. For full details see our accompanying report (Our Ref: 14290-3-11250-01).

Table 6.3–Applicable Background Noise Level Criteria, dB(A)

Receiver Point #	Applicable Background Noise Monitoring Location	Wind Speed at 10m Above Ground Level (m/s)						
		3	4	5	6	7	8	9
1	1	37	37	37	38	40	42	44
2	1	37	37	37	38	40	42	44
3	1	37	37	37	38	40	42	44
4	1	37	37	37	38	40	42	44
5	2	35	35	35	35	37	39	41
6	2	35	35	35	35	37	39	41
7	3	38	39	39	40	41	42	44
8	3	38	39	39	40	41	42	44
9	2	35	35	35	35	37	39	41
10	3	38	39	39	40	41	42	44
11	3	38	39	39	40	41	42	44
12	3	38	39	39	40	41	42	44
13	3	38	39	39	40	41	42	44

Table 6.4 below summarises the level of exceedance to the noise criteria based on background noise monitoring, with the predicted levels exceeding the criteria highlighted in red and the level of exceedance listed in brackets adjacent. It is noted that whilst the non-domestic locations have been assessed, the criteria is not considered applicable at these locations.

Table 6.4 – Assessment of Noise Levels at Identified Receiver Locations

Receiver Point #	Domestic / Non – Domestic Building	Development Participant / Non-participant	Predicted Noise Level, L _{Aeq} [dB(A)]			Noise Criteria Based on Background Noise Level, L _{Aeq} [dB(A)]		
			6m/s	7m/s	8m/s	6m/s	7m/s	8m/s
1	Domestic	Non - Participant	10	12	22	38	40	42
2	Domestic	Non - Participant	14	16	18	38	40	42
3	Domestic	Non - Participant	30	31	33	38	40	42
4	Domestic	Participant	21	23	26	38	40	42
5	Domestic	Participant	35	37	38	35	37	39
6	Domestic	Non - Participant	30	32	33	35	37	39
7	Domestic	Participant	27	29	31	40	41	42
8	Domestic	Participant	27	28	30	40	41	42
9	Domestic	Non - Participant	23	25	28	35	37	39
10	Non - Domestic	Participant	52 (12)	54 (13)	55 (13)	40	41	42
11	Domestic	Non - Participant	0	0	0	40	41	42
12	Non - Domestic	Non - Participant	26	28	30	40	41	42
13	Domestic	Non - Participant	13	15	22	40	41	42

(#) Criteria exceeded by

As can be seen from the above tables, calculated noise levels at all “domestic” receiver points have been calculated to comply with the background noise criteria.

Noise levels at Receiver Point 10 have been calculated to exceed the background noise criteria. The receiver point is non-domestic and owned by a participant of the development and we have been informed that they will remain non-domestic throughout the life of the wind farm.

Inspection of the noise contour map for the 8m/s wind speed scenario (noisiest operating condition – see Appendix B, Map 3A) indicated that there are some land areas within the 39 dB(A) contour, being the minimum background noise criteria at this wind speed, that are owned by non-participants of the wind farm development. This presents a risk that future residences, or other noise sensitive premises, could be built at a later date in these areas. The lots affected are:

10849
10854
10877

It is recommended that Verve Energy consider if measures need to be put in place to minimise this risk.

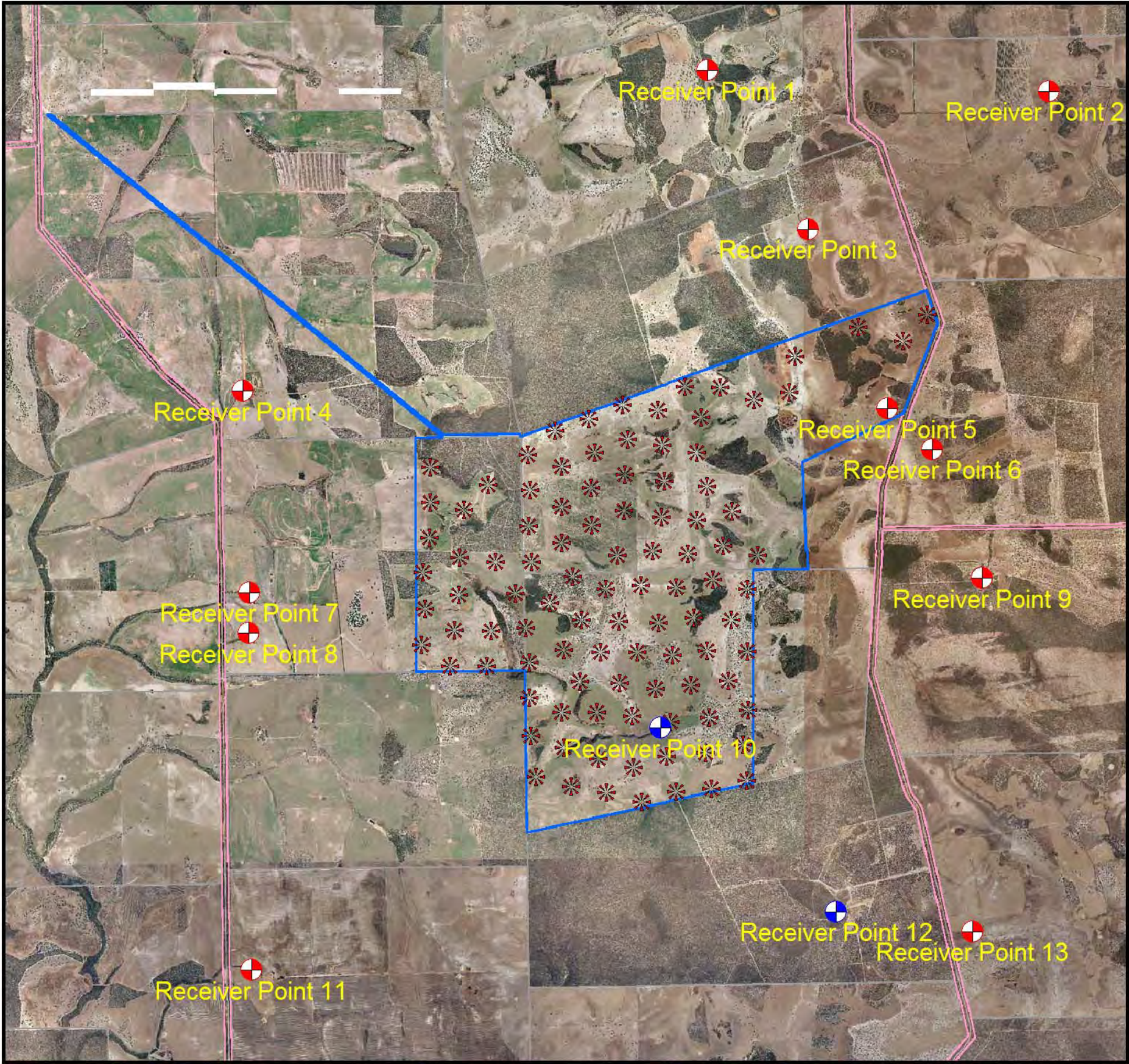
An assessment of low frequency and infrasound content has been conducted and included in Appendix C. Based on the assessment low frequency noise and infrasound are considered highly unlikely to represent a problem in the vicinity of the proposed wind farm.

7. CONCLUSION

Noise emissions at domestic receiver points have been calculated to comply with the background noise criteria under all wind conditions. It is noted that this conclusion applies to this turbine layout for the wind turbines considered (Siemens-3.0-101, at 100m hub height) and any other quieter turbines that may be considered. This includes operating in quieter “Noise Modes” or turbines with lower hub heights.

APPENDIX A

RESIDENTIAL AND WIND TURBINE LOCATIONS



Verve Energy
Warradarge Wind Farm
Receiver Point Locations

100 Wind Turbines
SWT-3.0 101
100m Hub Height
Receiver Point Locations

Locality
Map



Length scale 1:70000
00.25 0.5 1 1.5 2 2.5 3 km

Signs and symbols

- Domestic Building
- Wind Turbine
- Non Domestic Building

Job No : 11250
Calc Ref : Receiver Points Geofile

TABLE 1 – WIND TURBINE LOCATIONS

Turbine Number	Easting(m)	Northing (m)	Height of ground level at base of tower (m)	Turbine Number	Easting(m)	Northing (m)	Height of ground level at base of tower (m)
1	358,808	6,688,679	276.2	51	355,905	6,684,243	285.2
2	357,690	6,688,480	280.7	52	350,669	6,684,517	264.4
3	358,420	6,688,253	279.2	53	351,249	6,684,152	291.2
4	356,679	6,688,004	240.0	54	352,160	6,684,181	325.6
5	356,575	6,687,423	237.0	55	352,762	6,683,799	324.0
6	356,015	6,687,309	241.3	56	353,229	6,683,746	302.4
7	355,466	6,687,506	262.3	57	353,825	6,683,721	297.3
8	354,894	6,687,515	285.1	58	354,472	6,683,697	321.5
9	353,892	6,687,225	300.0	59	355,035	6,683,788	325.2
10	354,463	6,687,134	292.4	60	355,640	6,683,746	290.6
11	355,159	6,687,018	285.7	61	350,707	6,683,933	261.0
12	353,345	6,687,002	306.3	62	351,179	6,683,585	272.6
13	353,975	6,686,666	317.8	63	351,763	6,683,572	299.2
14	354,534	6,686,567	299.3	64	352,322	6,683,622	327.9
15	355,093	6,686,455	289.1	65	352,943	6,683,262	310.1
16	352,798	6,686,803	315.8	66	353,540	6,683,224	300.8
17	353,436	6,686,447	333.2	67	354,124	6,683,224	321.1
18	353,925	6,686,091	323.9	68	354,695	6,683,175	326.8
19	354,563	6,685,991	295.8	69	355,259	6,683,249	311.2
20	355,259	6,685,908	266.0	70	355,905	6,683,241	309.0
21	352,359	6,686,422	343.4	71	350,644	6,683,349	252.0
22	352,906	6,686,231	336.8	72	351,104	6,683,001	263.1
23	353,378	6,685,883	325.8	73	351,701	6,683,001	293.5
24	353,908	6,685,519	314.4	74	352,384	6,683,063	309.8
25	354,521	6,685,411	291.5	75	353,204	6,682,752	305.3
26	355,093	6,685,362	277.0	76	353,838	6,682,727	322.9
27	355,656	6,685,502	277.8	77	354,422	6,682,640	338.1
28	350,781	6,686,219	277.5	78	354,993	6,682,690	341.3
29	351,725	6,685,933	318.1	79	355,598	6,682,769	313.3
30	352,396	6,685,846	349.6	80	352,384	6,682,491	287.2
31	352,906	6,685,569	337.5	81	352,906	6,682,255	304.1
32	353,395	6,685,279	307.7	82	353,478	6,682,255	329.0

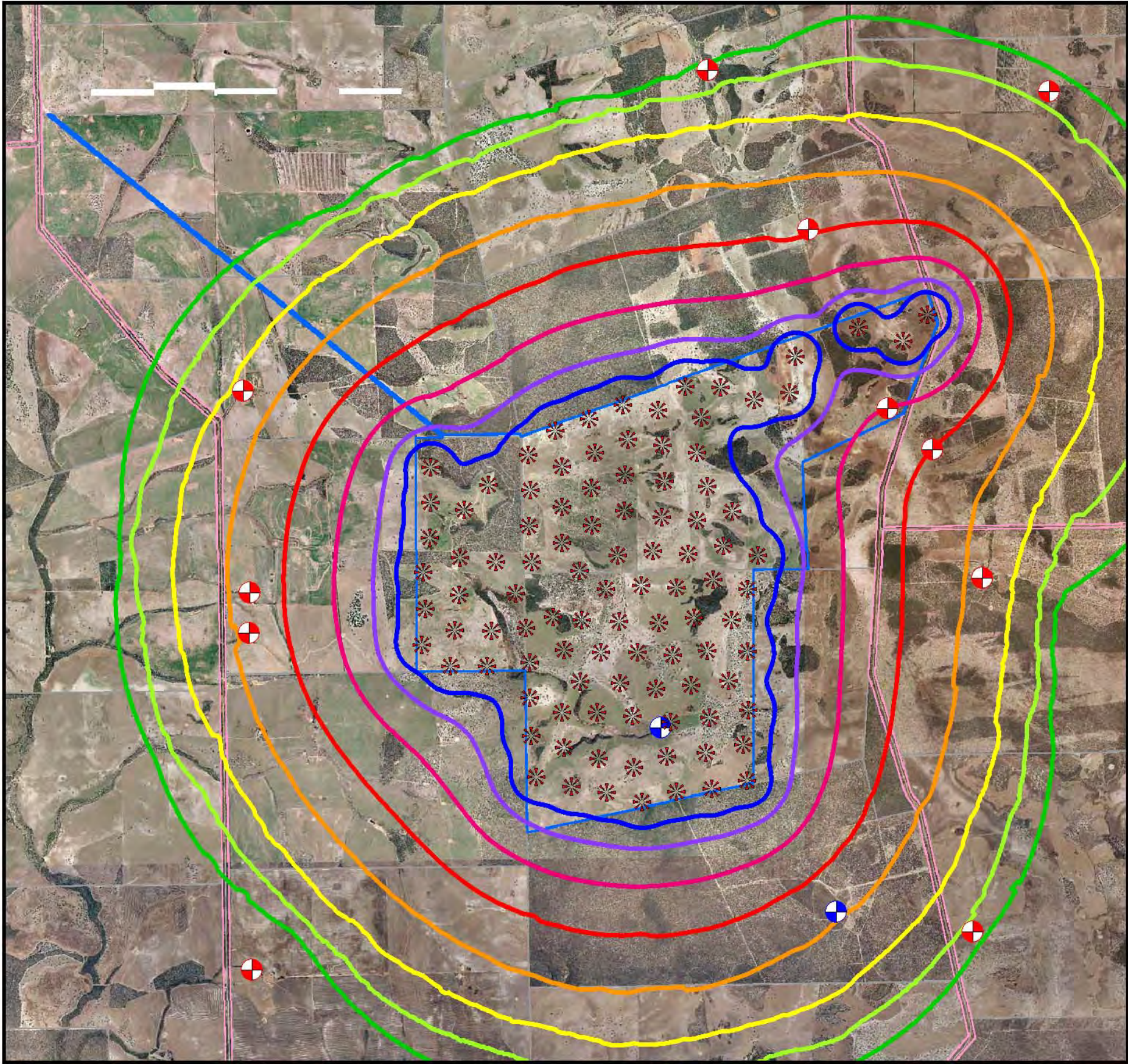
Turbine Number	Easting(m)	Northing (m)	Height of ground level at base of tower (m)	Turbine Number	Easting(m)	Northing (m)	Height of ground level at base of tower (m)
33	353,809	6,684,790	288.9	83	354,049	6,682,193	336.4
34	354,377	6,684,863	281.1	84	354,658	6,682,106	342.3
35	354,944	6,684,815	289.0	85	355,283	6,682,172	311.2
36	355,515	6,684,947	293.0	86	355,921	6,682,288	296.8
37	356,070	6,684,790	273.6	87	352,409	6,681,882	292.1
38	350,781	6,685,647	271.1	88	352,943	6,681,684	312.6
39	351,328	6,685,523	294.0	89	353,502	6,681,510	305.4
40	352,367	6,685,270	319.8	90	354,062	6,681,373	308.7
41	352,906	6,684,989	328.4	91	354,596	6,681,547	320.9
42	350,769	6,685,076	269.7	92	355,234	6,681,601	317.6
43	351,253	6,684,753	282.3	93	355,830	6,681,733	315.2
44	351,837	6,684,691	299.9	94	352,496	6,681,211	285.2
45	352,417	6,684,682	321.8	95	353,055	6,681,062	281.5
46	353,188	6,684,544	309.0	96	353,627	6,680,963	292.4
47	353,618	6,684,243	290.2	97	354,198	6,680,814	322.8
48	354,182	6,684,301	299.2	98	354,753	6,680,971	336.9
49	354,753	6,684,276	315.6	99	355,325	6,681,021	340.0
50	355,350	6,684,401	303.8	100	355,888	6,681,149	314.3

TABLE 2 – RECEIVER POINT LOCATIONS

Receiver Point #	Domestic / Non – Domestic	Participant / Non-participant	Easting (m)	Northing (m)	Height of ground level at receiver point (m)
1	Domestic	Non - Participant	355,265	6,692,624	244.34
2	Domestic	Non - Participant	360,775	6,692,288	303.25
3	Domestic	Non - Participant	356,887	6,690,058	257.52
4	Domestic	Participant	347,762	6,687,442	244.5
5	Domestic	Participant	358,165	6,687,158	254.86
6	Domestic	Non - Participant	358,889	6,686,500	263.1
7	Domestic	Participant	347,863	6,684,189	230
8	Domestic	Participant	347,860	6,683,532	240
9	Domestic	Non - Participant	359,703	6,684,420	270
10	Non - Domestic	Participant	354,506	6,682,004	340
11	Domestic	Non - Participant	347,902	6,678,091	209.6
12	Non - Domestic	Non - Participant	357,345	6,679,036	292.11
13	Domestic	Non - Participant	359,540	6,678,713	310

APPENDIX B

PREDICTED NOISE LEVEL CONTOURS



Verve Energy
Warradarge Wind Farm
Noise Contour Map

100 Wind Turbines
SWT-3.0 - 101
100m Hub Height
Wind Speed : 6m/s (@10m AG)

Map
1



Length scale 1:70000
0 0.5 1 1.5 2 2.5 3 km

- Noise levels**
in L_{Aeq} dB(A)

 - = 10
 - = 15
 - = 20
 - = 25
 - = 30
 - = 35
 - = 40
 - = 45
- Signs and symbols**

 - Domestic Building
 - Wind Turbine
 - Non Domestic Building

Noise Model Parameters
ISO 9613-2:1996 Algorithm
Temperature : 15°C
Relative Humidity : 70%
Atmospheric Pressure : 101.325 kPa

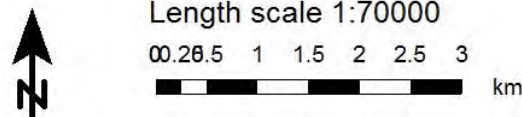
Job No : 11250
Calc Ref : 63



Verve Energy
Warradarge Wind Farm
Noise Contour Map

100 Wind Turbines
SWT-3.0 - 101
100m Hub Height
Wind Speed : 6m/s (@10m AG)

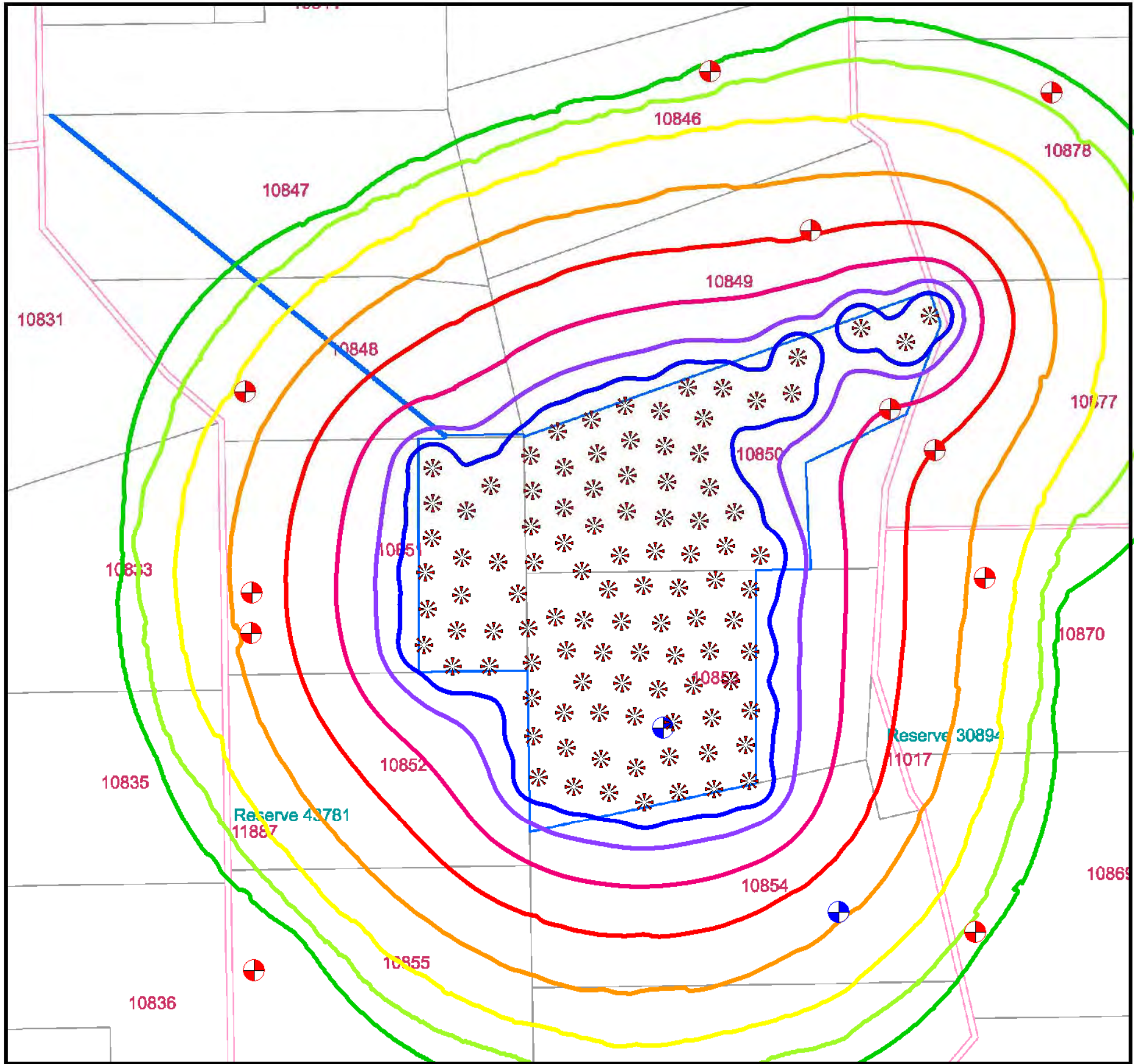
Map
1A

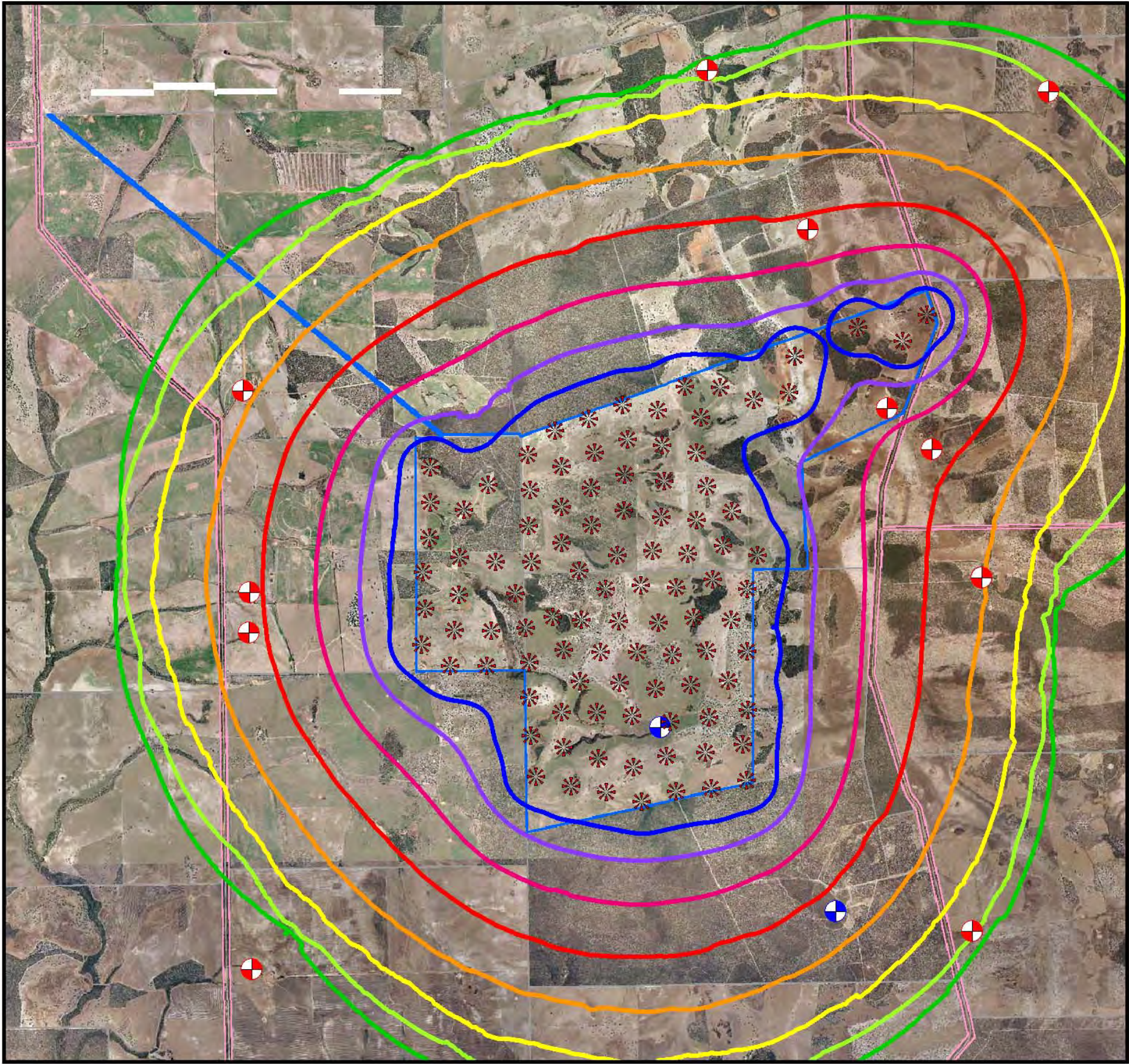


Noise levels in L_{Aeq} dB(A)	Signs and symbols
= 10	Domestic Building
= 15	Wind Turbine
= 20	Non Domestic Building
= 25	
= 30	
= 35	
= 40	
= 45	

Noise Model Parameters
ISO 9613-2:1996 Algorithm
Temperature : 15°C
Relative Humidity : 70%
Atmospheric Pressure : 101.325 kPa

Job No : 11250
Calc Ref : 63





Verve Energy
Warradarge Wind Farm
Noise Contour Map

100 Wind Turbines
SWT-3.0 - 101
100m Hub Height
Wind Speed : 7m/s (@10m AG)

Map
2



Length scale 1:70000

0 0.25 0.5 1 1.5 2 2.5 3 km

Noise levels
in L_{Aeq} dB(A)

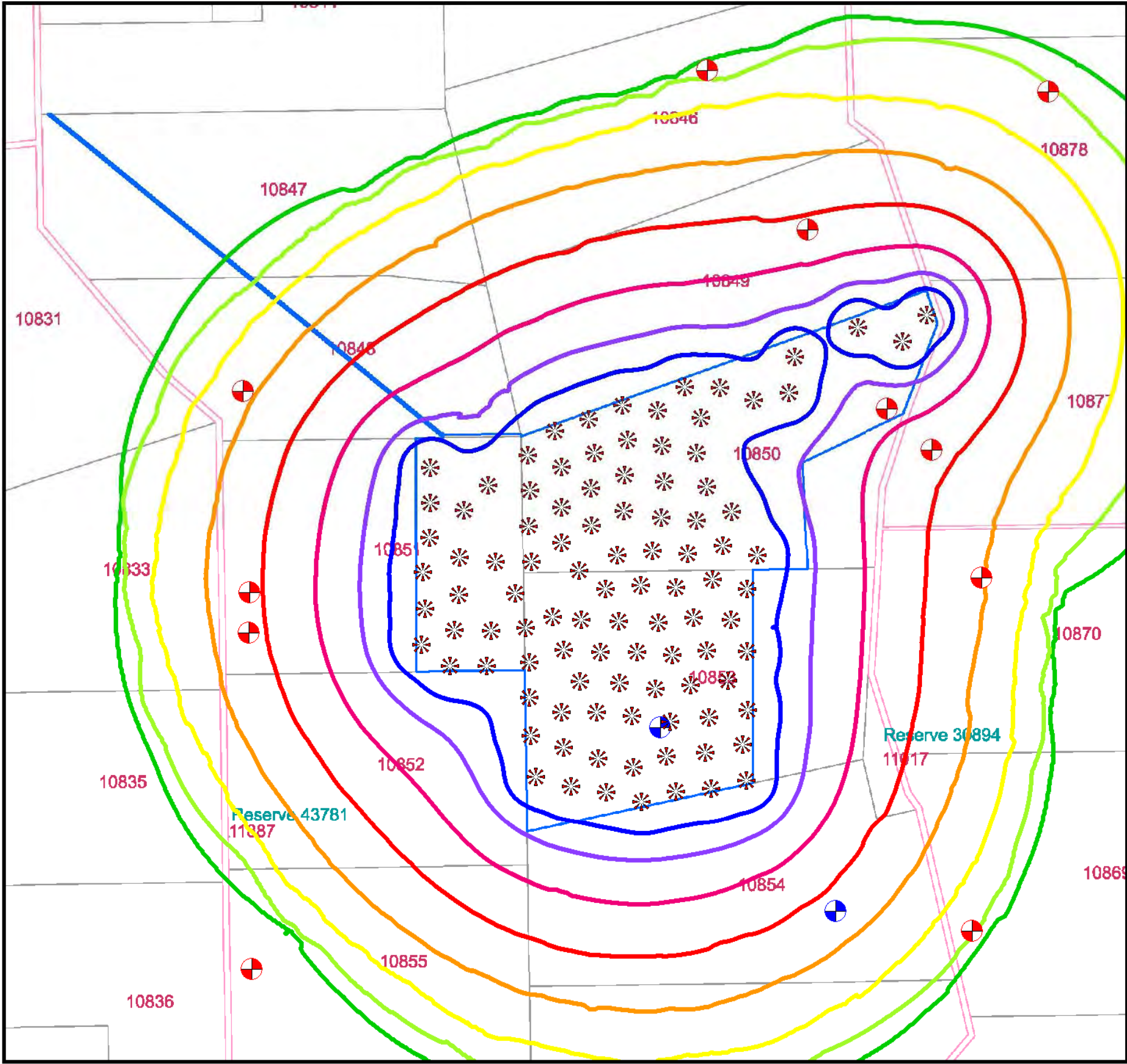


Signs and symbols

- Domestic Building (red and white symbol)
- Wind Turbine (asterisk symbol)
- Non Domestic Building (blue and white symbol)

Noise Model Parameters
ISO 9613-2:1996 Algorithm
Temperature : 15°C
Relative Humidity : 70%
Atmospheric Pressure : 101.325 kPa

Job No : 11250
Calc Ref : 73



Verve Energy
Warradarge Wind Farm
Noise Contour Map

100 Wind Turbines
SWT-3.0 - 101
100m Hub Height
Wind Speed : 7m/s (@10m AG)

Map
2A



Length scale 1:70000
0 0.25 0.5 1 1.5 2 2.5 3 km

Noise levels in L_{Aeq} dB(A)	Signs and symbols
= 10	Domestic Building
= 15	Wind Turbine
= 20	Non Domestic Building
= 25	
= 30	
= 35	
= 40	
= 45	

Noise Model Parameters
ISO 9613-2:1996 Algorithm
Temperature : 15°C
Relative Humidity : 70%
Atmospheric Pressure : 101.325 kPa

Job No : 11250
Calc Ref : 73



Verve Energy
Warradarge Wind Farm
Noise Contour Map

100 Wind Turbines
SWT-3.0 - 101
100m Hub Height
Wind Speed : 8m/s (@10m AG)

Map
3



Length scale 1:70000
0 0.25 0.5 1 1.5 2 2.5 3 km

Noise levels
in L_{Aeq} dB(A)

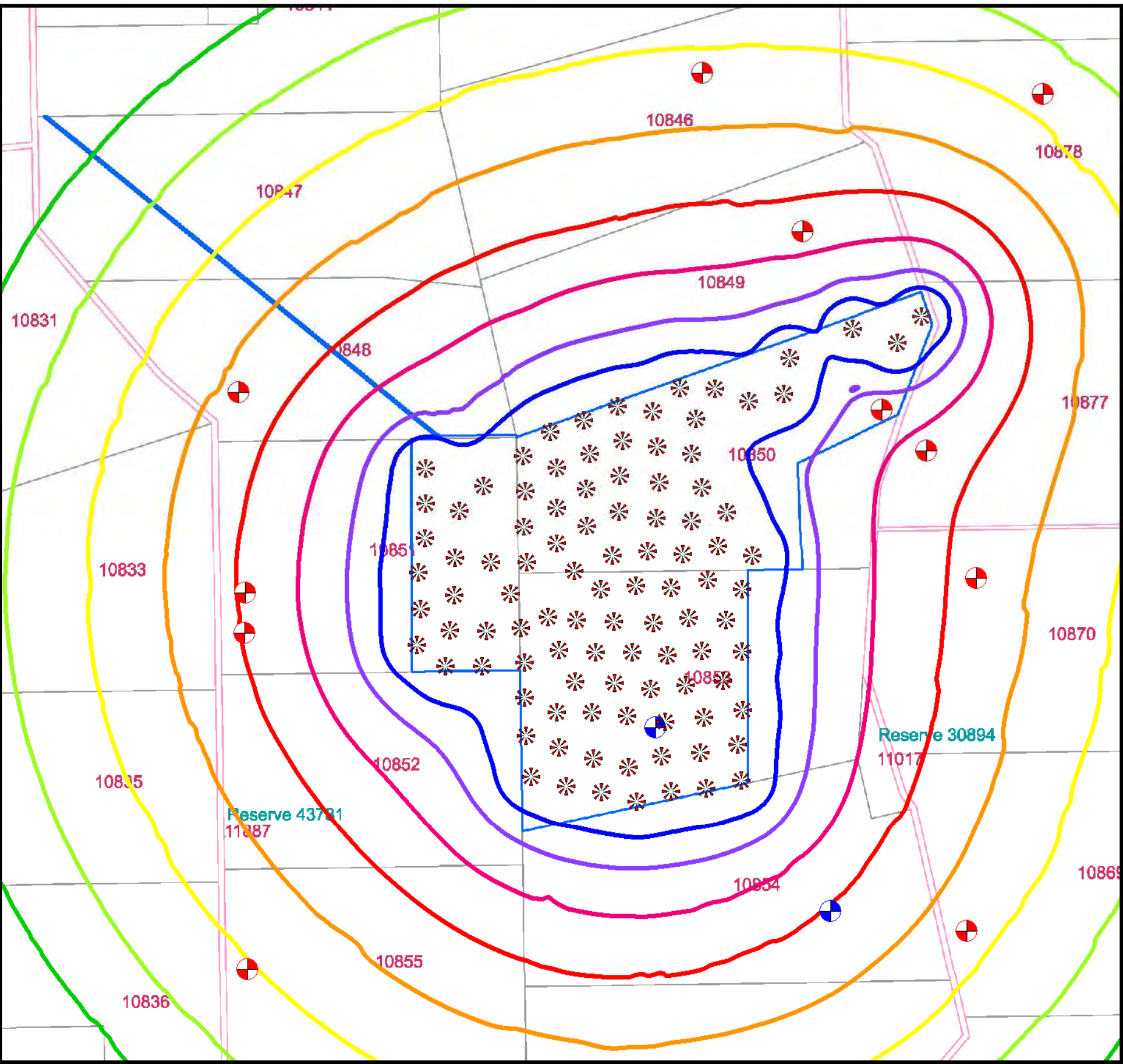
- 10
- 15
- 20
- 25
- 30
- 35
- 40
- 45

Signs and symbols

- Domestic Building
- Wind Turbine
- Non Domestic Building

Noise Model Parameters
ISO 9613-2:1996 Algorithm
Temperature : 15°C
Relative Humidity : 70%
Atmospheric Pressure : 101.325 kPa

Job No : 11250
Calc Ref : 86



Verve Energy
Warradarge Wind Farm
Noise Contour Map

100 Wind Turbines
SWT-3.0 - 101
100m Hub Height
Wind Speed : 8m/s (@10m AG)

Map
3A



Length scale 1:70000
0 0.5 1 1.5 2 2.5 3 km

- Noise levels**
in L_{Aeq} dB(A)
- 10
 - 15
 - 20
 - 25
 - 30
 - 35
 - 40
 - 45
- Signs and symbols**
- Domestic Building
 - Wind Turbine
 - Non Domestic Building

Noise Model Parameters
ISO 9613-2:1996 Algorithm
Temperature : 15°C
Relative Humidity : 70%
Atmospheric Pressure : 101.325 kPa

Job No : 11250
Calc Ref : 86

APPENDIX C

LOW FREQUENCY AND INFRASOUND ASSESSMENT

LOW FREQUENCY AND INFRASOUND ASSESSMENT

An assessment of low frequency and infrasound noise levels associated with the proposed wind farm has been carried out, with the calculated low frequency noise levels compared with the hearing threshold levels for each frequency. This is not an assessment required under the EPA of South Australia "Wind Farms – Environmental Noise Guidelines – July 2009" (Guidelines). It was requested to be carried out by John MacPherson, Principal Environmental Noise Officer of the Department of Environment and Conservation, and the developer has agreed to carry out the assessment – as recommended in the Draft National Wind Farm Development Guidelines of 2010.

The linear sound power level, at wind speeds of 12m/s (@ 10m above ground level) for 10 – 40 Hz has been used to calculate the low frequency noise level associated with the proposed wind farm development. The sound power levels for Vesta 112 3MW Turbines, at a hub height of 84m has been utilised for this assessment as low frequency data was not available for Siemens SWT-3.0-101 turbines.

The sound power level (in linear dB) and the corresponding hearing threshold, are listed below in Table 1. It is noted that an estimate of sound power levels at 2Hz has been included, based on a sound power level typically 10 dB(A) higher above the level at 10 Hz.

TABLE 1 – LOW FREQUENCY AND INFRASOUND NOISE LEVELS

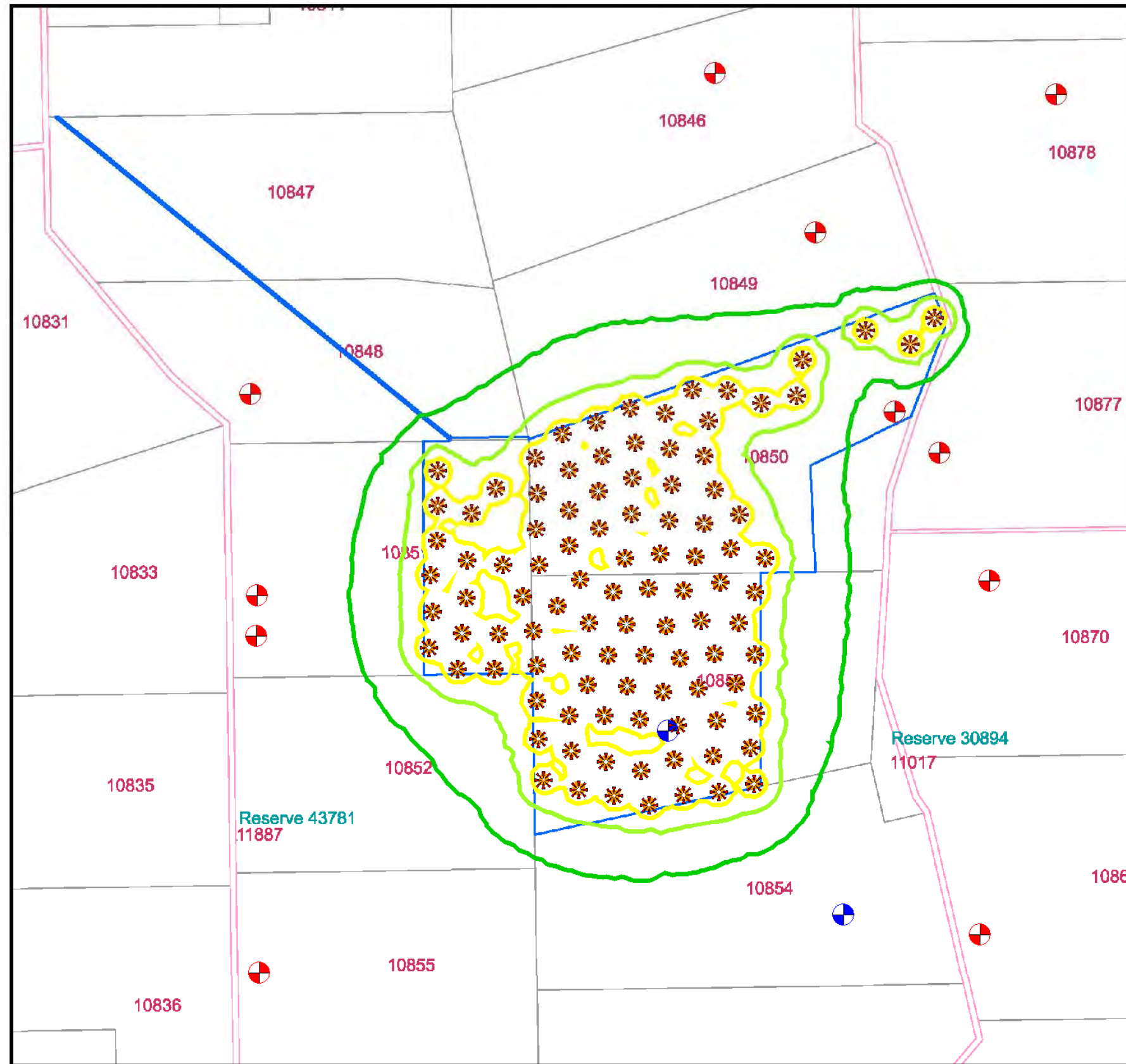
Frequency (Hz)	Linear Sound Power Level, dB	Hearing Threshold, dB
2	184.1	140
10	119.2	95
12.5	115.9	87
16	114.4	79
20	116.7	71
25	114.4	63
31.5	110.8	55.5
40	110.1	48

The noise propagation of the individual third octave band frequencies were calculated, with results shown in Figures 1 – 8 below. It is noted that the corresponding threshold of hearing level has been included on each contour map.

As can be seen from the contour maps, the low frequency / infrasound noise levels are generally below the hearing threshold for that frequency within the boundaries of the participating properties, and well below the hearing threshold at the identified receiver points.

It is noted the contour line for the threshold of hearing does not appear on all of the figures due to the scale of the contour maps and the close distance at which the threshold of hearing contour is to the wind turbines.

Therefore, low frequency noise and infrasound are considered highly unlikely to represent a problem in the vicinity of the proposed wind farm.

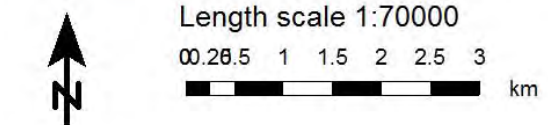


Verve Energy Warradarge Wind Farm Noise Contour Map

100 Wind Turbines
V112-3.0 MW
84m Hub Height
Wind Speed : 12m/s (@10m AG)
Noise Mode 0

2 Hz Third Octave Band
Centre Frequency

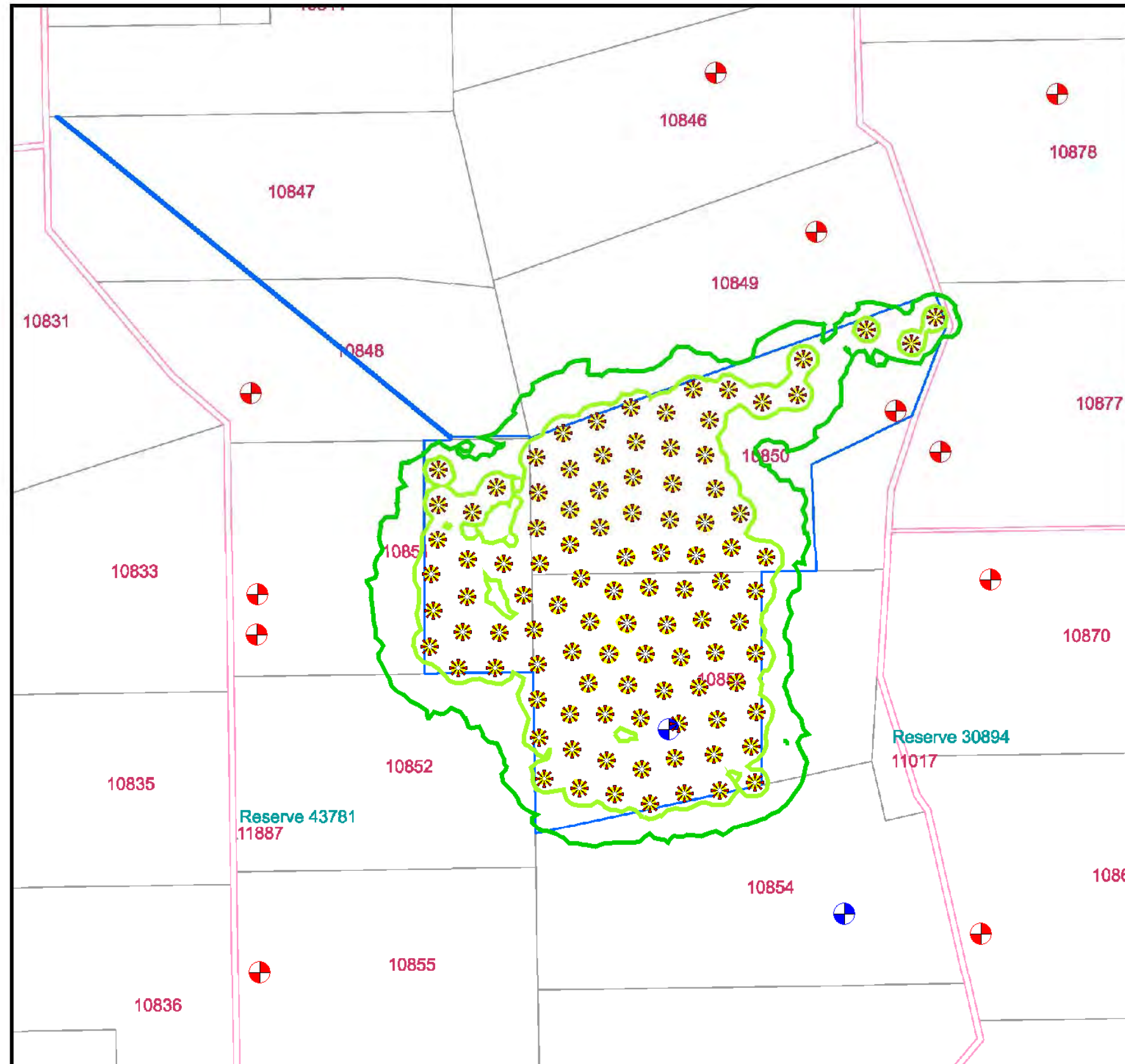
Map
1



Noise levels in L_{eq} dB	Signs and symbols
█ = 120	⊕ Non Domestic Building
█ = 125	✱ Wind Turbine
█ = 130	⊕ Domestic Building
█ = 135	— Threshold of Hearing @2 Hz - 140dB
█ = 140	
█ = 145	

Noise Model Parameters
ISO 9613-2:1996 Algorithm
Temperature : 15°C
Relative Humidity : 70%
Atmospheric Pressure : 101.325 kPa

Job No : 11250
Calc Ref : 102



Verve Energy Warradarge Wind Farm Noise Contour Map

100 Wind Turbines
V112-3.0 MW
84m Hub Height
Wind Speed : 12m/s (@10m AG)
Noise Mode 0

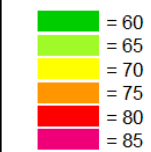
10 Hz Third Octave Band
Centre Frequency

Map
2



Length scale 1:70000
0 0.25 0.5 1 1.5 2 2.5 3 km

Noise levels in L_{eq} dB

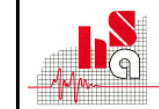
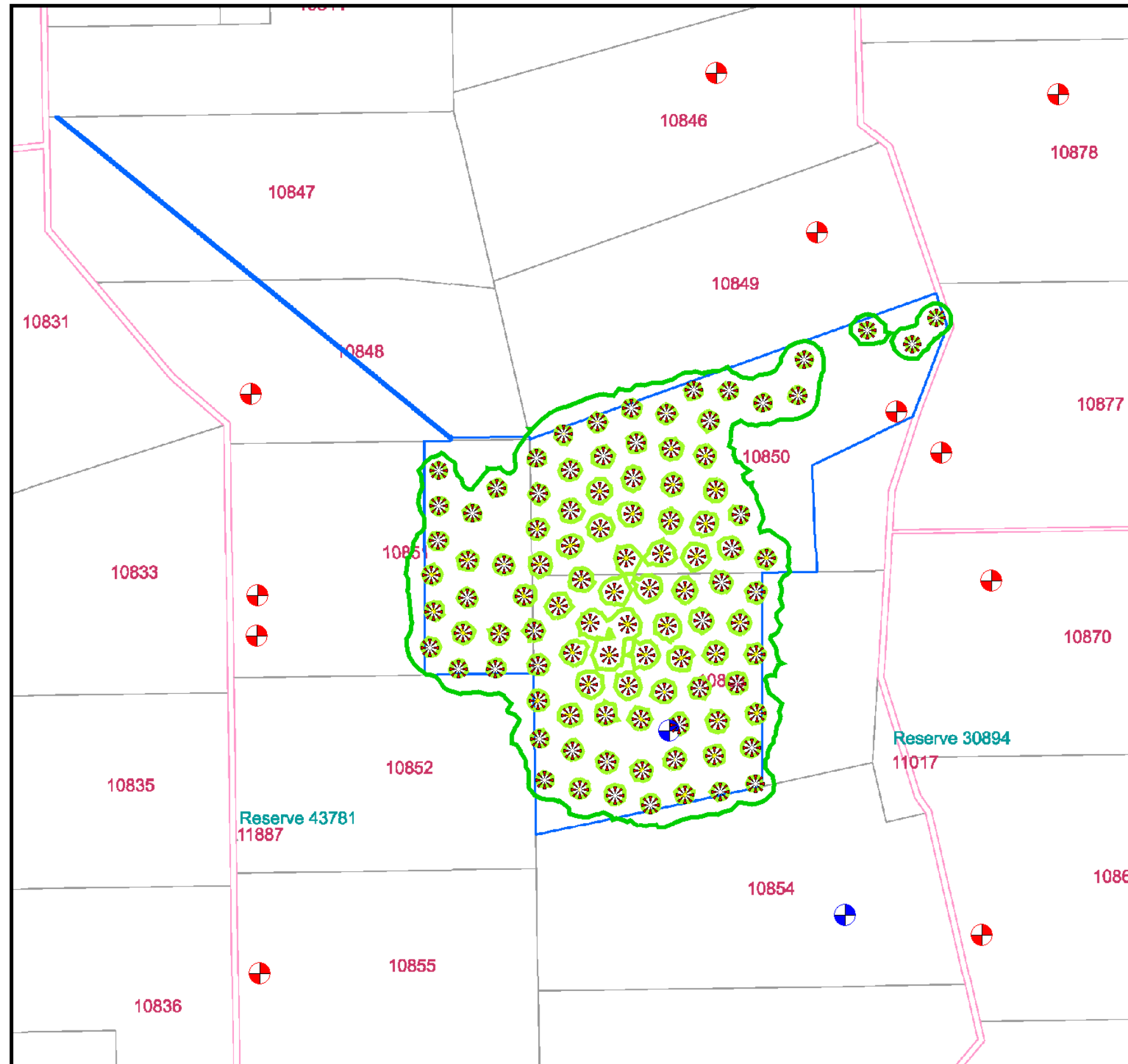


Signs and symbols

- Non Domestic Building
- Wind Turbine
- Domestic Building
- Threshold of Hearing @10 Hz - 95dB

Noise Model Parameters
ISO 9613-2:1996 Algorithm
Temperature : 15°C
Relative Humidity : 70%
Atmospheric Pressure : 101.325 kPa

Job No : 11250
Calc Ref : 101



Verve Energy Warradarge Wind Farm Noise Contour Map

100 Wind Turbines
V112-3.0 MW
84m Hub Height
Wind Speed : 12m/s (@10m AG)
Noise Mode 0

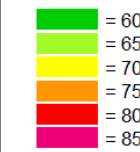
12.5 Hz Third Octave Band
Centre Frequency

Map
3



Length scale 1:70000
0.25 0.5 1 1.5 2 2.5 3 km

Noise levels in L_{eq} dB

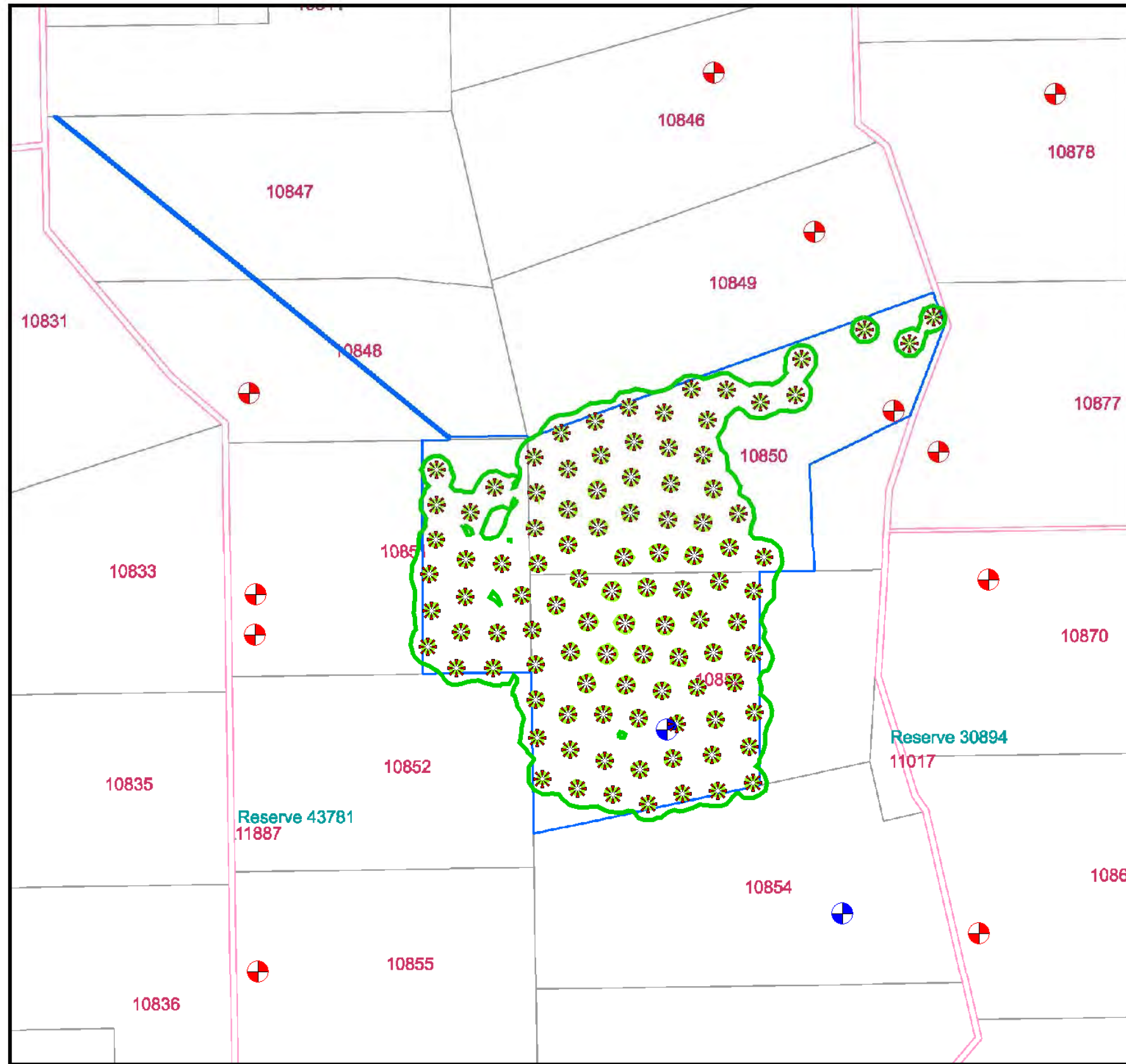


Signs and symbols

- Non Domestic Building
- Wind Turbine
- Domestic Building
- Threshold of Hearing @12.5Hz - 87dB

Noise Model Parameters
ISO 9613-2:1996 Algorithm
Temperature : 15°C
Relative Humidity : 70%
Atmospheric Pressure : 101.325 kPa

Job No : 11250
Calc Ref : 101



Verve Energy Warradarge Wind Farm Noise Contour Map

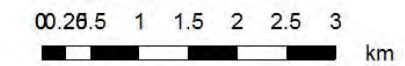
100 Wind Turbines
V112-3.0 MW
84m Hub Height
Wind Speed : 12m/s (@10m AG)
Noise Mode 0

16 Hz Third Octave Band
Centre Frequency

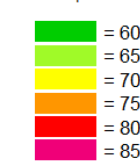
Map
4



Length scale 1:70000



Noise levels
in L_{eq} dB

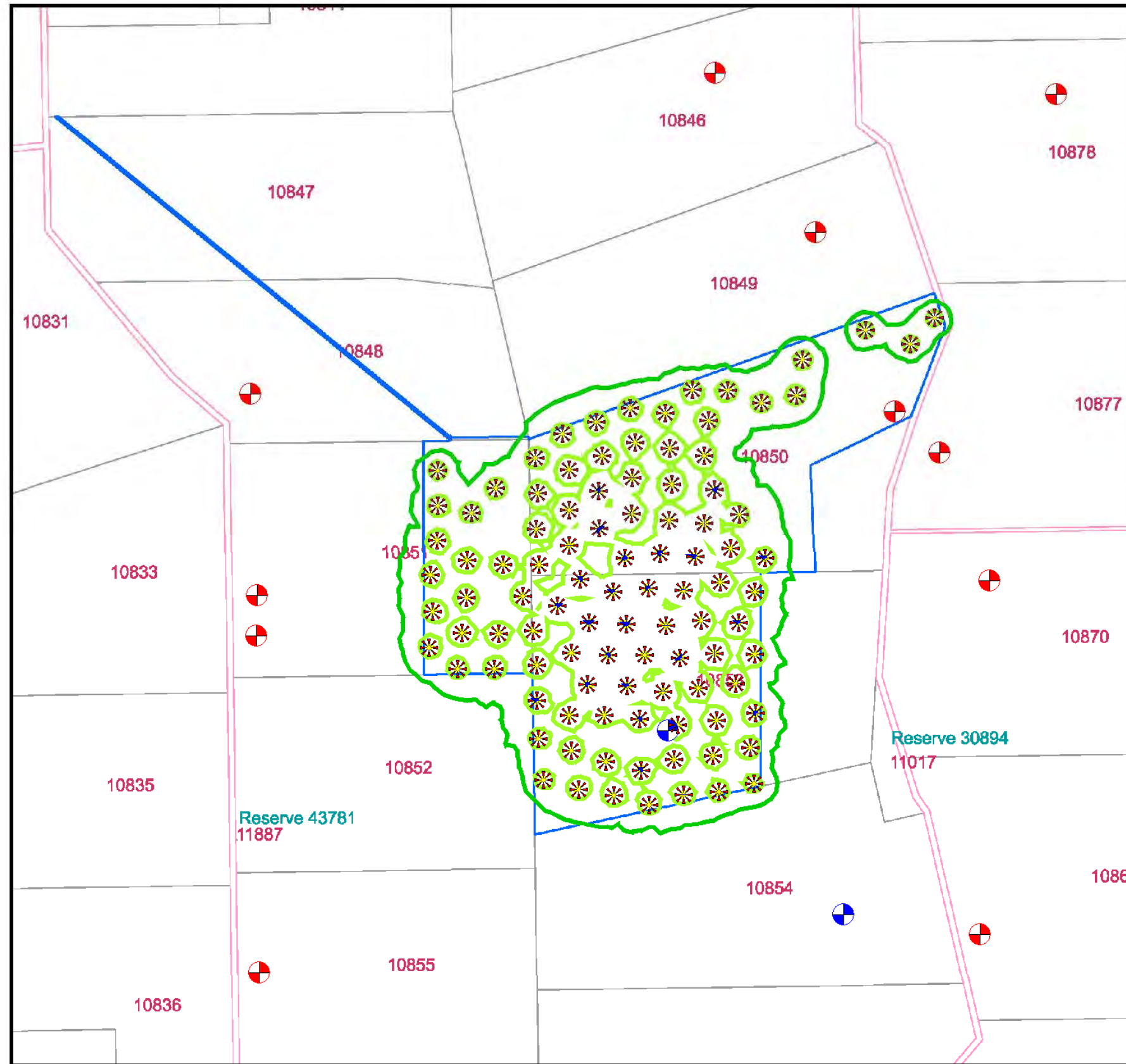


Signs and symbols

- Non Domestic Building
- Wind Turbine
- Domestic Building
- Threshold of Hearing @16 Hz - 79 dB

Noise Model Parameters
ISO 9613-2:1996 Algorithm
Temperature : 15°C
Relative Humidity : 70%
Atmospheric Pressure : 101.325 kPa

Job No : 11250
Calc Ref : 101



Verve Energy Warradarge Wind Farm Noise Contour Map

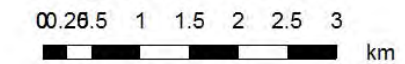
100 Wind Turbines
V112-3.0 MW
84m Hub Height
Wind Speed : 12m/s (@10m AG)
Noise Mode 0

20 Hz Third Octave Band
Centre Frequency

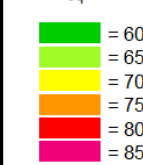
Map
5



Length scale 1:70000



Noise levels
in L_{eq} dB

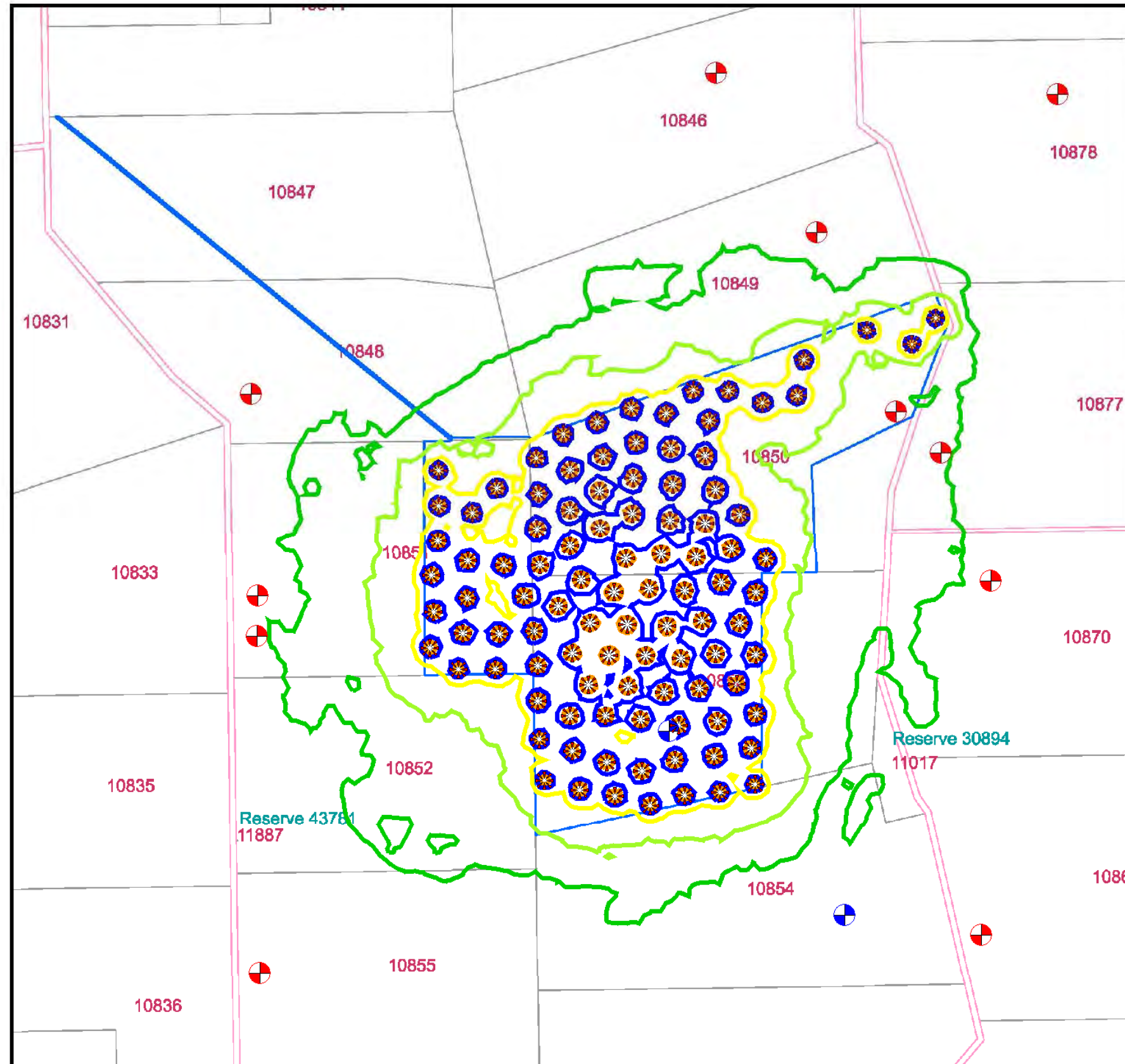


Signs and symbols

- Non Domestic Building
- Wind Turbine
- Domestic Building
- Threshold of Hearing @20 Hz - 71 dB

Noise Model Parameters
ISO 9613-2:1996 Algorithm
Temperature : 15°C
Relative Humidity : 70%
Atmospheric Pressure : 101.325 kPa

Job No : 11250
Calc Ref : 101



Verve Energy Warradarge Wind Farm Noise Contour Map

100 Wind Turbines
V112-3.0 MW
84m Hub Height
Wind Speed : 12m/s (@10m AG)
Noise Mode 0

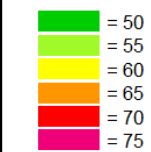
25 Hz Third Octave Band
Centre Frequency

Map
6



Length scale 1:70000
0 0.25 0.5 1 1.5 2 2.5 3 km

Noise levels
in L_{eq} dB

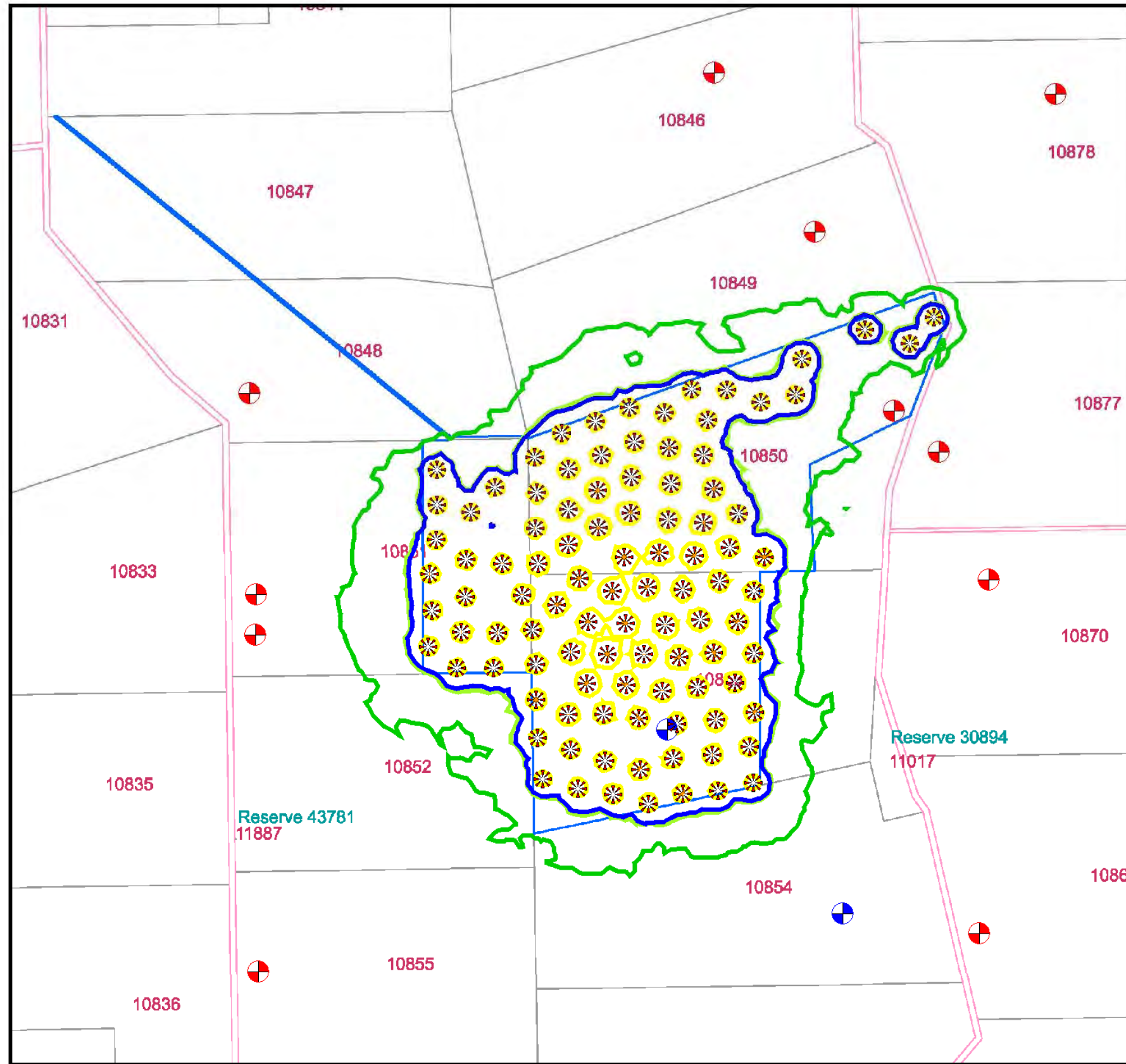


Signs and symbols

- Non Domestic Building
- Wind Turbine
- Domestic Building
- Threshold of Hearing @25 Hz - 63 dB

Noise Model Parameters
ISO 9613-2:1996 Algorithm
Temperature : 15°C
Relative Humidity : 70%
Atmospheric Pressure : 101.325 kPa

Job No : 11250
Calc Ref : 100



Verve Energy Warradarge Wind Farm Noise Contour Map

100 Wind Turbines
V112-3.0 MW
84m Hub Height
Wind Speed : 12m/s (@10m AG)
Noise Mode 0

31.5 Hz Third Octave Band
Centre Frequency

Map
7



Length scale 1:70000

0 0.25 0.5 1 1.5 2 2.5 3 km

Noise levels
in L_{eq} dB

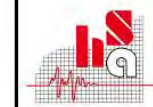
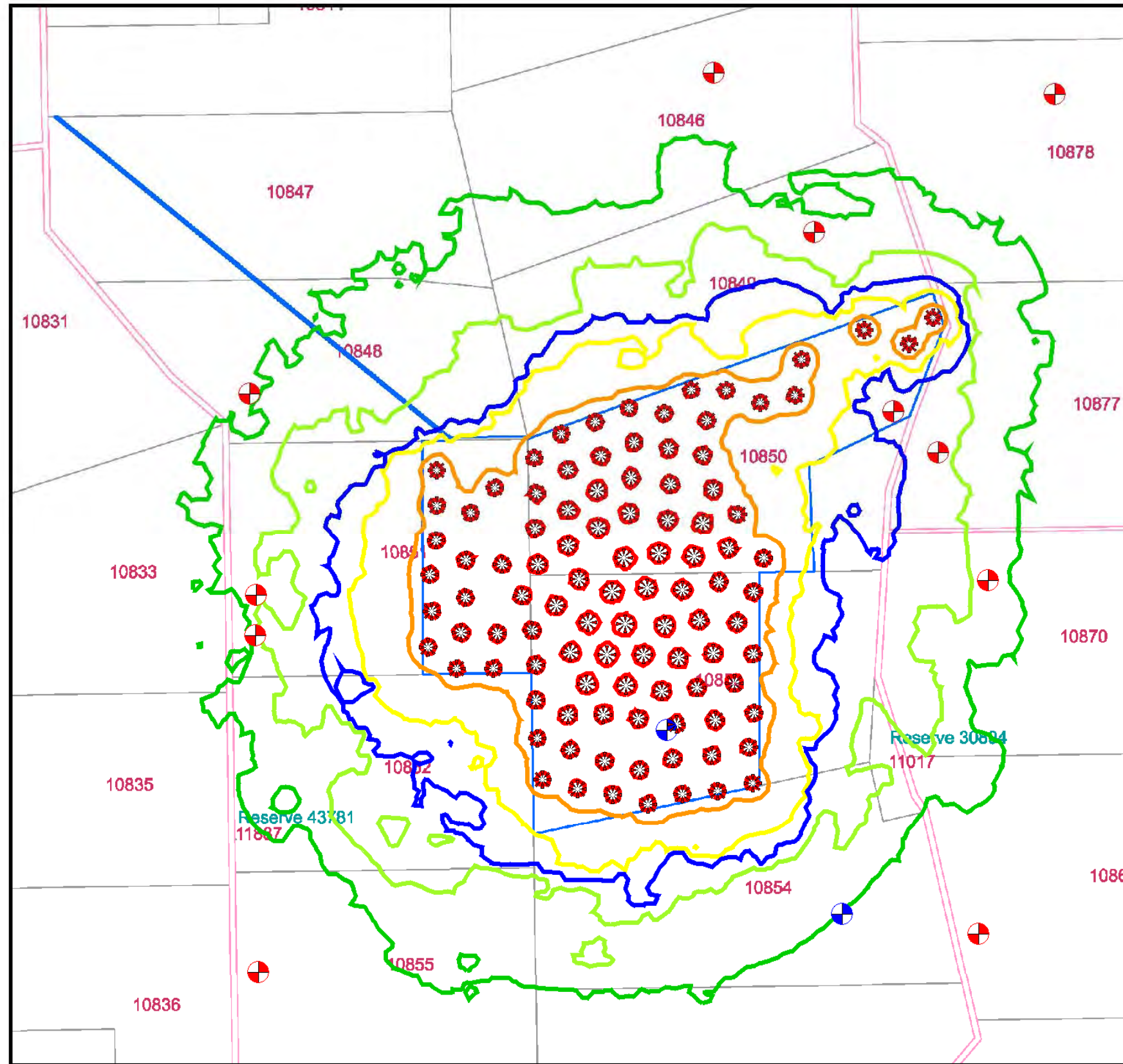
50
55
60
65
70
75

Signs and symbols

Non Domestic Building
Wind Turbine
Domestic Building
Threshold of Hearing@31.5Hz-55.5 dB

Noise Model Parameters
ISO 9613-2:1996 Algorithm
Temperature : 15°C
Relative Humidity : 70%
Atmospheric Pressure : 101.325 kPa

Job No : 11250
Calc Ref : 101



Verve Energy Warradarge Wind Farm Noise Contour Map

100 Wind Turbines
V112-3.0 MW
84m Hub Height
Wind Speed : 12m/s (@10m AG)
Noise Mode 0

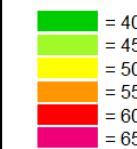
40 Hz Third Octave Band
Centre Frequency

Map
8



Length scale 1:70000
0 0.25 0.5 1 1.5 2 2.5 3 km

Noise levels in L_{eq} dB



Signs and symbols

- Non Domestic Building (blue circle with cross)
- Wind Turbine (red star)
- Domestic Building (red circle with cross)
- Threshold of Hearing @40 Hz - 48 dB (blue line)

Noise Model Parameters
ISO 9613-2:1996 Algorithm
Temperature : 15°C
Relative Humidity : 70%
Atmospheric Pressure : 101.325 kPa

Job No : 11250
Calc Ref : 100

APPENDIX D

COMPLIANCE CHECKLIST

Compliance Checklist

Table 1, below, provides a checklist of the information and documentation required to undertake noise modelling for the Warradarge Wind Farm proposal against the South Australian Noise Guidelines, in the absence of WA specific noise guidelines for wind farms:

**TABLE 1 –WIND FARM ENVIRONMENTAL NOISE GUIDELINES COMPLIANCE CHECKLIST
(SOUTH AUSTRALIA) (SOURCE: EPA SA 2012)**

COMPLIANCE CHECKLIST EXTRACT	COMPLIANCE	DISCUSSION
Predicted Noise from the Wind Farm		
Make and model of WTGs to be used	✓	Siemens SWT-3.0-101), at the highest hub height under consideration (100m). This represents the noisiest turbine possible for the proposed wind farm.
Octave one-third octave band sound power levels and associated wind speed of WTGs to be used	✓	The one-third octave band data sound power levels for Vesta 112 3MW Turbines, at a hub height of 84m has been utilised for the low frequency assessment. One third octave band data was not as low frequency data was not available for Siemens SWT-3.0-101 turbine.
Positions of all WTGs shown on a map	✓	See Appendix A of 14014-8-11250
Table of WTGs and relevant receivers coordinates	✓	See Appendix A of 14014-8-11250
Description of zone category, zone maps for all receivers.	x	All areas assumed to be "rural living"
Predicted noise levels for those premises in worst-case wind direction for wind speeds from cut-in speed to the speed of WTG rated power	✓	
Model used and method for deriving noise levels	✓	
Indication of accuracy of wind farm noise prediction	✓	
Amount of noise reduction	x	Noisiest operating condition utilised for modelling, hence no noise reduction (other than distance)
Topographic map of wind farm and affected premises showing labelled noise contour lines	✓	See Appendix A of 14014-8-11250
Location of wind measuring position(s) used for noise assessment and compliance purposes	✓	See Appendix A of Background Noise Monitoring Report (our Ref: 14290-4-11250-01)

**TABLE 1 –WIND FARM ENVIRONMENTAL NOISE GUIDELINES COMPLIANCE CHECKLIST
(SOUTH AUSTRALIA) (SOURCE: EPA SA 2012) (CONT.)**

COMPLIANCE CHECKLIST EXTRACT	COMPLIANCE	DISCUSSION
Measurement and Assessment of Background Noise		
Description of noise measuring equipment used (make, model, type)	✓	
Noise measurement position including height above ground, wind speed and distance to nearest building structure.	✓	
Description and photograph of measurement position showing nearby trees and building structures.	✓	See Appendix B of Background Noise Monitoring Report (our Ref: 14290-4-11250-01)
Angle direction between the line connecting the noise measurement point and nearest WTG	x	Information not needed for this area as background noise levels do not change with wind direction
Atmospheric conditions	✓	
Wind speed data at noise measurement site	✓	
Time and duration of monitoring	✓	
Sampling time for wind and noise measurements	✓	
Total number of data pairs measured and number of data pairs measured at worst wind conditions between cut-in speed to the speed of WTG rated power	✓	
Description of regression analysis method	✓	
Graphical plot of data in Section 3.4 of Guidelines	✓	
Correlation coefficient and equation for the regression curve	✓	

HERRING STORER ACOUSTICS

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VERVE ENERGY

WARRADARGE WIND FARM WARRADARGE

BACKGROUND NOISE MONITORING

MARCH 2012

OUR REFERENCE: 14290-5-11250-01



DOCUMENT CONTROL PAGE

**BACKGROUND NOISE MONITORING
WARRADARGE**

Job No: 11250-01

Document Reference: 14290-5-11250-01

**FOR
VERVE ENERGY**

DOCUMENT INFORMATION				
Author:	George Watts	Checked By:	Tim Reynolds	
Date of Issue :	16 March 2012			
REVISION HISTORY				
Revision	Description	Date	Author	Checked
1	Incorporating Verve Energy Comments	21/03/2012	GW	TR
2	Incorporating Verve Energy Comments	30/03/2012	HS	TR
3	Incorporating Verve Energy Comments	17/04/2012	GW	TR
4	Incorporating Verve Energy Comments	21/05/2012	GW	TR
DOCUMENT DISTRIBUTION				
Copy No.	Version No.	Destination	Hard Copy	Electronic Copy
1	1	Verve Energy		✓
1	2	Verve Energy		✓
1	3	Verve Energy		✓
1	4	Verve Energy		✓
1	5	Verve Energy		✓

CONTENTS

1.	INTRODUCTION	1
2.	SUMMARY	1
3.	METHODOLOGY	1
4.	RESULTS	2
5.	CRITERIA	3

APPENDICIES

A	Monitoring Locations
B	Monitoring Location Details
C	Background Noise Levels vs Wind Speed Plots
D	Background Noise Level Time History Plots
E	Calibration Certificates

1. INTRODUCTION

Herring Storer Acoustics was commissioned by Verve Energy to carry out background noise monitoring for the proposed Warradarge Wind Farm development.

The proposed development site is located on private farming land in Warradarge, approximately 240km north of Perth and 18km east of Eneabba.

The proposed wind farm consists of up to 100 wind turbines, with a maximum generating capacity of 250 MW.

See Appendix A for locations of background noise monitoring and wind measurement masts.

The background noise monitoring has been carried out in accordance with the EPA of South Australia "*Wind Farms – Environmental noise guidelines – July 2009*" (Guidelines) which is the guidelines recognised by the Department of Environment and Conservation for the assessment of wind farms.

2. SUMMARY

Based on the results of background noise monitoring within the proposed wind farm development area, the applicable criteria for each location is as listed in Table 2.1

TABLE 2.1 – NOISE CRITERIA BASED ON BACKGROUND NOISE LEVELS, dB(A)

Location	WIND SPEED AT 10m ABOVE GROUND LEVEL (m/s)						
	3	4	5	6	7	8	9
1	37	37	37	38	40	42	44
2	35	35	35	35	37	39	41
3	38	39	39	40	41	42	44

3. METHODOLOGY

Background noise levels were monitored at three locations within the proposed development area in accordance with the Guidelines and AS4959-2010. Locations are detailed in Table 3.1 and the monitoring location map is attached in Appendix A.

TABLE 3.1 – MONITORING LOCATION DETAILS

Location	Easting	Northing
1	356887	6690058
2	358165	6687158
3	355325	6681021
Wind Measurement Mast 1	352736	6685888
Wind Measurement Mast 2	354229	6682679

The background noise monitoring locations were chosen to give representative locations for the noise sensitive premises that were highlighted during the initial noise impact assessment as potentially being exposed to noise emissions associated with the proposed wind farm at close to the base criteria of 35 dB(A).

Monitored noise levels were then paired with corresponding wind data, provided by the wind measurement masts located within the development by Verve Energy. The wind measurement masts recorded wind speeds at heights of 40, 60 and 80m above ground level.

Rain affected data was removed from the collected data using weather information provided by the Bureau of Meteorology rainfall monitoring site, located at Coorow.

Background noise levels were plotted against the corresponding wind speed measurement, calculated at 10m above ground level, assuming a linear wind shear rate (see Appendix C).

The wind measurement mast closest to the background noise monitoring location was utilised in the calculation i.e. Wind measurement mast 1 was utilised for Locations 1 and 2, with Wind measurement mast 2 utilised for Location 3.

The relevant regression line providing the best correlation co-efficient for each location was determined (from linear to third order). The calculated regression line equations were then used to ascertain the background noise ($L_{A90,10 \text{ minutes}}$) at each integer wind speed to determine the relevant noise criteria for the wind farm development, which should not exceed whichever is the greater of;

- 35 dB(A), or
- The background noise ($L_{A90,10 \text{ minutes}}$) by more than 5 dB(A).

Calibration certificates for meters used are attached in Appendix E.

Automatic noise data loggers were established on 19 January 2012 and retrieved on 6 March 2012, storing data at 10 minute intervals. Details of each monitoring site are listed in Table 3.2 below.

TABLE 3.2 – MONITORING LOCATION DETAILS

Location	Noise Logger Details			Location Details	
	Make	Model	Serial Number	Height Above Ground Level (m)	Distance to Nearest Building Structure (m)
1	RTA Technology	RTA02	052	1.2	~20
2	RTA Technology	RTA01	091	1.5	~20
3	RTA Technology	RTA01	069	1.5	> 1000

4. RESULTS

Background noise monitoring regression analysis results for each of the three locations is presented in Appendix C, with time history charts presented in Appendix D.

Refer to Appendix A and B for location information for each noise logger.

The noise floor of the loggers utilised appears to have affected the data collected at location 3. This has been confirmed through testing of the automatic noise data logger used during the monitoring period. The data for wind speeds less than 7m/s has been impacted by the noise floor. Given that the critical wind speed for the turbines is in the order of 8m/s (as this corresponds to the highest noise level produced by the turbines) and the data at this wind speed – and higher – is valid, the collected data has still been used. It is also noted that location 3 is situated greater than 1000m from the nearest building structure, hence is not a critical background noise monitoring location.

The total number of valid sample data pairs for each monitoring location is listed below in Table 4.1.

Table 4.1 – VALID SAMPLE POINTS

Monitoring Location	Number Valid Sample Data Pairs
1	5952
2	2501
3	5870

The calculated relevant regression line equations for each location are listed below;

Monitoring Location 1

$$y = -0.0183x^3 + 0.6188x^2 - 4.1625x + 39.777$$

Monitoring Location 2

$$y = -0.013x^3 + 0.381x^2 - 1.5347x + 28.336$$

Monitoring Location 3

$$y = -0.0059x^3 + 0.2248x^2 - 1.144x + 35.065$$

It is noted that in the above equations, $y = L_{A90}$ (dB(A)) and x = wind speed at 10 metres height (m/s).

Based on the above calculated regression lines, Table 4.2 summarises the background noise at each location for each integer wind speed.

TABLE 4.2 – BACKGROUND NOISE LEVELS, $L_{A90,10 \text{ minutes}}$ [dB(A)]

Location	WIND SPEED AT 10m ABOVE GROUND LEVEL (m/s)						
	3	4	5	6	7	8	9
1	32	32	32	33	35	37	39
2	32	32	33	33	34	34	35
3	33	34	34	35	36	37	39

5. CRITERIA

The noise criteria for new wind farm developments, based on the Guidelines, is for the predicted noise level to not exceed whichever is the greater of;

- 35 dB(A) at relevant receivers in localities which are primarily intended for rural living, or,
- 40 dB(A) at relevant receivers in localities in other zones, or
- the background noise ($L_{A90,10 \text{ minute}}$) by more than 5 dB(A).

In accordance with the Guidelines, 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.

If there is any uncertainty about the zone, and whether the rural living criteria should be applied, the question should be resolved in consultation with the relevant environmental protection authority and council for the area concerned.

Through discussions with John MacPherson, Principal Environmental Noise Officer of the Department of Environment and Conservation, it is understood that the Department of Environment and Conservation has the expectation that the “rural living” zone is applicable for the receivers in the proposed development area.

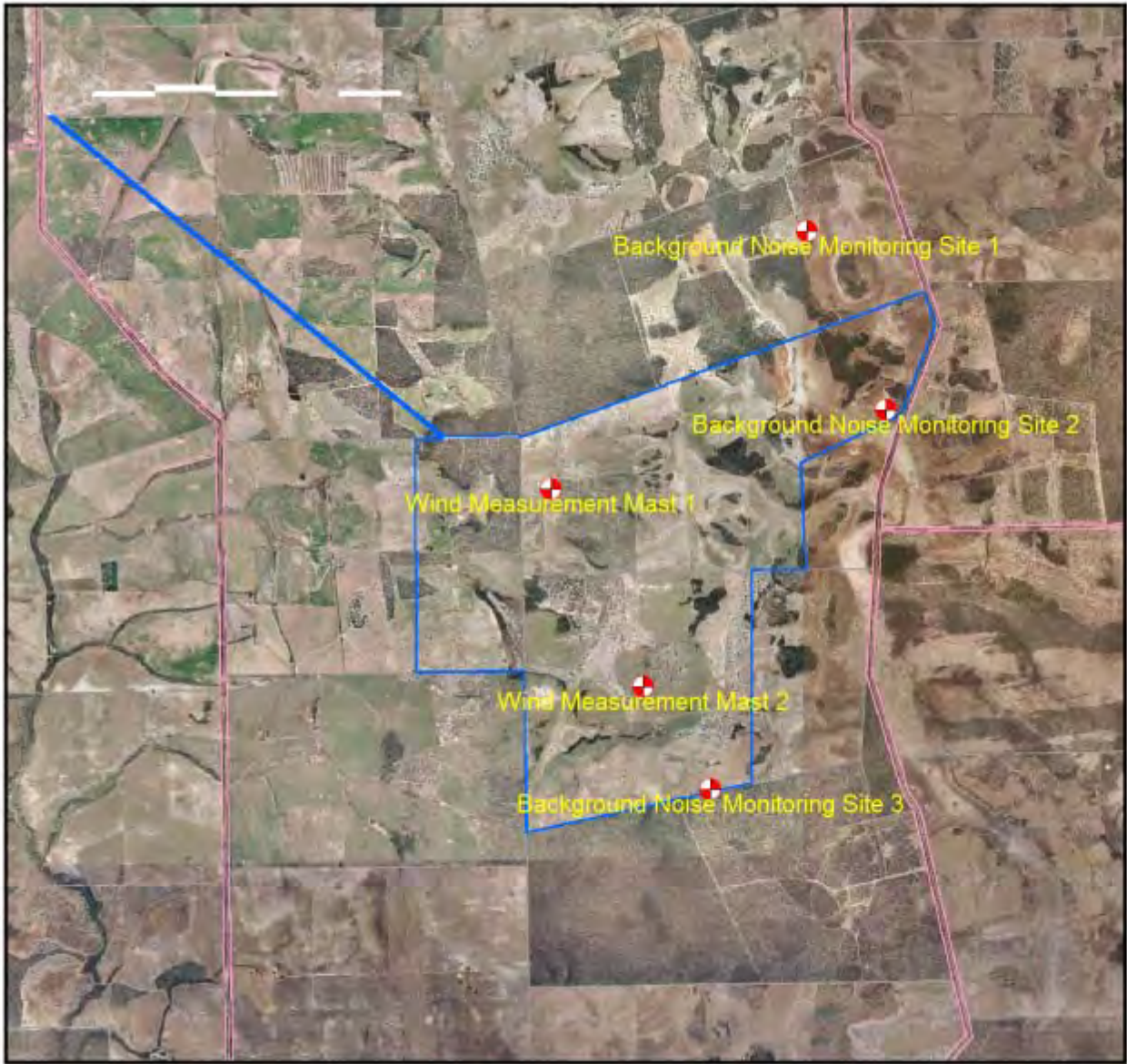
Hence the applicable criteria for the proposed wind farm development based on the background noise monitoring are listed below in Table 5.1.

TABLE 5.1 – NOISE CRITERIA BASED ON BACKGROUND NOISE LEVELS, dB(A)

Location	WIND SPEED AT 80m ABOVE GROUND LEVEL (m/s)						
	3	4	5	6	7	8	9
1	37	37	37	38	40	42	44
2	35	35	35	35	37	39	41
3	38	39	39	40	41	42	44

APPENDIX A

MONITORING LOCATIONS



Warradarge Wind Farm
Background Noise
Monitoring Locations

Background Noise Monitoring
Locations & Wind Monitoring
Mast Locations

Locality
Map



Length scale 1:70000
00.25 0.5 1 1.5 2 2.5 3 km



Signs and symbols

 Monitoring Location

Job No : 11250
Calc Ref : BNM and Masts Geofile

APPENDIX B

MONITORING LOCATION DETAILS

Location 1



Location 2



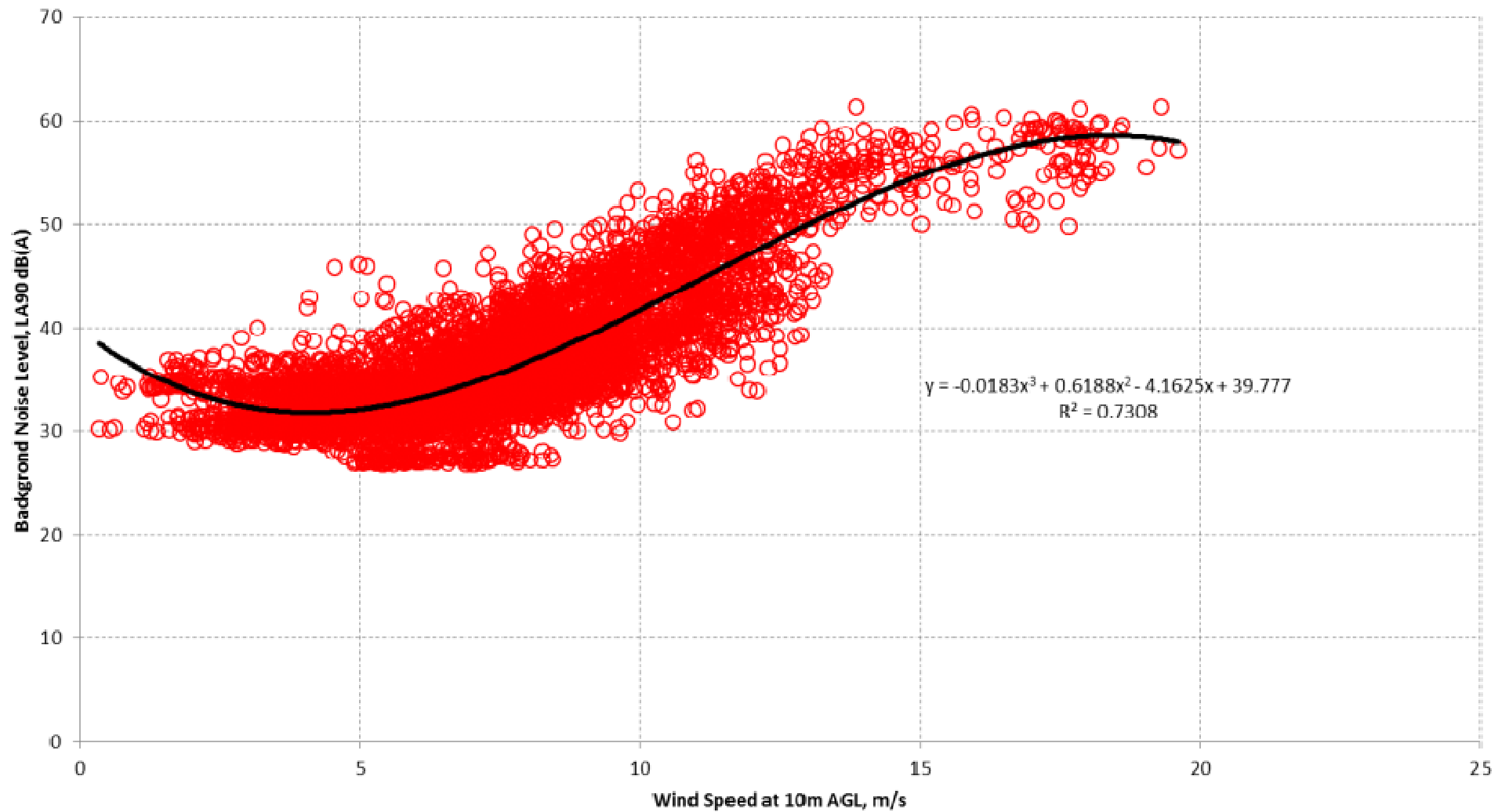
Location 3



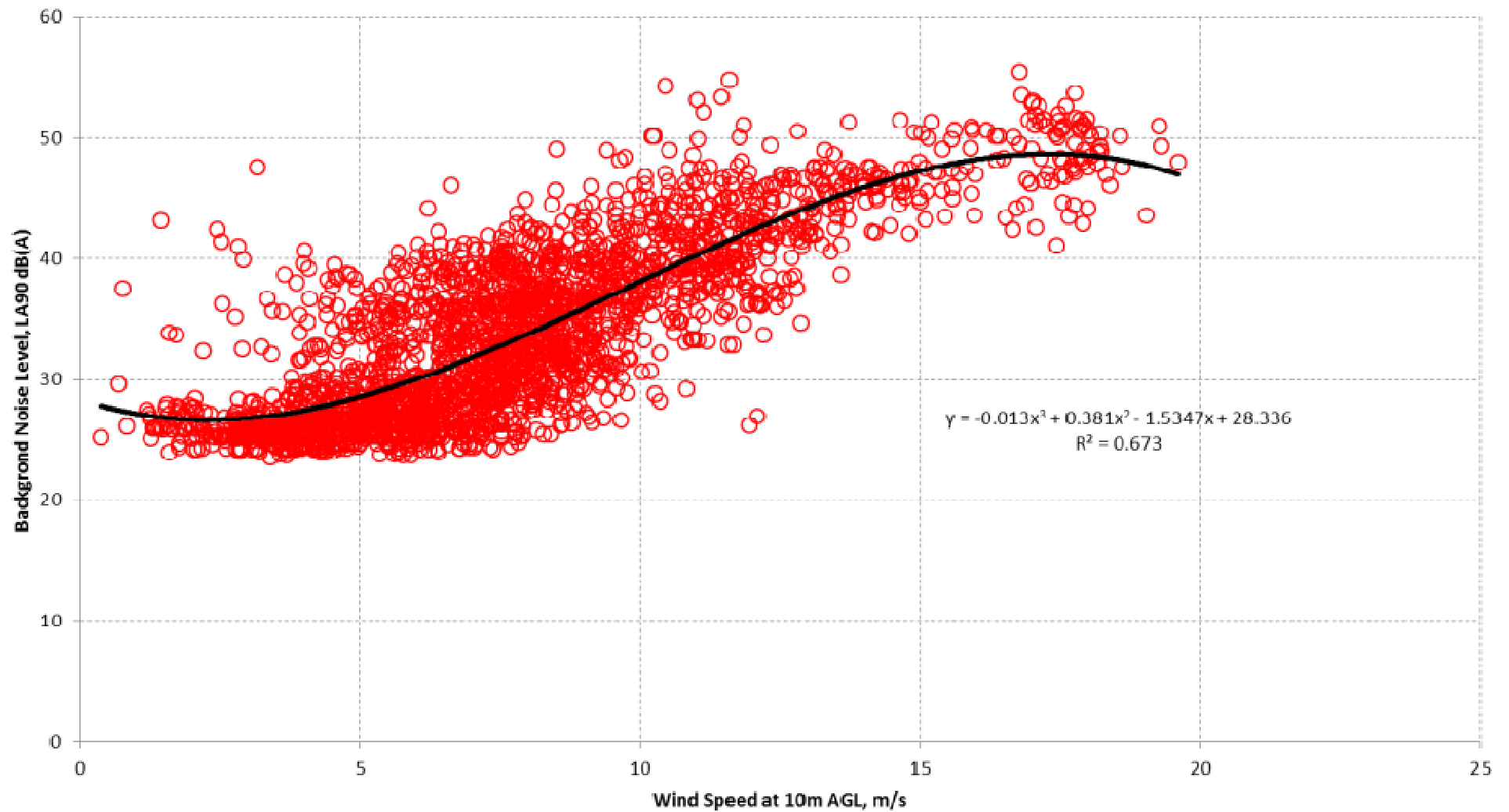
APPENDIX C

BACKGROUND NOISE LEVELS vs WIND SPEED PLOTS

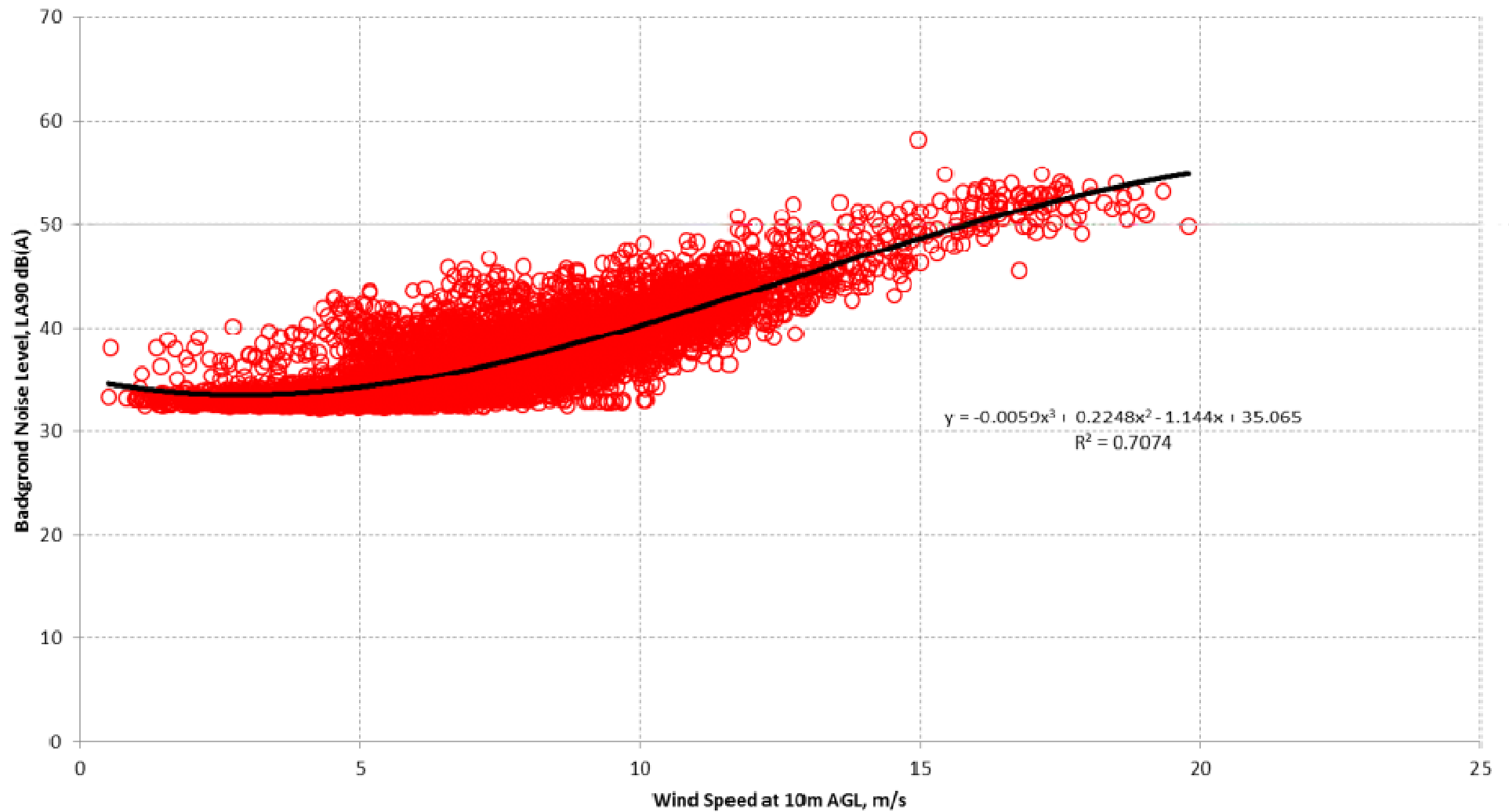
Warradarge Wind Farm Background Noise Monitoring Site 1 Mast 1



Warradarge Wind Farm Background Noise Monitoring Site 2 Mast 1

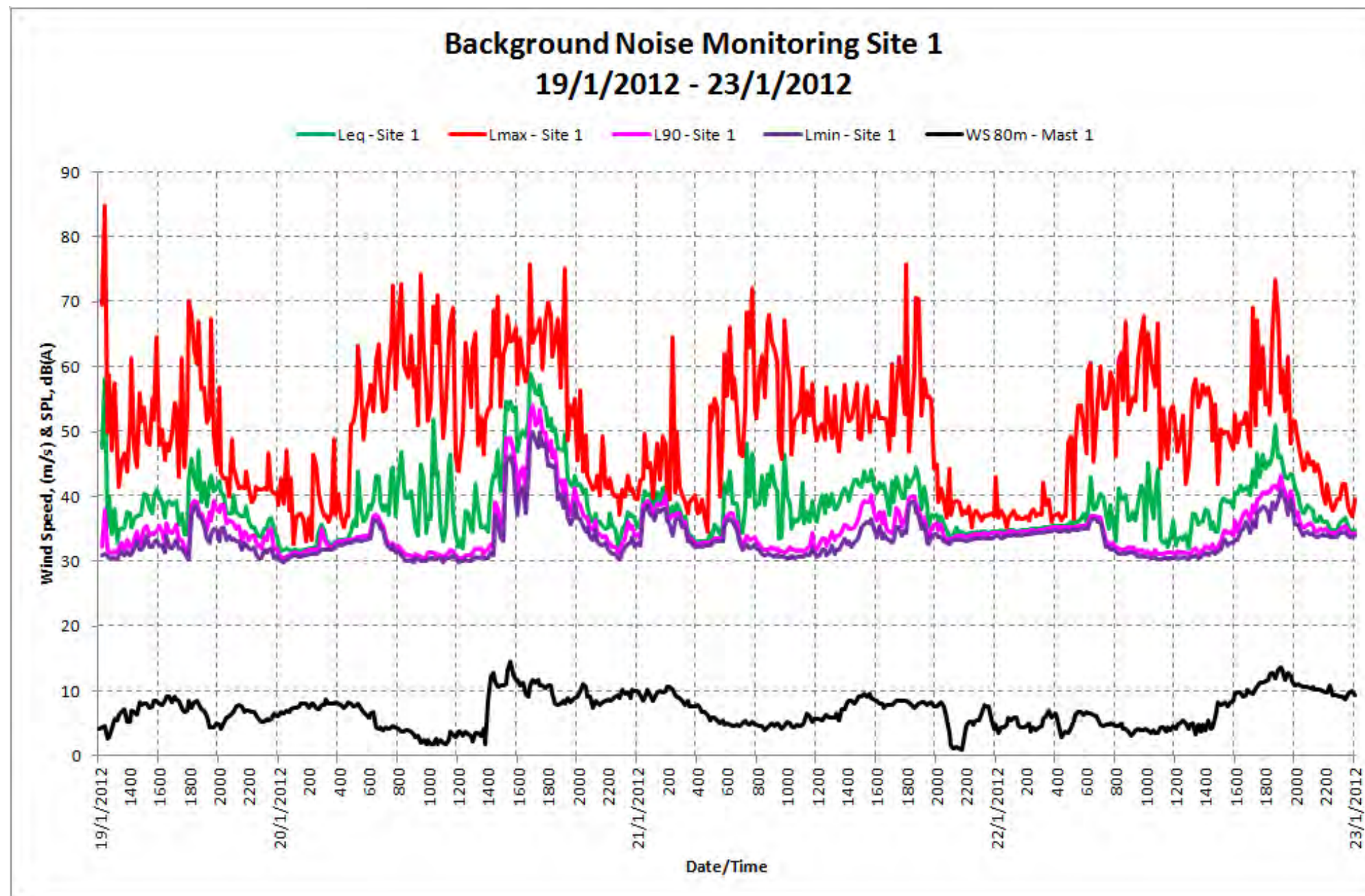


Warradarge Wind Farm Background Noise Monitoring Site 3 Mast 2

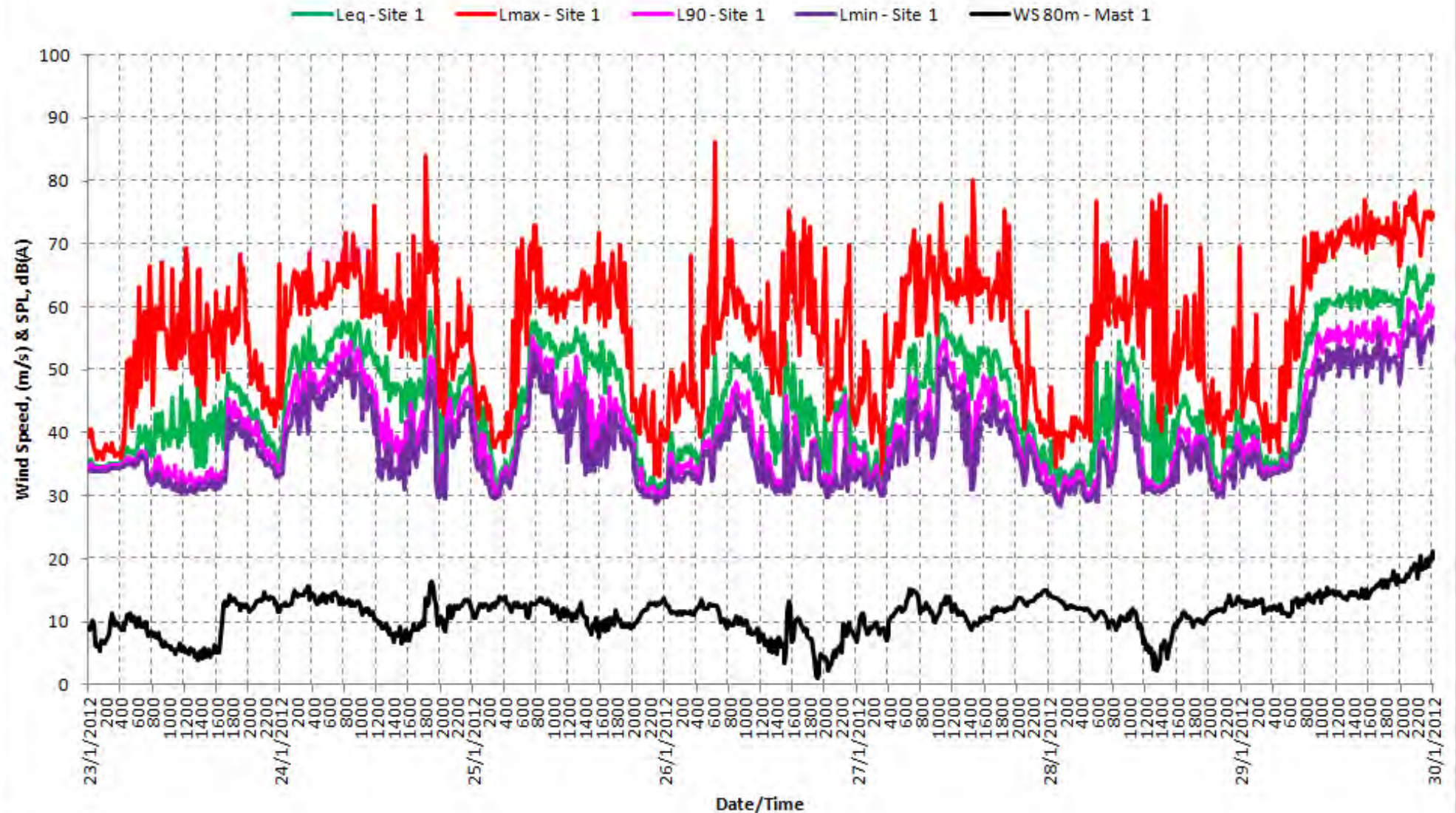


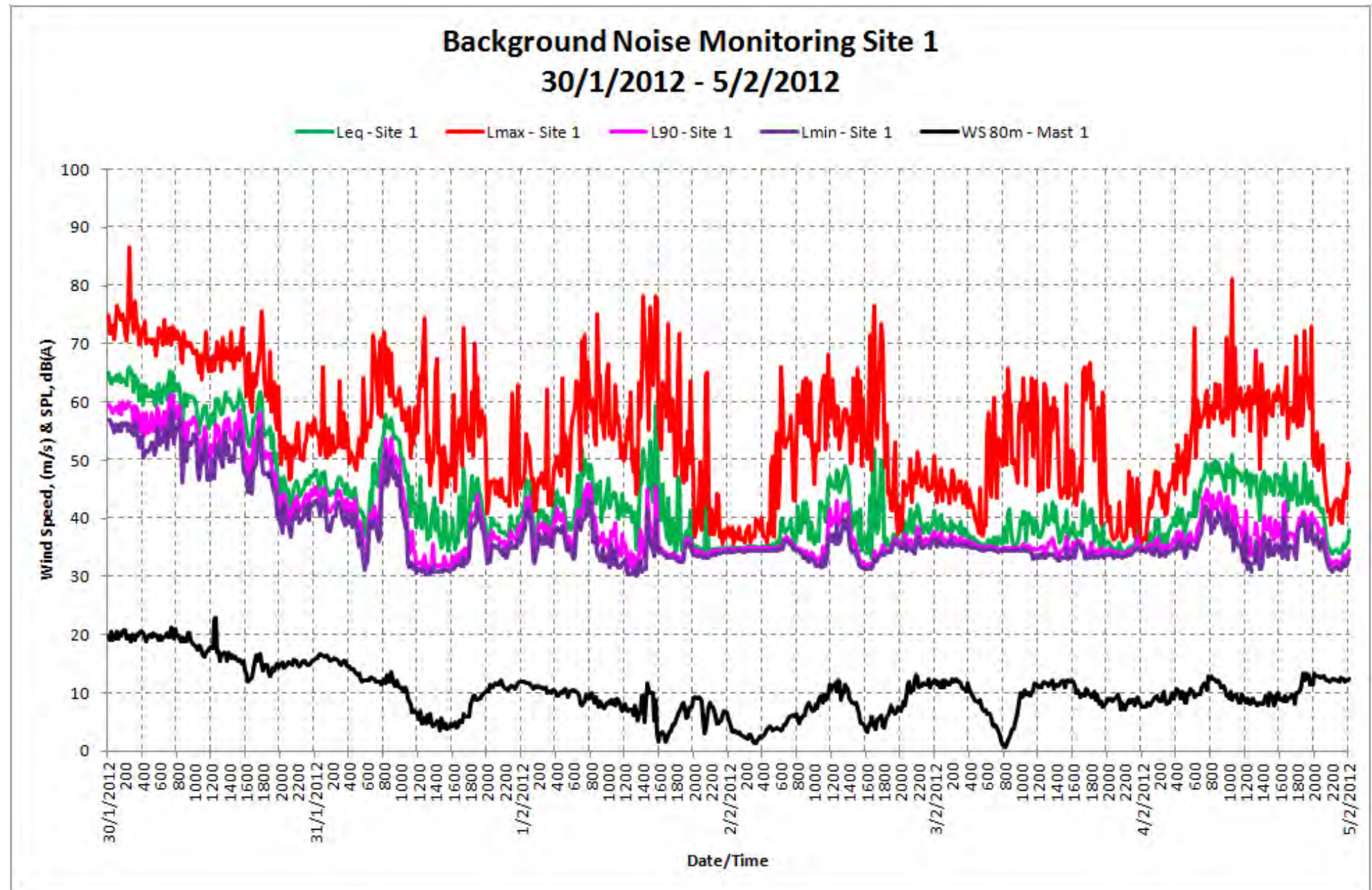
APPENDIX D

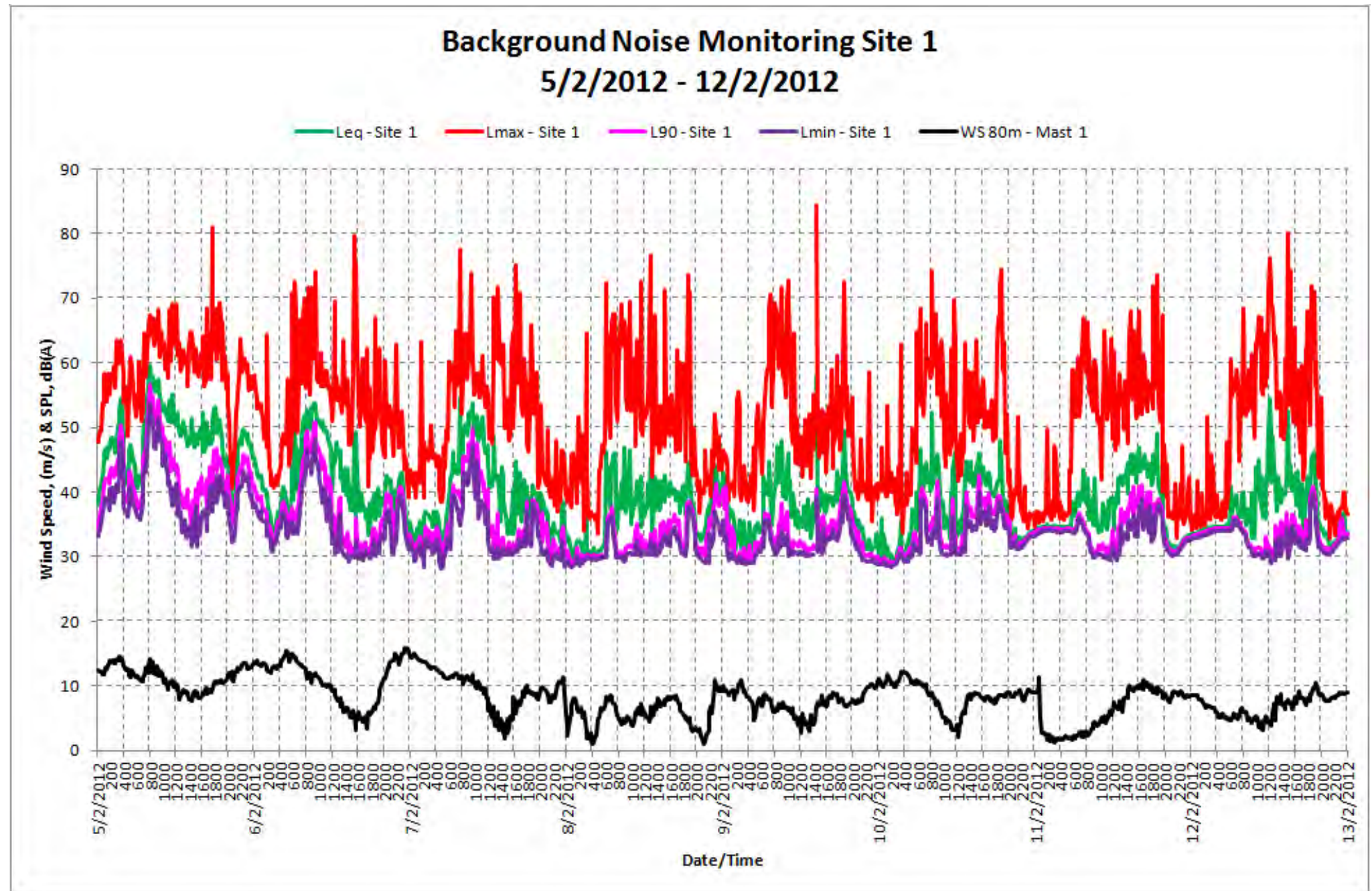
BACKGROUND NOISE LEVELS TIME HISTORY PLOTS



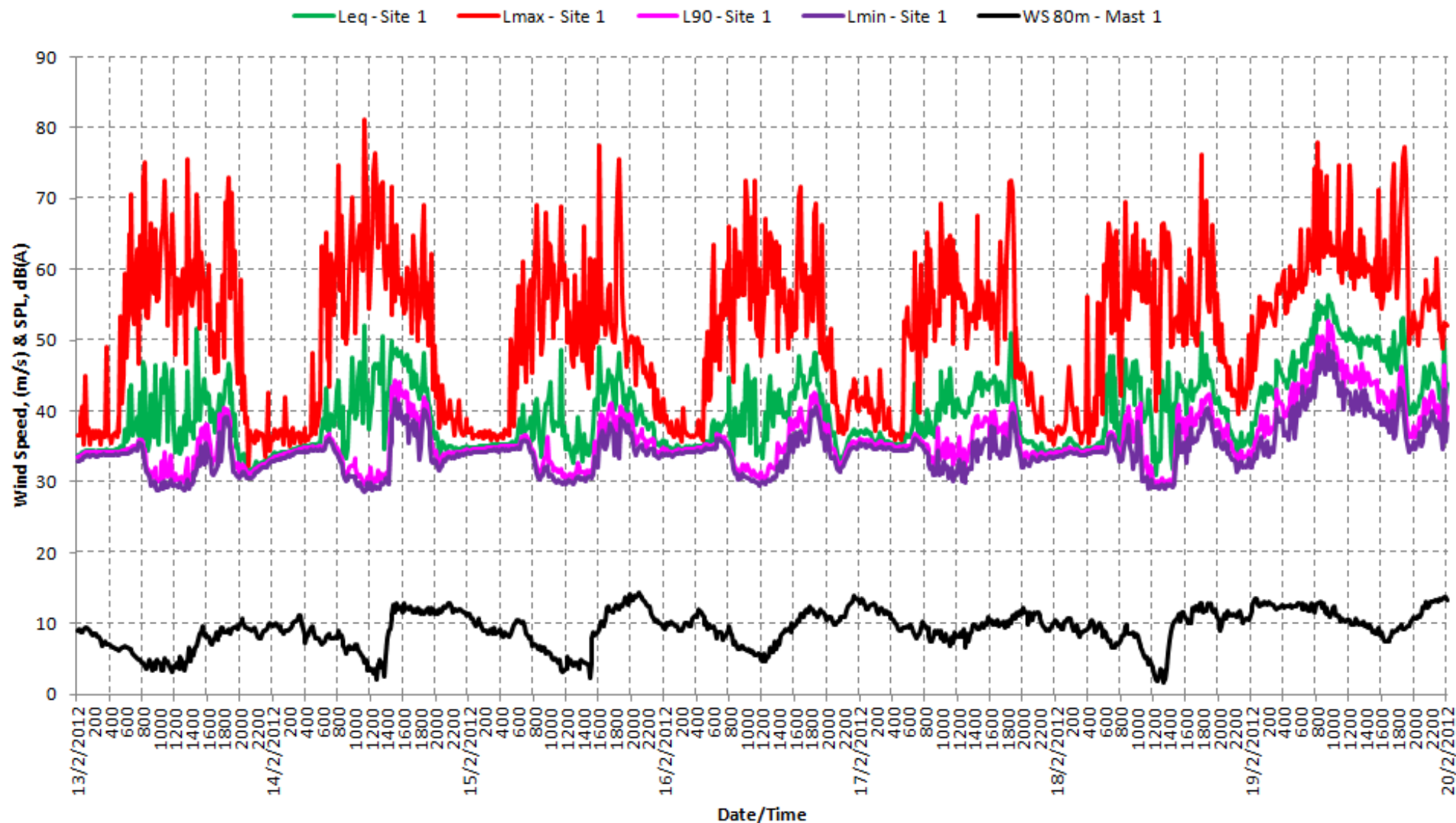
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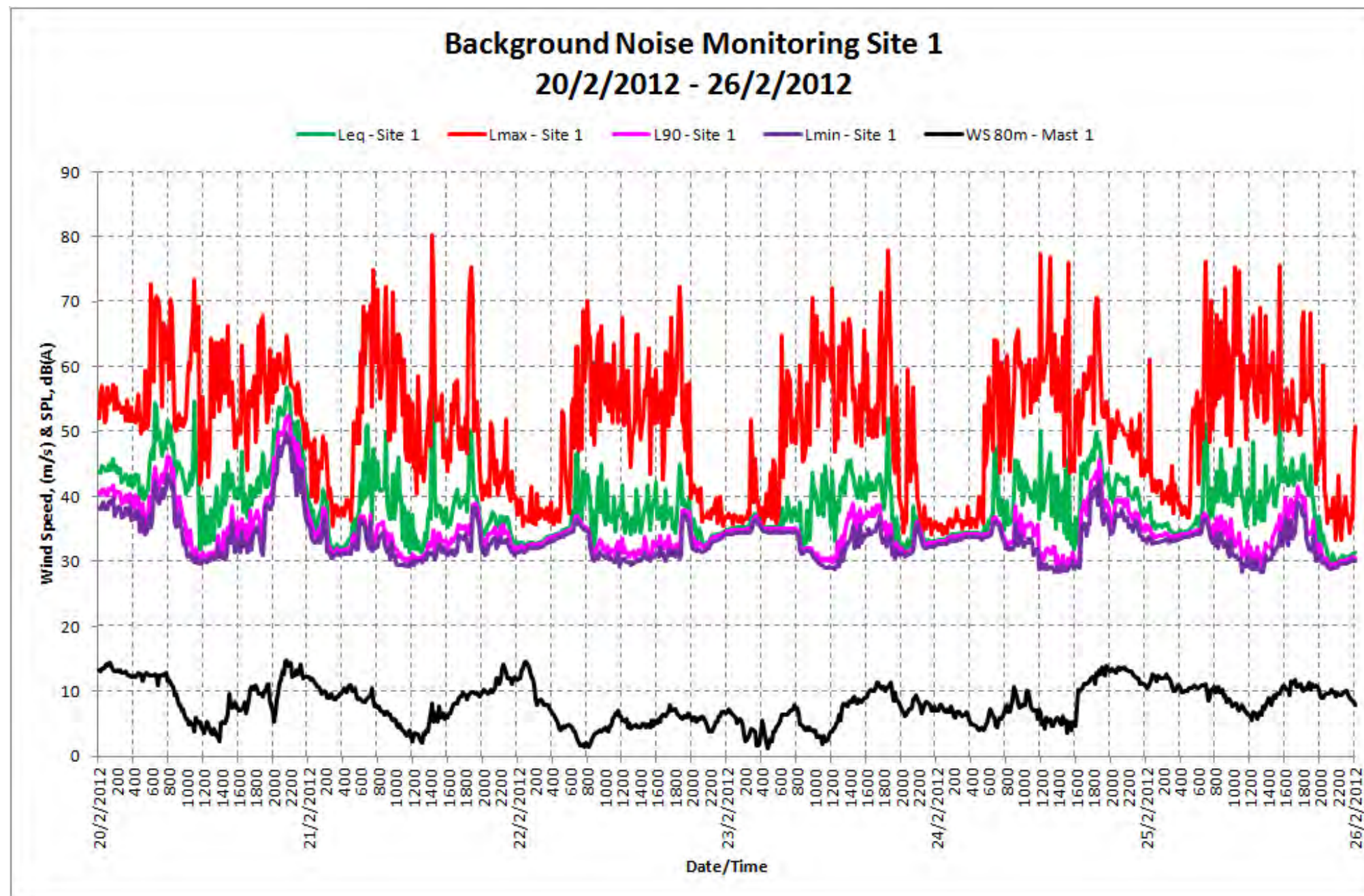


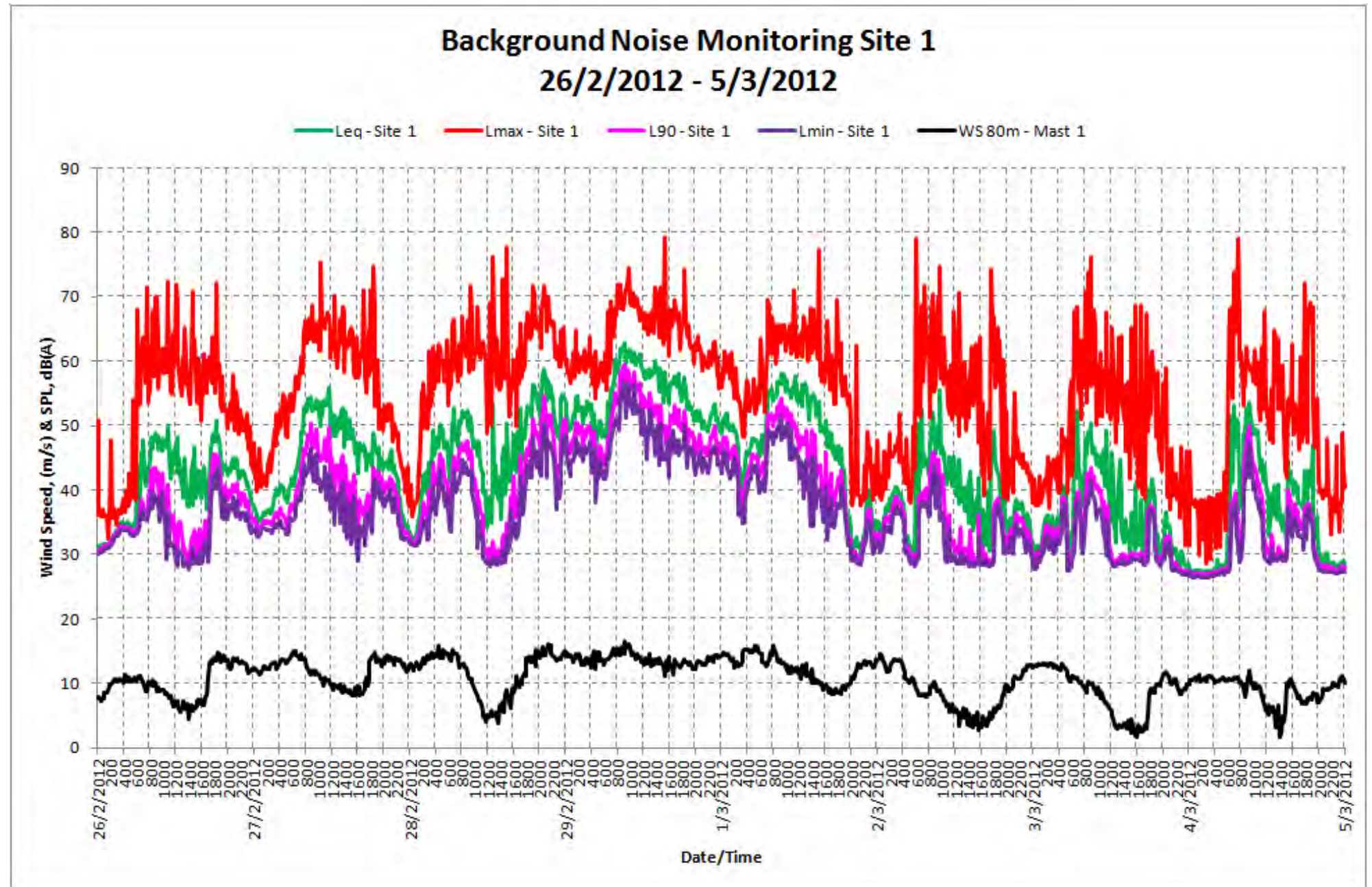


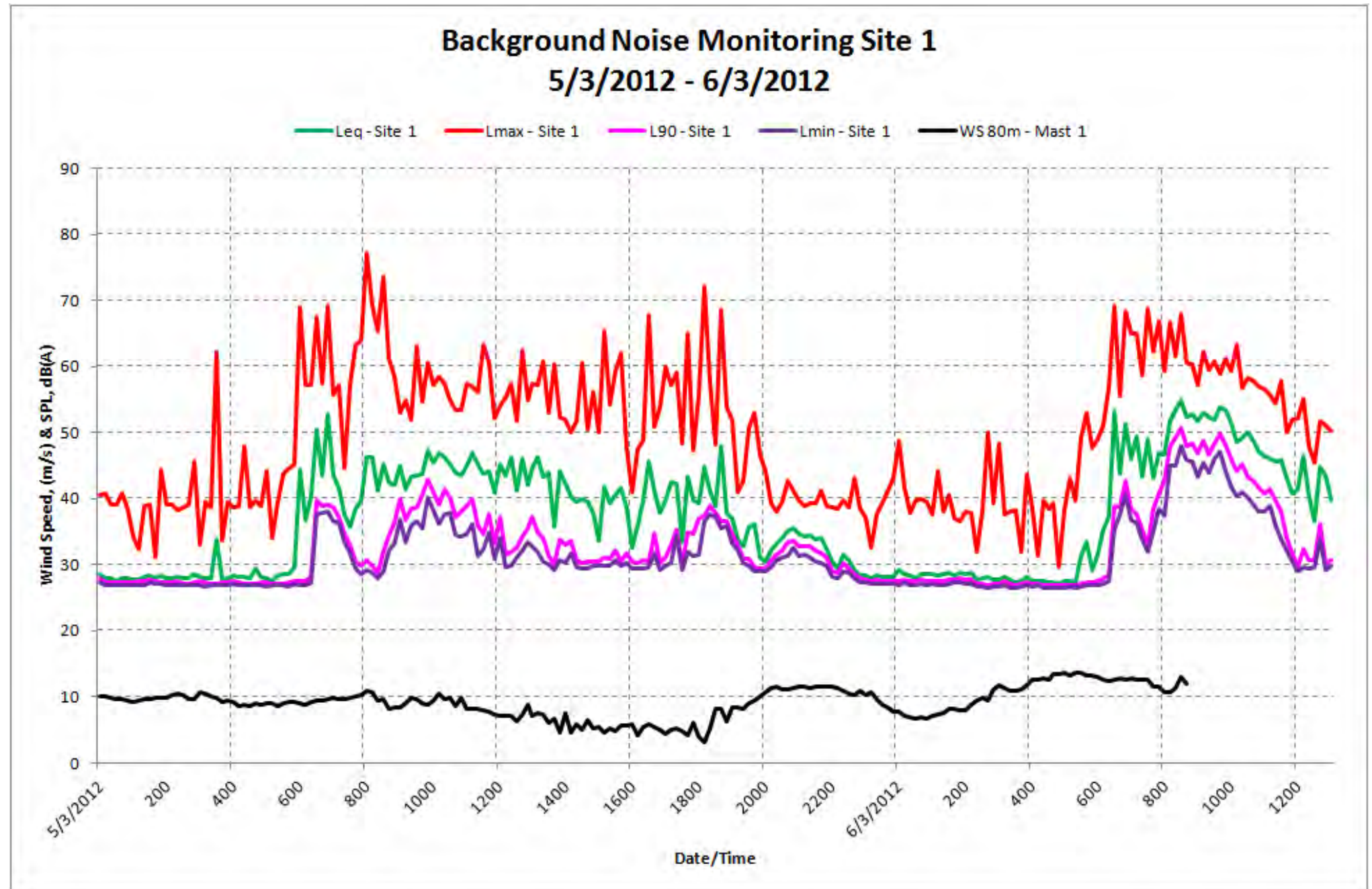


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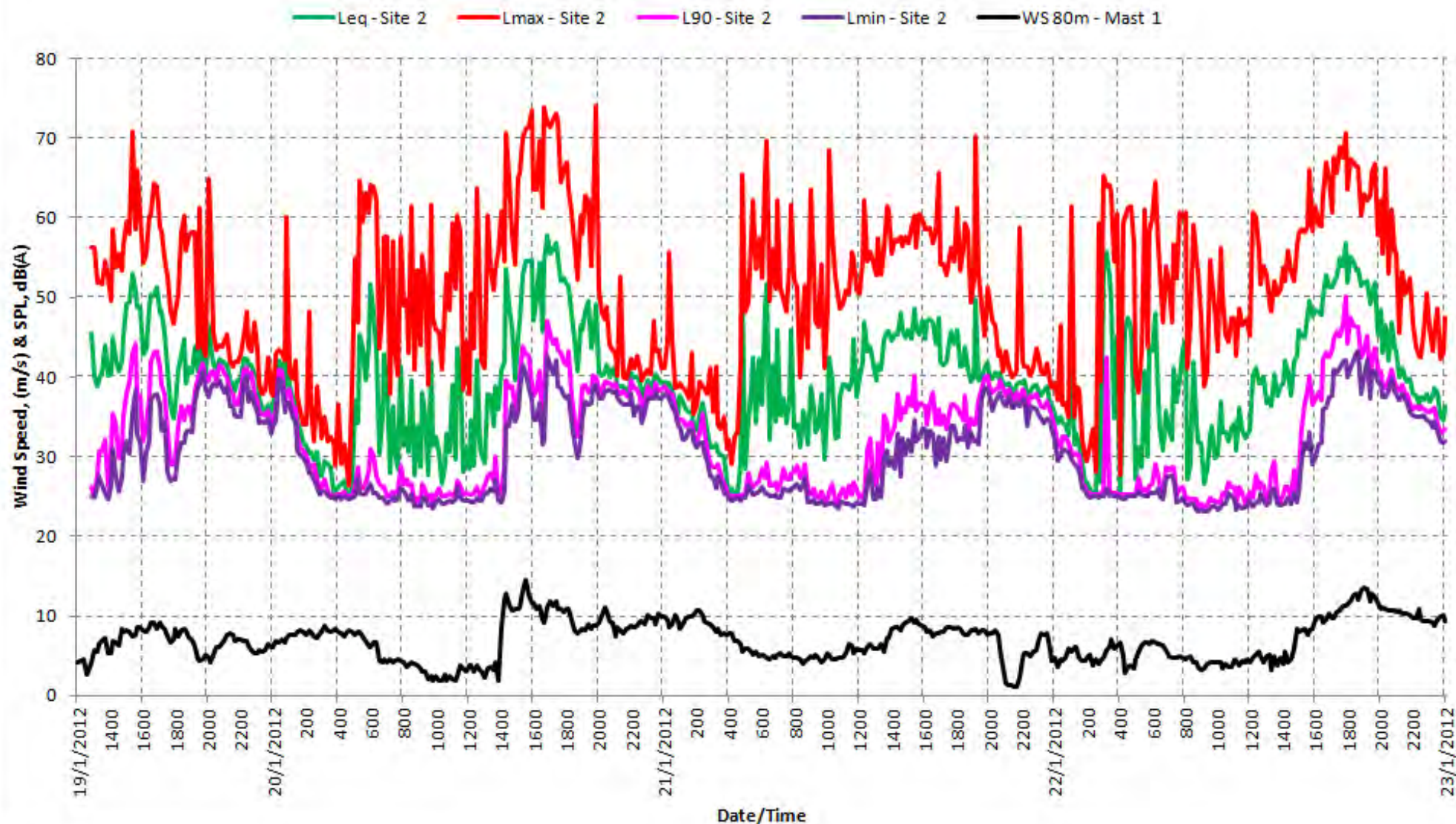


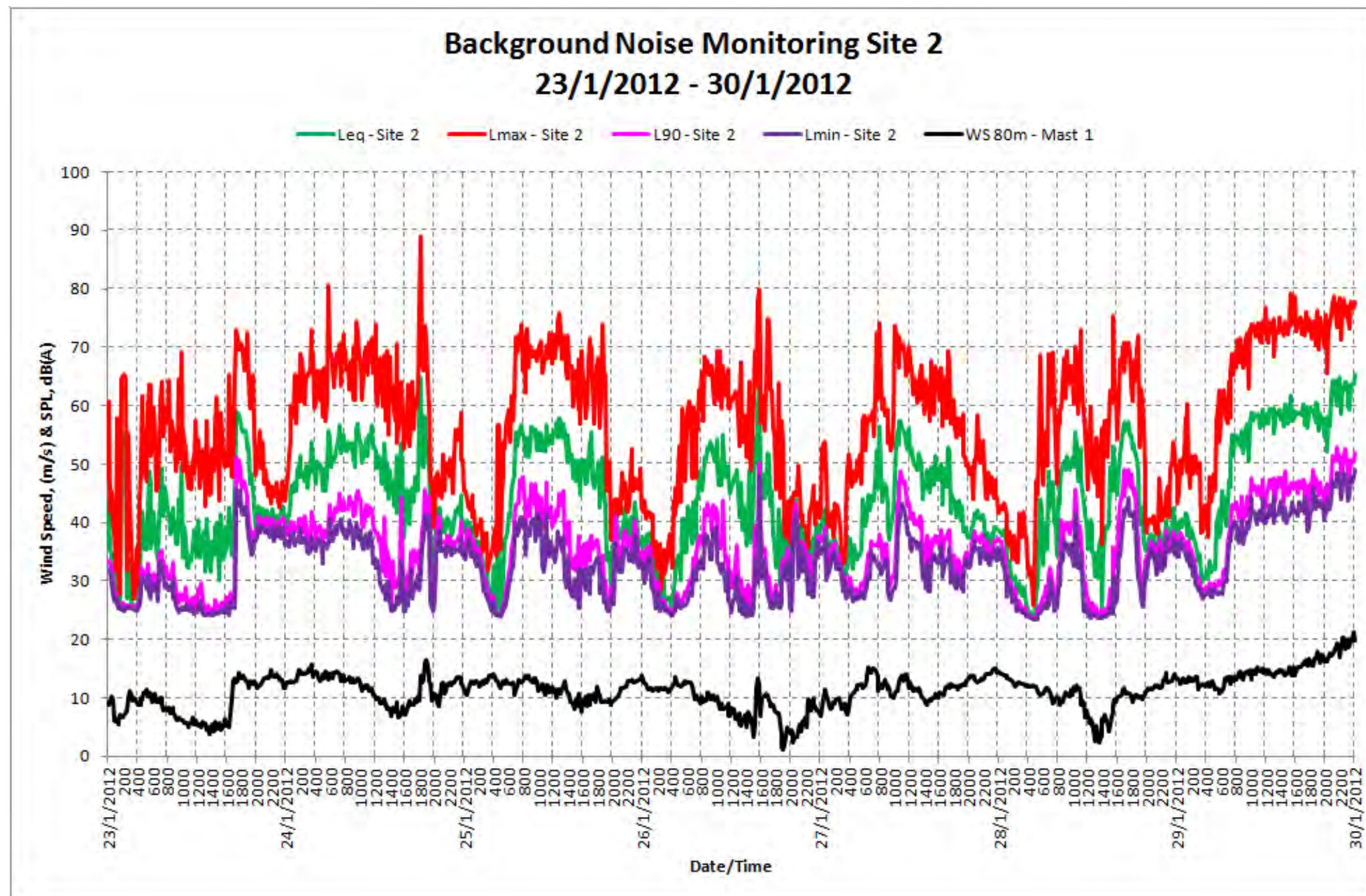


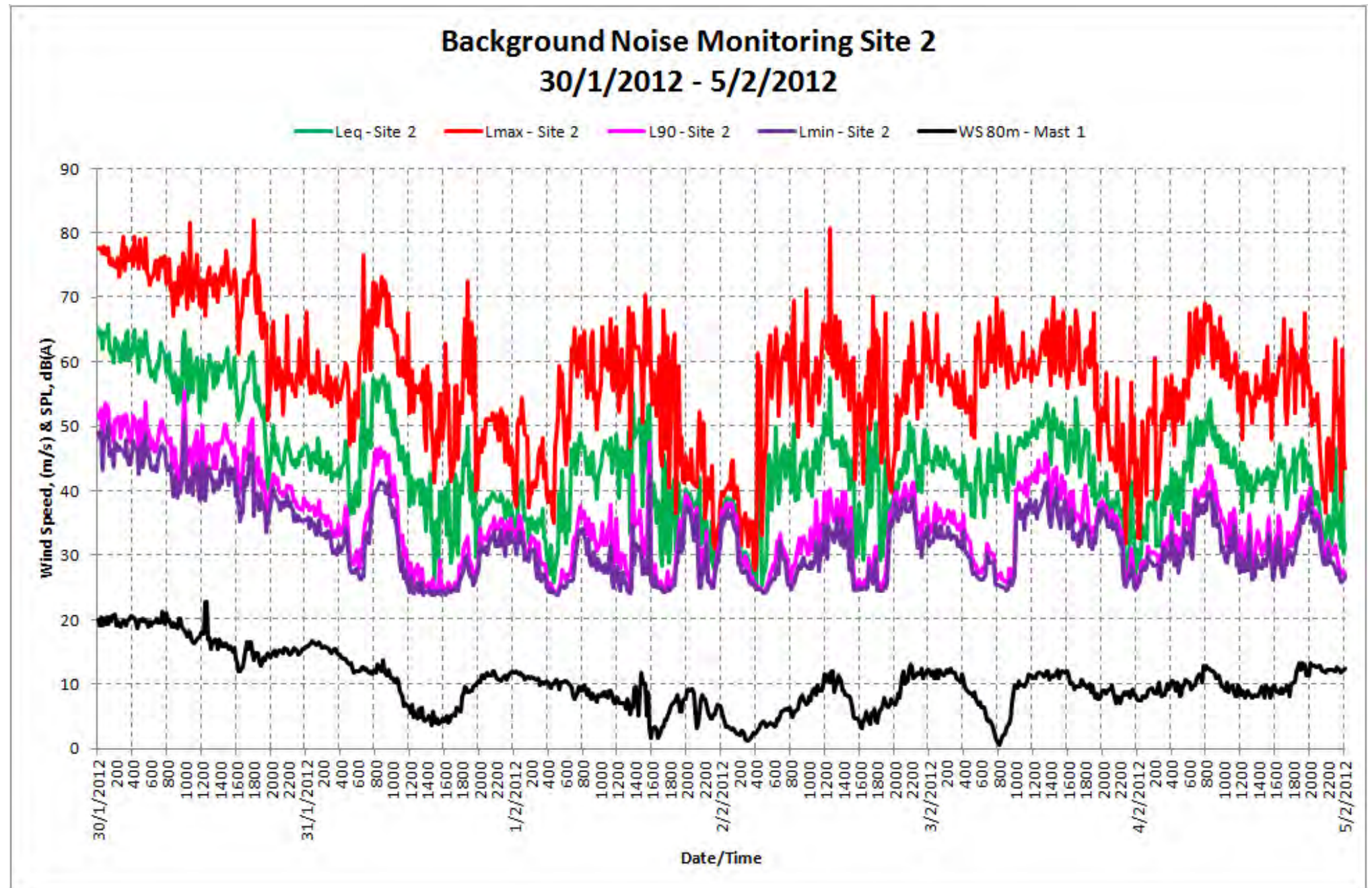




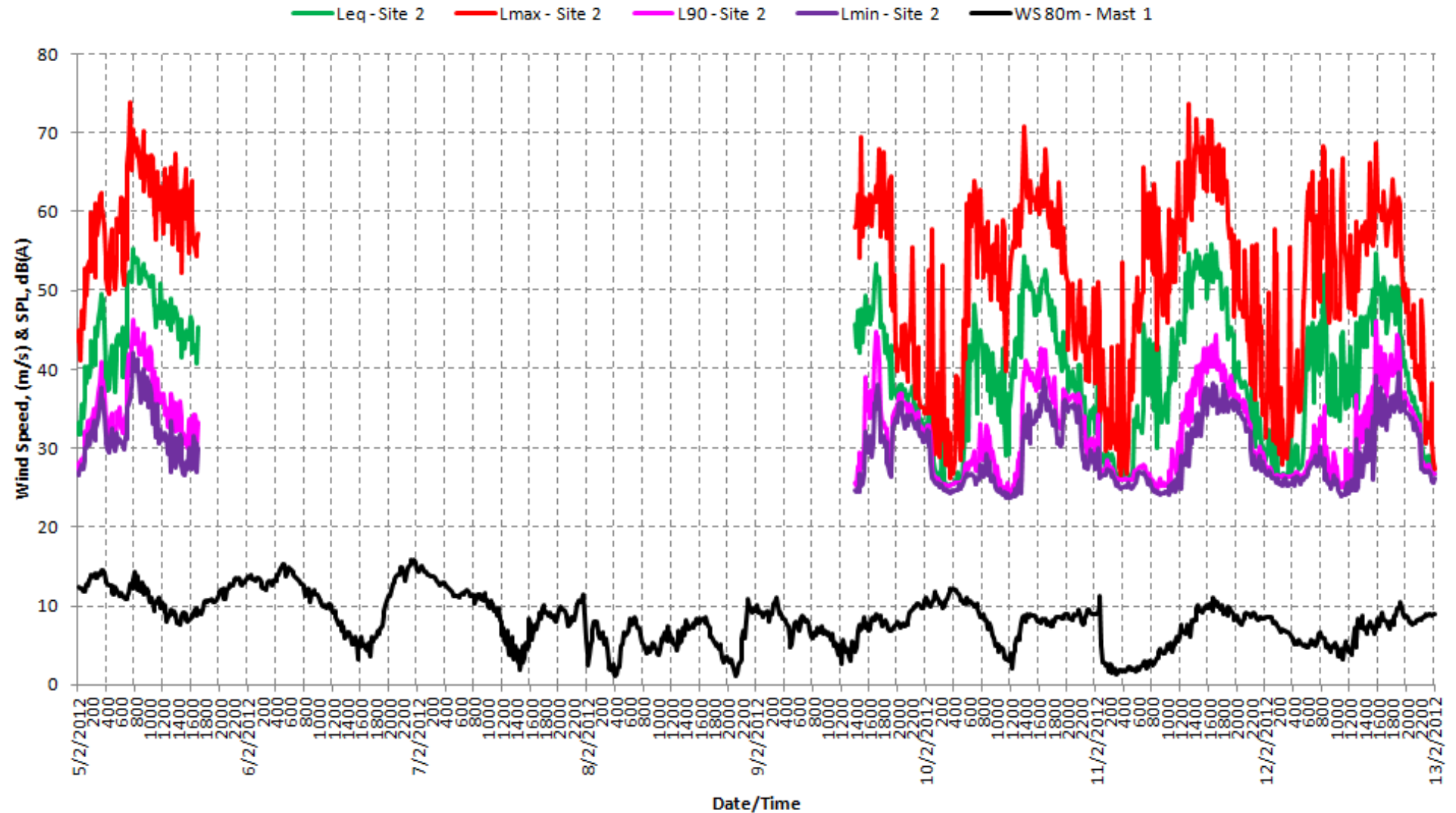
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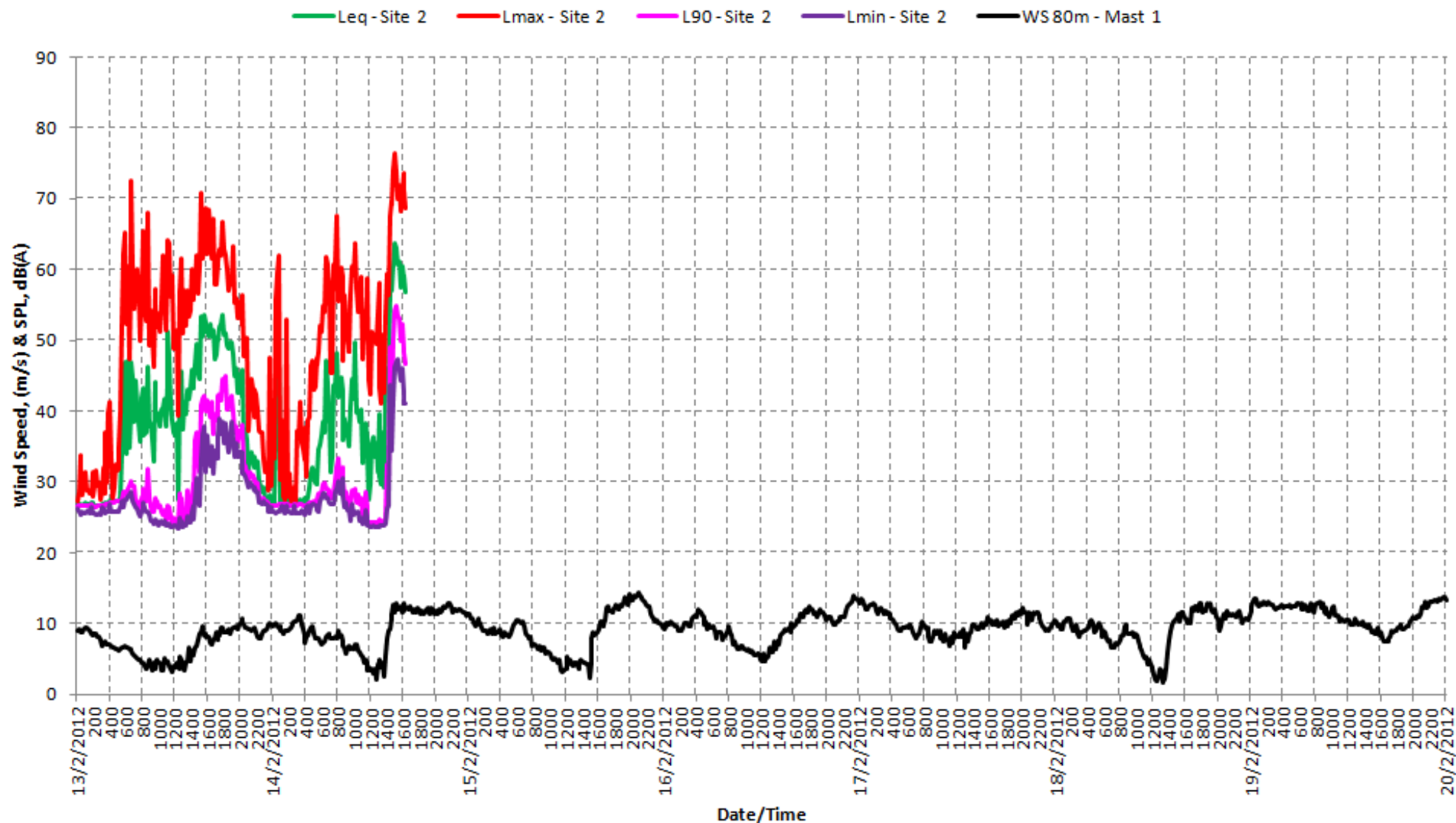


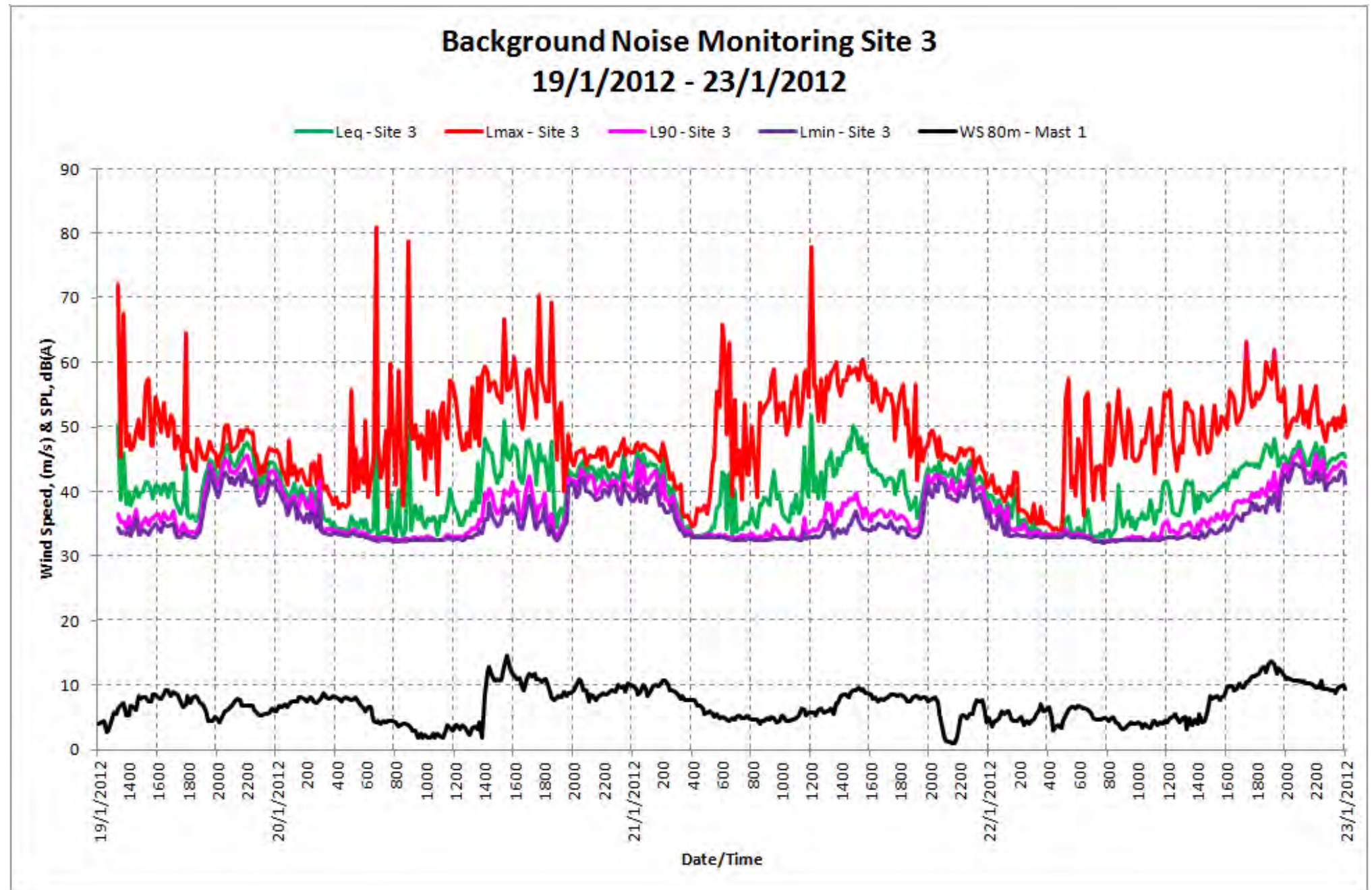


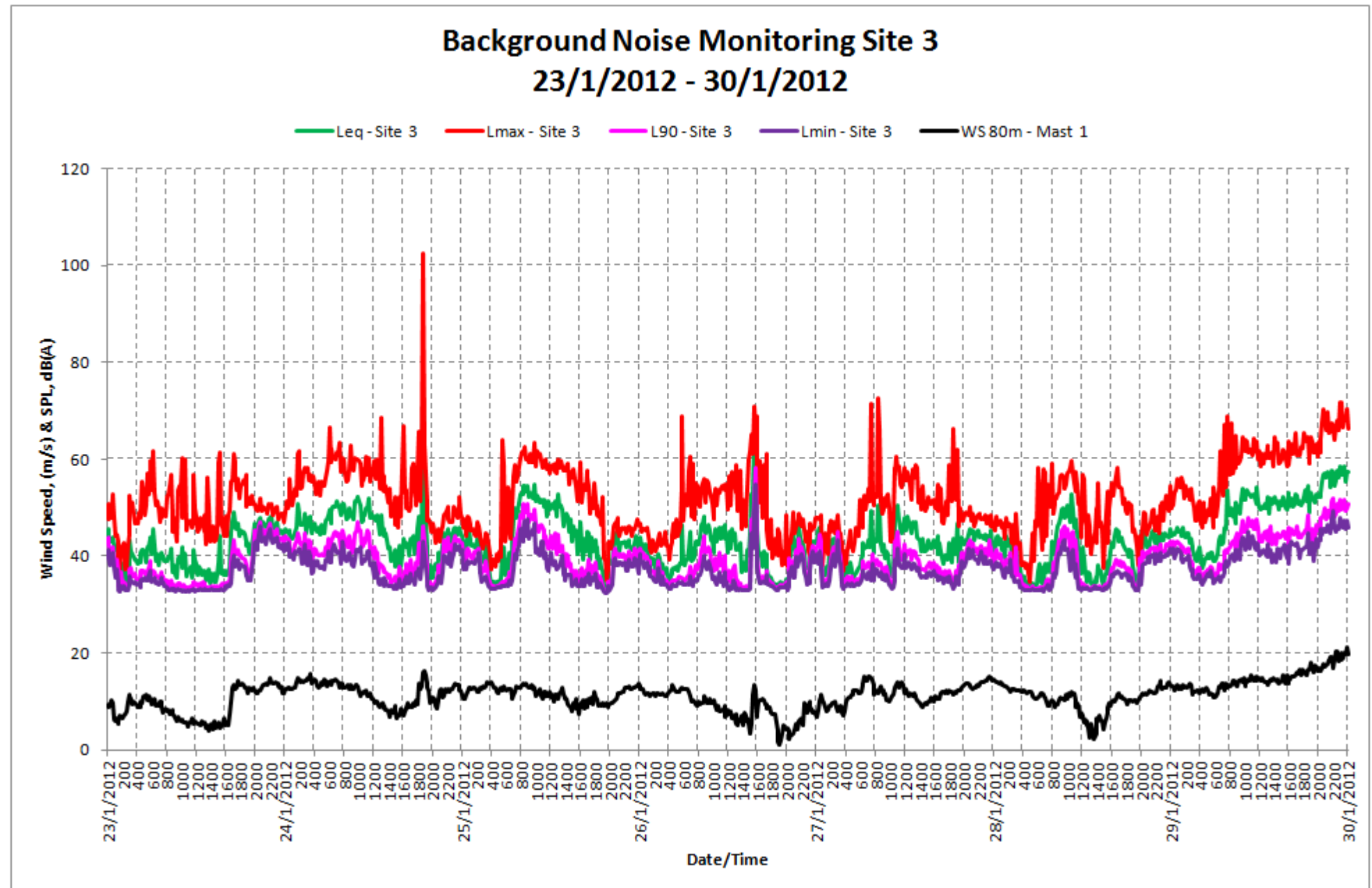
Background Noise Monitoring Site 2 5/2/2012 - 13/2/2012



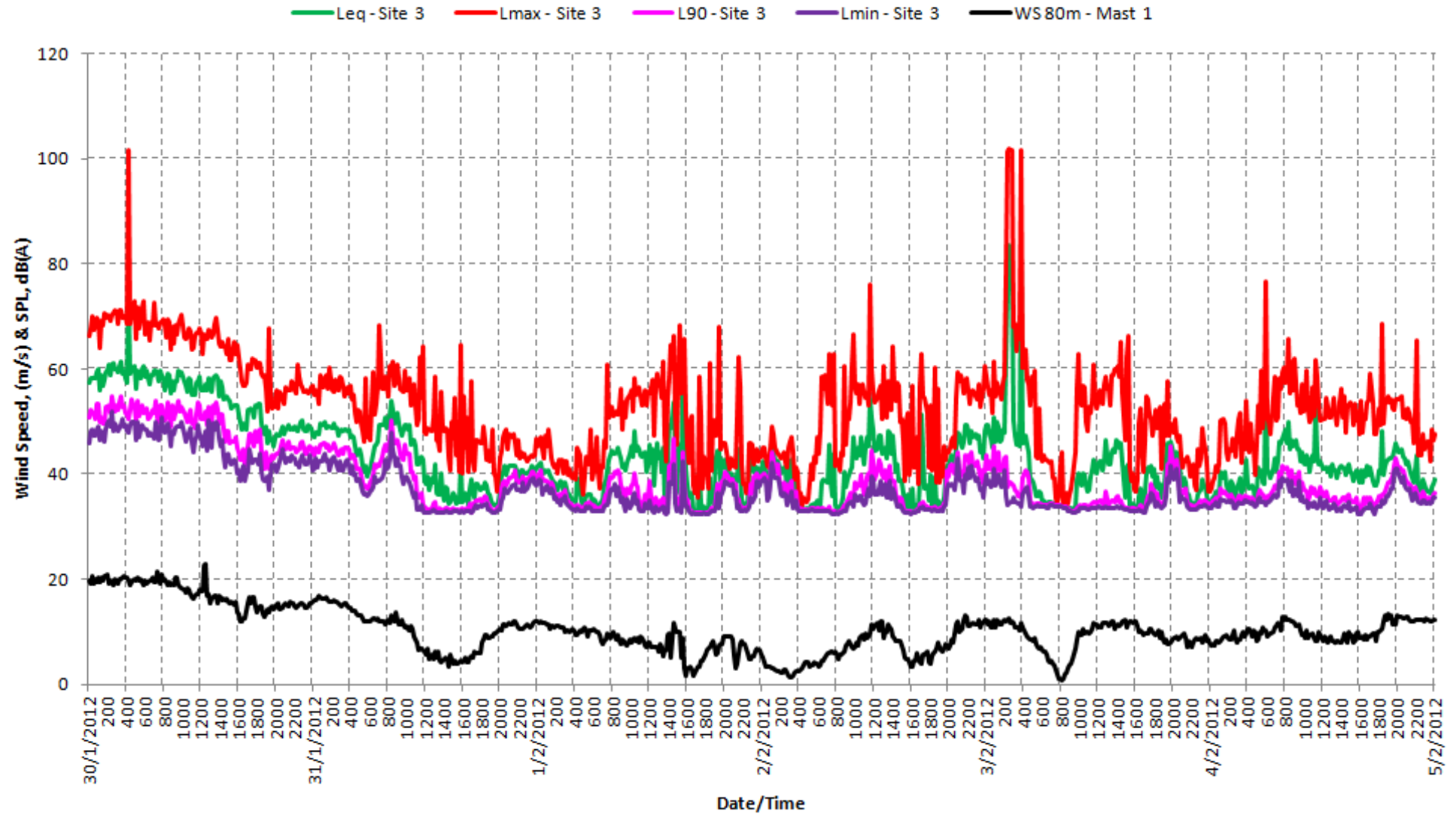
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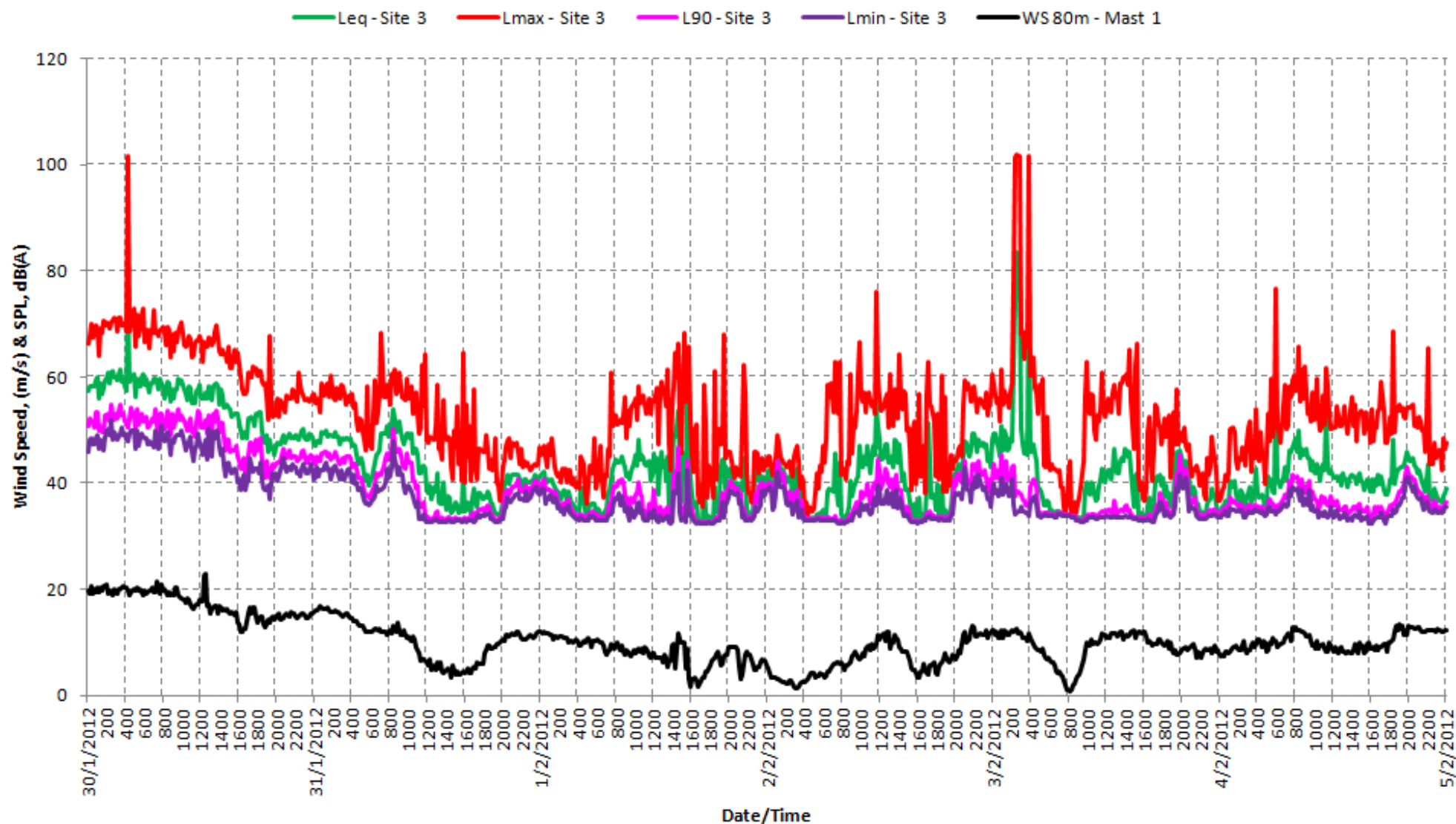




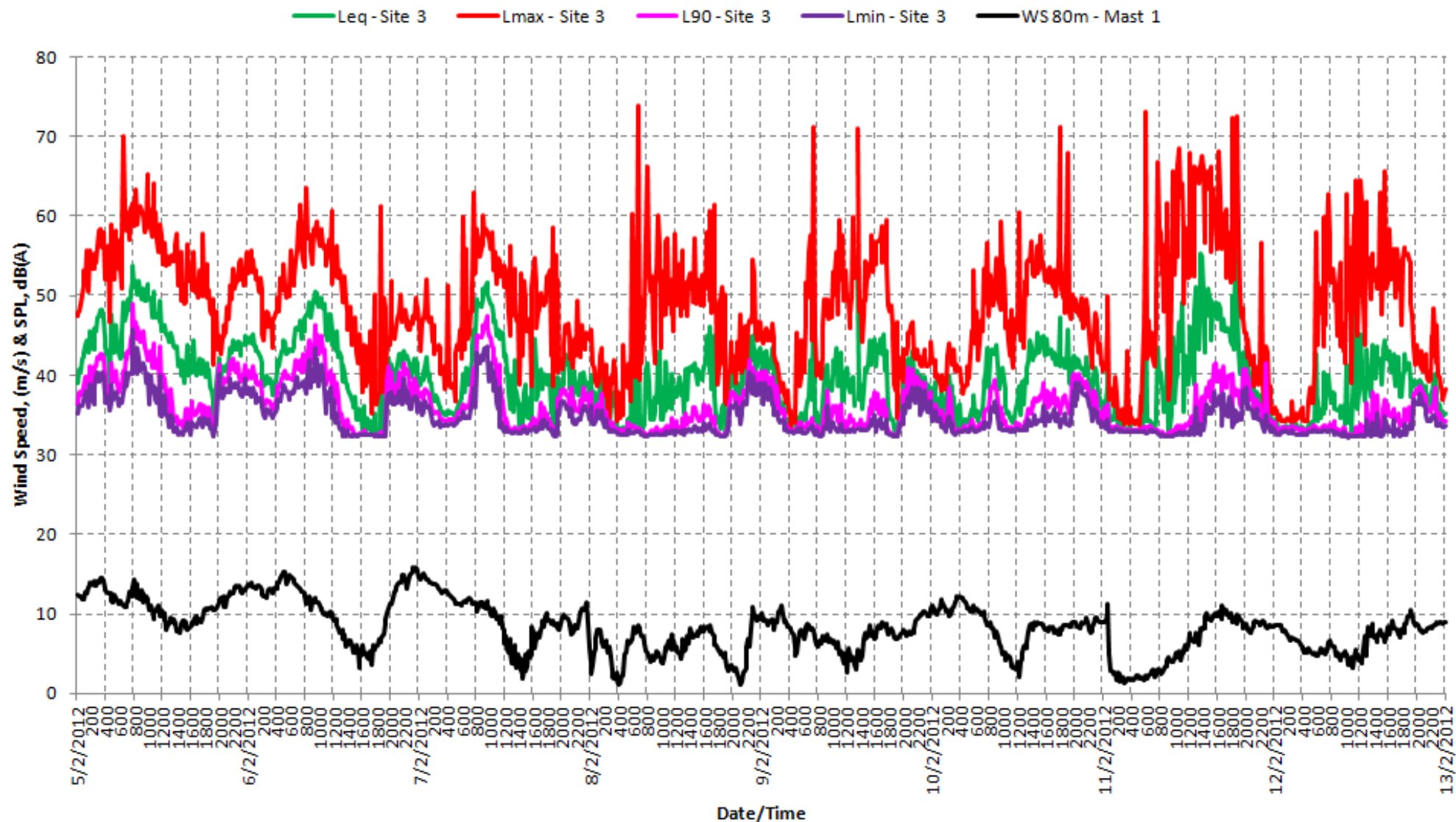
Background Noise Monitoring Site 3 30/1/2012 - 5/2/2012



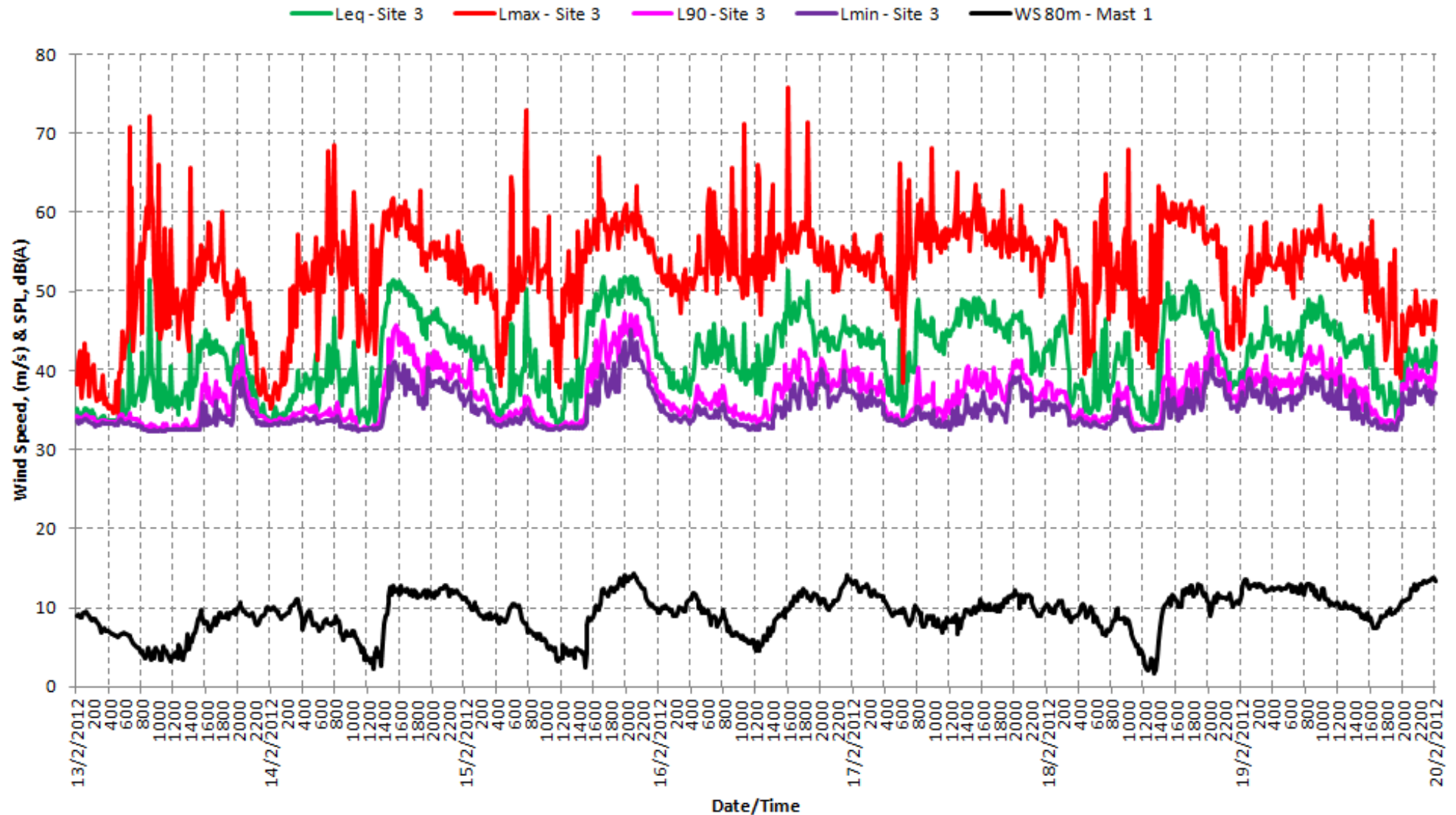
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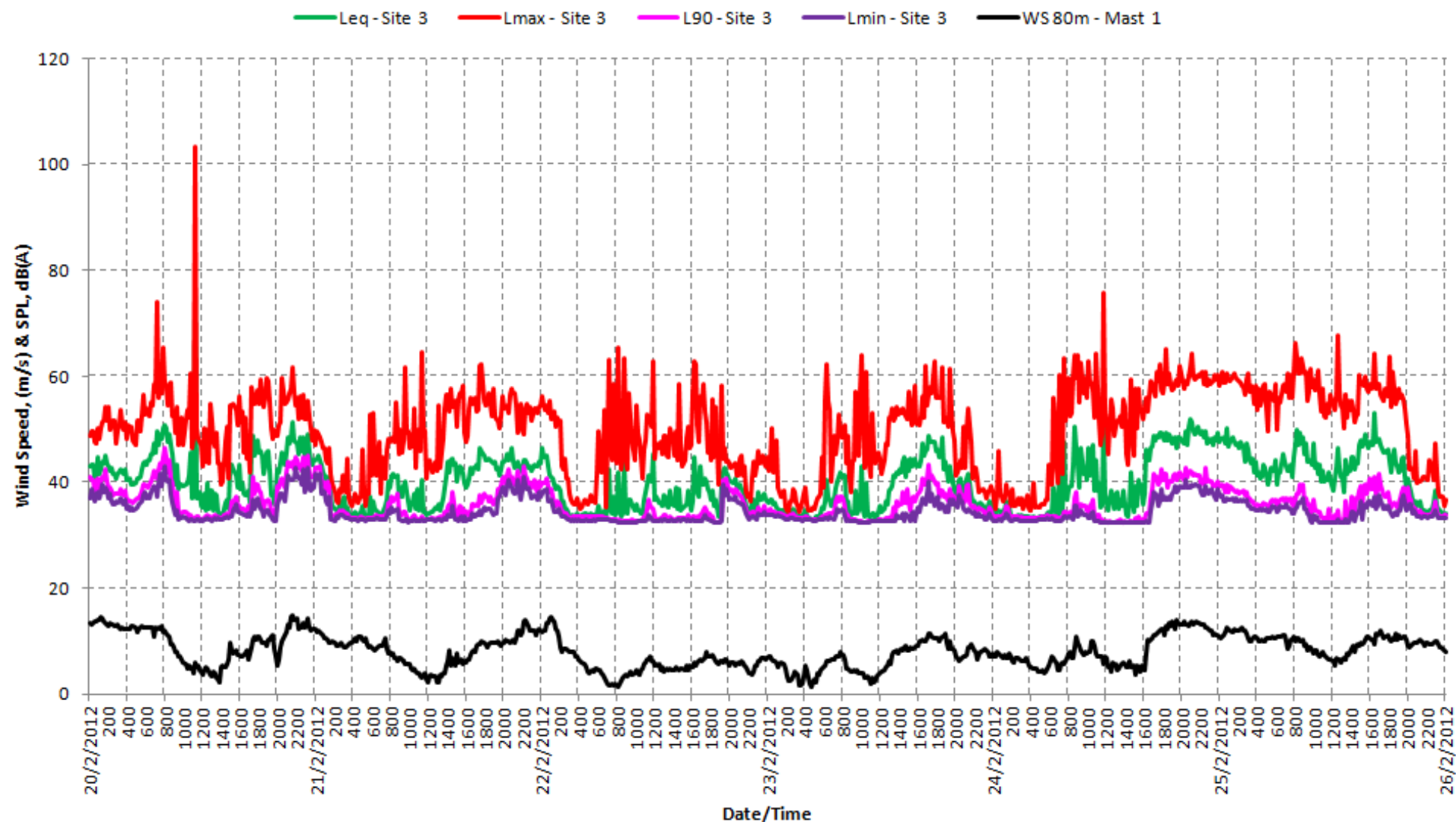
Background Noise Monitoring Site 3 5/2/2012 - 13/2/2012



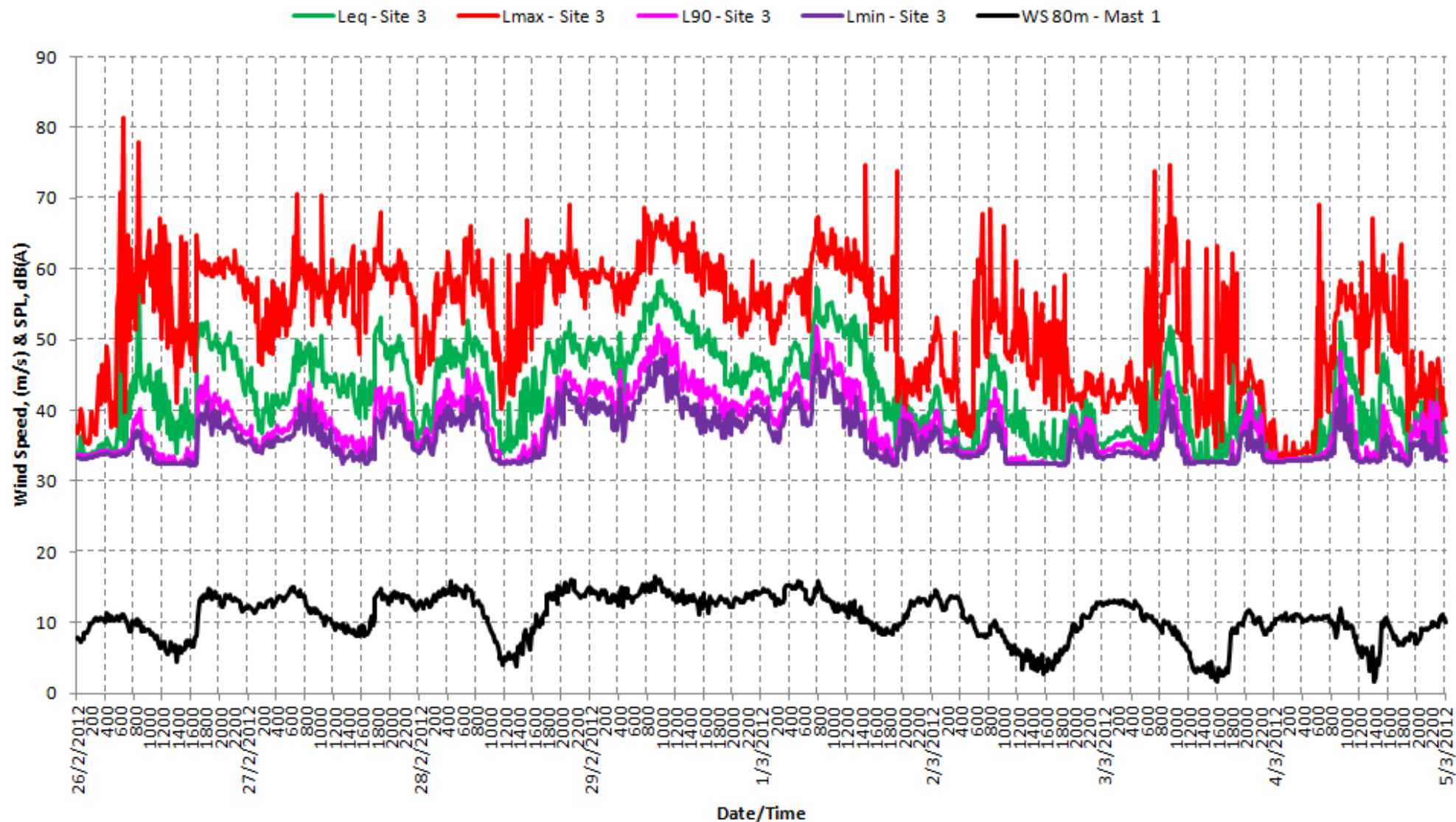
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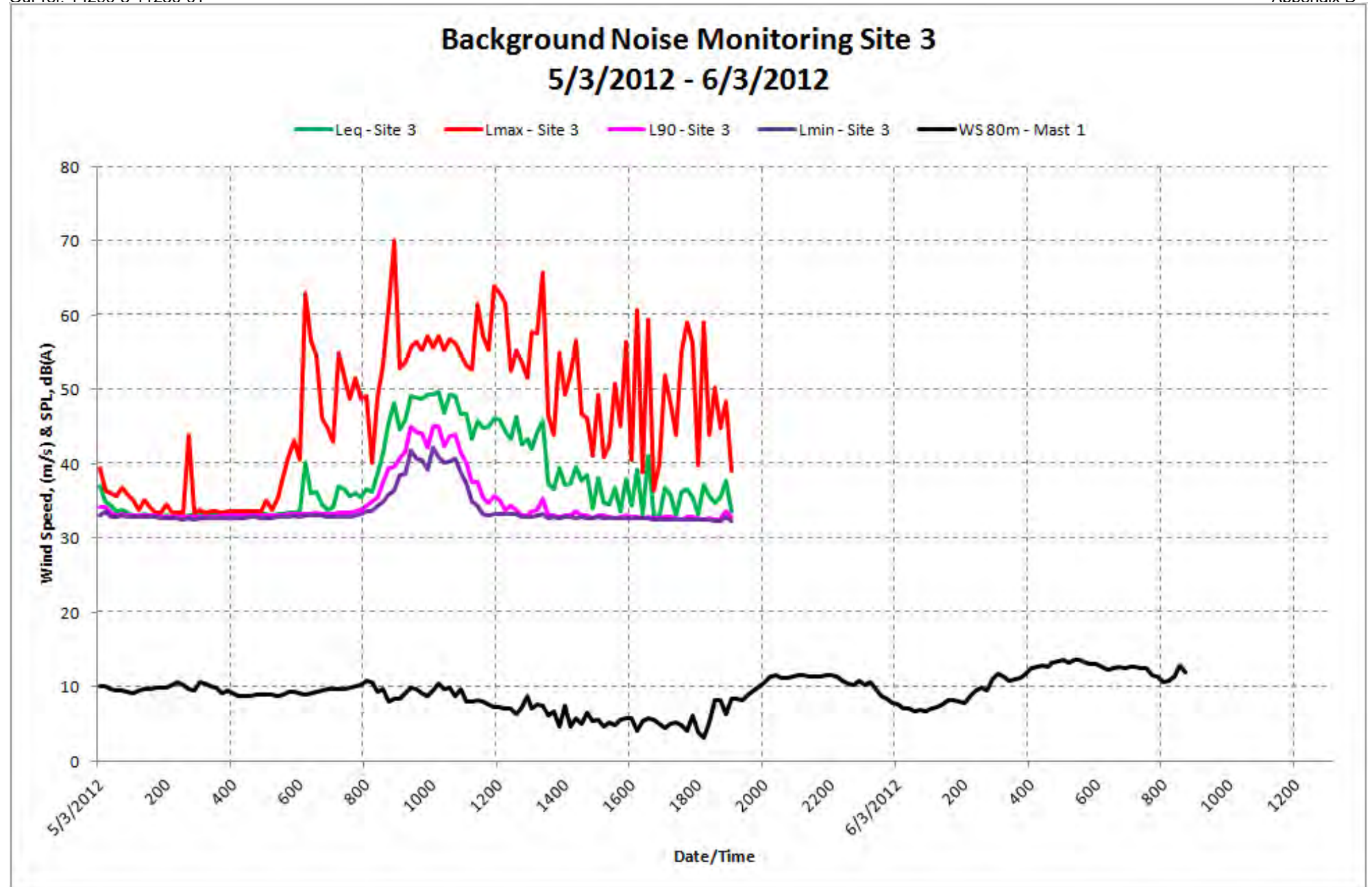


Background Noise Monitoring Site 3 20/2/2012 - 26/2/2012



Background Noise Monitoring Site 3 26/2/2012 - 5/3/2012





APPENDIX E

CALIBRATION CERTIFICATES



Instrulabs Pty. Ltd.

SOUND LEVEL METER CALIBRATION CERTIFICATE

THIS IS TO CERTIFY THAT THE SOUND LEVEL METER : RTA Logger , Black Box 1
S/N: Logger 69 Class 1

OWNED BY : Herring Storer Acoustics
34/11 Preston Street

HAS BEEN CALIBRATED ON : 03-September-10

DATE OF ISSUE : 06-September-10

And adjusted according to AS 1259.1-1990, AS 1259.2-1990, AS/NZS 4476:1997 that incorporate specifications for and procedures for calibrating Sound Level Meters and their Filter Set if applicable.

Acoustic Tests AS 1259.1-1990		
Complies	clause 1/10.2.2	Absolute Acoustic Sensitivity
Complies	clause 1/10.2.3	Acoustic Check on A Weighting
Electrical Tests AS 1259.1-1990		
Complies	clause 1/10.2.3	Frequency Response – A Weighting
Complies	clause 10.4.5	RMS Detector
Complies	clause 10.4.2	Fast and Slow Time Weighting Characteristic
Complies	clause 10.3.3	Level Range
Complies	clause 8.9, 8.10	Indicator Linearity
Complies	clause 10.3.4	Self Generated Noise

Calibrated by : **Jason Dixon** , NATA Signatory
Accredited Calibration Officer

Reviewed by : **Erik Fry** , NATA Signatory
Managing Director Instrulabs Pty. Ltd.

Signature :

Report No : 426

Temperature °C	Pressure hPa
21	1019

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This document is issued in accordance with NATA's accreditation requirements

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Accredited for compliance with ISO/IEC 17025:2005

19 Argyle Street, Bentley, WA. 6102, Ph: + 61 8 9356 7999 Fax: + 61 8 9356 9444

email: info@instrulabs.com.au web : www.instrulabs.com.au

Doc. ID: 017 Page 1 of 1

Approved by Erik Fry 07/04/2009



Instrulabs Pty Ltd

SOUND LEVEL METER CALIBRATION CERTIFICATE

THIS IS TO CERTIFY THAT THE SOUND LEVEL METER : RTA Logger Model: RTA02
S/N: 052 Class 2

OWNED BY : Herring Storer Acoustics
34/11 Preston Street, Como WA, 6152

HAS BEEN CALIBRATED ON : 11/July/2011

according to AS 1259.1-1990, AS 1259.2-1990, AS/NZS 4476:1997 that incorporate specifications for and procedures for calibrating Sound Level Meters and their Filter Set if applicable.

Pass/Fail		
Acoustic Tests AS 1259.1-1990		
Pass	clause 1/10.2.2	Absolute Acoustic Sensitivity
Pass	clause 1/10.2.3	Acoustic Check on A Weighting
Electrical Tests AS 1259.1-1990		
Pass	clause 1/10.2.3	Frequency Response -- Weighting A
Pass	clause 10.4.5	RMS Detector
Pass	clause 10.4.2	Fast and Slow Time Weighting Characteristic
Pass	clause 8.9, 8.10	Indicator Linearity
Pass	clause 10.3.2	Overload Indication Test
Pass	clause 10.3.4	Self Generated Noise
Integrating/Averaging Meters only AS 1259.2-1990		
Pass	clause 9.3.2	Time Averaging
Pass	clause 9.3.3	Indicator Linearity

Calibrated by : Jason Dixon , NATA Signatory Reviewed by : Erik Fry , NATA Signatory, General Manager

Signatures :

Report No : 681

Issue Date : 11-July-2011

Temperature °C	Pressure hPa
23	1018

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Doc. ID: IL-017 Page 1 of 1 Approved by Erik Fry 07/04/2009

RTA TECHNOLOGY PTY LTD

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Website: www.rtagroup.com.au ABN 56 003 290 140

Certificate of Calibration Sound Level Meter

Calibration Date 18/02/2010 **Job No** RA706 **Operator** AL
Client Name HERRING STORER ACOUSTICS
Client Address SUITE 34, 11 PRESTON STREET, COMO, 6952

Test Item

Instrument Make	RTA Technology Pty Ltd	Model	RTA01	Serial No	#091
Microphone Make	RTA Technology Pty Ltd	Model	RTA01	Serial No	#091
Preamplifier Make	RTA Technology Pty Ltd	Model	RTA01	Serial No	#091
Ext'n Cable Make	Nil	Model	N/A	Serial No	N/A
Accessories	Nil				

SLM Type	2
Filters Class	N/A

Temp deg C	23.0
RH %	43.0
Bar Pressure hPa	1018

Applicable Standards:

Australian Standard AS1259.1 1990 "Sound Level Meters Part 1: Non-integrating"
Australian Standard AS1259.2 1990 "Sound Level Meters Part 2: Integrating-averaging"

Applicable Work Instruction:

RWI-08 SLM Verification.doc

Traceability:

The tests, calibrations or measurements covered by this document have been performed in accordance with NATA requirements which include the requirements of ISO/IEC 17025 and are traceable to Australian national standards of measurement. This document shall not be reproduced, except in full.

Scope:

This certificate is issued on the basis that the instrument complies with the manufacturer's specification. See "Sound Level Meter Verification - Summary of Tests" page for an itemised list of results for each test.

Uncertainty:

Unless otherwise stated, the uncertainty of measurement is $\pm 0.14\text{dB}$. The uncertainty is stated at a confidence level of 95% using a k factor of 2.



NATA Accredited Laboratory
Number 14966

Authorized Signatory:

A handwritten signature in blue ink, appearing to read 'RT' or similar, written over a light blue grid background.

Print Name: Renzo Tonin

Date: 15th March 2010

Template Document Name: RQT-02 (rev 40) SLM Verification

Aviation Impact Statement

Warradarge Wind Farm



Aviation Impact Statement

Warradarge Wind Farm

Prepared for

Verve Energy

Prepared by

AECOM Australia Pty Ltd

3 Forrest Place, Perth WA 6000, GPO Box B59, Perth WA 6849, Australia

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ABN 20 093 846 925

26 March 2012

60248070

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Quality Information

Document Aviation Impact Statement

Ref 60248070

Date 26 March 2012

Prepared by M. McWilliams

Reviewed by N. Hawley

Revision History






Revision	Revision Date	Details	Authorised	
			Name/Position	Signature
A	26-Mar-2012	Internal Review	N. Hawley Principal Aviation Engineer	
B	28-Mar-2012	Issued For Use	N. Hawley Principle Aviation Engineer	
C	02-Apr-2012	Internal Verification	R. Murran Senior Aviation Engineer	
0	02-Apr-2012	Issued For Use	N. Hawley Principle Aviation Engineer	
1	4-Apr-2012	Issued For Use	N. Hawley Principle Aviation Engineer	

Table of Contents

Executive Summary	i
Abbreviations and Acronyms	1
1.0 Introduction	2
1.1 AECOM	2
1.2 Project Inputs and Assumptions	2
1.3 AIS Criteria and Document Structure	2
2.0 Aerodromes	4
3.0 Air Spaces and Air Routes	5
3.1 Air Routes	5
3.2 Air Space	5
4.0 Navigation/Radar	7
Appendix A	
Appendix A - ASA Aviation Assessments for Wind Farms	A
Appendix B	
Appendix B - Obstacle Co-ordinates and Elevations	A
Appendix C	
Appendix C – Drawing 60248070-AV-DRG-001_A	B
Appendix B	
Appendix D - Radar Horizon Calculations	C

Executive Summary

AECOM were engaged by Verve Energy to deliver an Aviation Impact Statement for a proposed wind turbine farm at Warradarge, Shire of Coorow, Western Australia.

This report examines and assesses the impact of the tall wind turbine structures as potential obstacles to aviation operations and procedures.

The report locates aerodromes within 30Nm (55.56km) radius of the wind farm perimeter, assesses any potential intrusion to Object Limitation Surfaces (OLS) and any impact to aerodrome instrument approach and landing procedures.

Air routes and airspace are examined to determine whether there is an impact on Lowest Safe Altitudes (LSALT) and potential conflicts with air routes located near or over the proposed wind farm.

The statement finds that the wind farm is located in an area of farming communities and minor mining at Eneabba. Aerodromes are small and unregistered within the vicinity of the proposed wind farm with most low airspace aviation related to the farming communities, mining and light general aviation.

The site of the proposed wind farm is on a prominent hill, and minor adjustments to aviation charts will potentially be required to highlight the proposed wind farm as the turbines need to be stated as obstacles when they are above 110m in height.

Published air routes, both high and low domestic routes, are 6Nm (11km) or greater distance from the proposed wind farm.

No Airservices Australia surveillance radar is located within line of sight of the proposed wind farm. The nearest primary radar location is at Mt Kalamunda, Perth.

AECOM's recommendation is that the findings of this study are passed onto ASA and the Civil Aviation Safety Authority (CASA) to enable them to assess the impact before commencement of construction of the proposed wind farm at Warradarge.

Abbreviations and Acronyms

AIC	Aeronautical Information Circulars
AIP	Aeronautical Information Package
AIS	Aviation Impact Assessment
AMSL	Above Mean Sea Level
ASA	Airservices Australia
CASA	Civil Aviation Safety Authority
CASR 1998	Civil Aviation Safety Regulations 1998
DAP	Departure and Approach Procedure
ERC-H & ERC-L	En route Chart (High and Low) following number indicates chart area.
ERSA	En-route Supplement – Australia
FAC	Facilities
FT	Feet
GDA	Geocentric Datum of Australia
ICAO	International Civil Aviation Organisation
IFR	Instrument Flight Rules
km	Kilometres
LSALT	Lowest Safe Altitude
m	Metres
MGA	Metric Rectangular Grid System
NASAG	National Airports Safeguarding Advisory Group
Nm	Nautical Miles
NOTAM	Notice to Airmen
RAAF	Royal Australian Air Force
RNAV	Area Navigation (Random Navigation)
TAC	Terminal Area Chart
VFR	Visual Flight Rules
VOR	VHF Omni directional Radio range
WAC	World Aeronautical Chart
WGS	World Geodetic System

1.0 Introduction

Verve Energy has commissioned AECOM to complete an Aviation Impact Statement (AIS) for the proposed Warradarge Wind Farm. Guidelines to manage the risk of aviation safety from wind turbine installations are currently under development by the National Airports Safeguarding Advisory Group (NASAG). In the interim, this AIS has been written to meet the criteria set out by Airservices Australia (ASA) as attached in Appendix A.

The proposed Warradarge wind farm will consist of 100 turbines, up to 152m in height. The farm is to be located 120Nm (222km) north of Perth on a hill between Rose Thompson Road and Garibaldi Willis Road in the Shire of Coorow, Western Australia.

1.1 AECOM

AECOM are an aviation consultant with experience in the assessment and examination of obstacles for aerodromes and general airspace. Recent projects in the field include:

- Blackstone Power Station Plume Rise Assessment – A proposed plume was assessed for impact to RAAF Amberley Airbase's controlled airspace.
- Gladstone Air Space Risk Assessment – Assessment of new gas fired power station plume
- Albany Airport Master Plan – assessment of the Object Limitation Surfaces at Albany airport for future terminal and apron developments and runway extensions

1.2 Project Inputs and Assumptions

Verve Energy provided AECOM with a spread sheet of data for the proposed wind farm towers, which included:

- latitudes / longitudes
- eastings / northings
- height of ground level at the base of each tower

The latitudes/longitudes are WGS84 Datum; eastings / northings are GDA 1994 MGA zone 50; and the heights of ground level at the bases provided as metres above mean sea level.

A drawing was also provided showing the arrangement of the wind farm turbines. To allow for Verve Energy to adjust and finalise the permanent position of the turbines within the proposed wind farm, the boundary of the wind farm site has been used for this AIS. Verve Energy has also provided greatest possible height for the base of a turbine as being 1154FT (352m) AMSL. The site boundary, at this maximum possible turbine base height, has been used as the design obstacle envelope to be assessed for the AIS.

No assessment has been made of the aviation impact during construction of the wind farm. Appropriate authorities will need to be notified on construction methods adopted (especially crane operations). CASA/ASA should be specifically informed as the proposed wind farm is on a hill with highest spot height (1142FT, 348.1m) within a 25Nm (46.3km) radius on Chart WAC 3351 (Perth). At the discretion of appropriate authorities NOTAMs released could be made to cover construction as well as the completed proposed wind farm.

Assessments or statements for the purpose of supplying information to Royal Australian Air Force (RAAF) Aeronautical Information Services is outside of the scope of this report. However this AIS has found no military airfield within 30km (16.2Nm) of the proposed wind farm. The RAAF Aeronautical Information Service's database of tall structures does require top measurements of tall structures 45m or more above ground level as set out in CASA Advisory Circular 139-08(0) which can be found in Appendix B

Any required conversions of units have been completed using the conversion tables and factors set out in the Aeronautical Information Package (AIP).

1.3 AIS Criteria and Document Structure

This AIS has been written to meet the criteria set out in the Airservices Australia Aviation Assessments for Wind Farm Developments. This letter has been provided by Verve Energy and is included in Appendix A. The criteria are set for regulatory and safety procedures to protect aviation operations.

The main requirements of ASA's AIS Criteria are as follows:

- 1) Determine the location (in WGS 84 to 0.1 second of arc or better) and Elevations (AMSL to 0.3 meters) of each potential obstacle. This is a statutory requirement of Civil Aviation Safety Regulations 1998 (CASR1998) Part 139.365 that the owner (or proponents) of structures greater than 110m must inform CASA/ASA.
 - a) This information has been provided in table form in Appendix B
 - b) An overlaid topographical base drawing "60248070-AV-DRG-001_A" has been included in Appendix C of this AIS. An electronic version (Microstation V8i) has also been provided to Verve Energy.
- 2) The Aerodromes Section has three requirements:
 - a) Specify all registered/certified aerodromes that are located within 30Nm (55.56km) from any obstacle referred to in 1) above.
 - b) Nominate all instrument approach and landing procedures at these aerodromes.
 - c) Confirmation that the obstacles do not penetrate Annex 14 or OLS for any aerodrome. If an obstacle does penetrate, specify the extent.

This section is for the safe operation of aerodromes to CASR 1998 Part 139 and to locate potential conflicts with Airports (Protection of Airspace) Regulations 1996. This is set out in Section 2 of this AIS.

- 3) Airspaces and Air Routes need to be considered where a proposed wind farm is to be located outside of the operation limits of an aerodrome's Procedures for Air Navigation Systems Operations and Obstacle Limitation Surfaces (OLS). There are three elements to produce and/or assess:
 - a) Nominate air routes published in En Route Chart (High and Low) (ERC-L & ERC-H) which are located near/over any obstacle referred to in 1) above.
 - b) Specify two waypoint names located on the routes which are located before and after the obstacles.
 - c) Airspace classification – A, B, C, D, E, G etc. where the obstacles are located.

CASR 1998 Part 139.365 directly impacts the declaration and calculation of obstacles and this has been assessed in Section 3 of this AIS.

- 4) Navigation and Radar impact assessment is required to determine any potential for any degradation due to interference potentially caused by the proposed wind farm. This is especially the case where there are two or more turbines.

2.0 Aerodromes

This section presents the investigation into the location, CASA/AIP registration status, DAP and other applicable information for aerodromes located within 30Nm (55.56km) of the proposed wind farm. The following process has been followed:

- The location of the proposed wind farm has been identified and a zone within 30Nm (55.56km) searched for registered / certified aerodromes
- Where applicable, the aerodromes were checked for DAP 130 information and registration levels on AIP websites
- The Shires of Three Springs, Dongarra, Carnamah, Coorow, Dandaragan and Moora were contacted to identify the aerodromes found previously and provide information on any other known aerodromes within the shire boundaries
- All the information gathered was added to a drawing and the aerodromes assessed for any potential impact following construction of the wind farm

The main findings for the aerodromes within 30Nm (55.56km) of the proposed wind farm were:

- No CASA registered or certified aerodromes are found
- No aerodromes have DAP or any specific AIP DAP130 recorded information
- Jurien Bay is shown as an unregistered aerodrome in the En-Route Supplement – Australia (ERSA) facilities (FAC) document. It has also the following waypoint information: JURIEN BAY WA YJNB 30 18 12S 115 03 19E (source Section 19 AIP)
- The Jurien Bay VOR is located at Jurien Bay Aerodrome and is the only Navigational Aid System identified within the 30Nm (55.56km) range of the proposed wind farm
- The light aircraft gravel strip at Judeen Farm, approximately 3100m North East of the nearest turbine location 28, has been recognised as the nearest aerodrome. Its runway length is between 700-800m (as scaled off Google aerial photography) and has been confirmed by Dave Haddon of Shire of Coorow Regulatory Services as being a farmer's cleared gravel strip. CASA Manual of Standards 139 (MOS139) and the ICAO Annex 14 state that the combined inner horizontal and conical OLS' for a Code 1 airport with a runway length of no more than 800m shall extend to 2700m. This is less than the 3100m from turbine location 28.
- The next nearest airport, Eneabba, is located approximately 30km (16.2Nm) from the proposed wind farm, is unregistered and is unlikely to have an OLS that would extend more than 15km (8.1km).

3.0 Air Spaces and Air Routes

3.1 Air Routes

Air routes have been assessed from the following charts;

- TAC-4(Perth)
- ERC-L8
- ERC-H4/3

The relevant air routes data have been presented in Table 1. The proximity to the proposed wind farm has been calculated through a distance measured using a scale ruler on chart TAC-4(Perth).

Table 1 ERC-L&H Air Routes

Route Number	Type	Proximity to Wind Farm	Safe Altitude	Charts	Waypoint Start		Waypoint End	
					Name	Position	Name	Position
Z41	Low RNAV Domestic	~6Nm (11.1km)	N/A	TAC-4 (Perth) ERC-L8	IRWIN (Bearing 141)	S29 21.3 E115 06.8	HINDS (Bearing 320)	S30 47.7 E116 32.3
H17	High RNAV One Way Domestic	~10Nm (18.5km)	2700fFT (822.9m)	TAC-4 (Perth) ERC-L8 ERC-H4/3	GURAK (Bearing 339)	S30 51.9, E115 38.9	GERALDTON (Bearing 160)	S28 47.4 E114 42.4
Z16	Low RNAV Domestic	~12Nm (22.2km)	N/A	TAC-4 (Perth) ERC-L8	GURAK (Bearing 337)	S30 51.9, E115 38.9	ONGAR (Bearing 157)	S29 12.0 E114 47.9
Y35	High RNAV One Way Domestic Route	~16Nm (29.6km)	N/A	TAC-4 (Perth) ERC-L8 ERC-H4/3	GURAK (Bearing 339)	S30 51.9, E115 38.9	MORAWA (Bearing 192)	S29 12.5 E116 01.4
N752	High RNAV Regional Route	~24Nm (44.4km)	N/A	TAC-4 (Perth) ERC-H4/3	GURAK (Bearing 337)	S30 51.9, E115 38.9	POKIP (Bearing 144)	S29 02.3 E114 01.3
W14	Low Conventional 2 Way Domestic	~24Nm (44.4km)	2200FT (670.5m)	TAC-4 (Perth) ERC-L8	JURIEN BAY (Bearing 350)	S30 18.8 E115 03.2	ONGAR (Bearing 170)	S29 12.0 E114 47.9

3.2 Air Space

For the assessment on impact to local airspace the wind farm was located on ERC-L8 chart. The Wind farm is located in grid square S29° E115°. This grid is shown on AIP ERC-L8 as being a Class G airspace (unshaded) and has a grid lowest safe altitude of 2800FT (853.4m).

ERC-H4 and H3 show the wind farm located in grid square S28° E114° with a LSALT of 2900FT (884m).

From the charts Class E mid-level airspace starts at a flight level of 18,000FT and high level Class A airspace starts at flight level 24,500FT in the vicinity of the wind farm.

Class G airspace is uncontrolled and accounts for the majority of Australian Airspace. Separation service of aircraft is not provided by ASA within this airspace however flight information service is provided to IFR Aircraft and, upon request, for VFR Aircraft at an altitude where there is potential for radar coverage. Aircraft speeds are limited to 250 knots below 10,000fFT AMSL and 'no-radio' flights may be conducted below 5,000FT AMSL.

The highest wind turbine has a height of 1646FT (501.6m) AMSL. As set out in the AIP section GEN 3.2, 2.21 (<http://www.airservicesaustralia.com/aip/current/aip/general.pdf>) the LSALT is calculated by adding 1000FT (304.8m) to the highest obstacle. This amounts to a LSALT of 2640FT (804.6m) for the obstacles at the proposed wind farm.

As a worst case, the highest point on the hill within the proposed wind farm boundary is 352m (as provided by Verve Energy). A 152m tall turbine on this high point will equate to a maximum potential obstacle height of 1654FT (504m) or a LSALT of 2654FT (808.9m). Both the current proposed highest wind turbine and maximum potential height of a wind turbine within the proposed wind farm are lower than the currently published LSALT of 2800FT (853.4m) for grid square S29° E115°.

The proposed wind farm may need to be added to the World Aeronautical Chart (WAC) (3351) Perth as an obstacle. The wind farm is likely to become the highest obstacle within the S29°30' E115°0' half degree grid square as it to be located on the hill which is currently shown as the highest obstacle at 1142FT (348.1m).

The most likely use of the airspace below the LSALT is aviation involved in the agricultural industry operating light aircraft to Visual Flight Rules (VFR). No special use of airspace was located on any chart within the vicinity of the proposed wind farm including sporting and miscellaneous uses.

4.0 Navigation/Radar

The nearest radar location to the proposed wind farm is located 120Nm (222km) away at Mount Kalamunda in the hills east of Perth Airport. Whilst the range of this surveillance equipment is very extensive, the curvature of the earth means the wind farm is located out of line of sight and should have little or no effect on the existing radar coverage. Appendix C shows calculations for determining the Radar Horizon distance required for the radar and proposed wind farm to be in line of sight.

Further assessment for dead zones, false targets etc. have been discussed with Joe Doherty of ASA and deemed to be unnecessary.

Assessment of other navigational aids such as the VOR at Jurien Bay is unlikely to raise any issues due to the lack of air routes that coincide with the proposed location of the wind farm. ICAO uses a 1:50 surface to determine potential impact of an obstacle. The proposed wind farm site does not interfere with this surface.

Appendix A

Appendix A - ASA Aviation Assessments for Wind Farms



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To Whom It May Concern

Airservices Aviation Assessments for Wind Farm Developments

Guidelines to manage the risk to aviation safety from wind turbine installations (Wind Farms/Wind Monitoring Towers) are under development by the National Airports Safeguarding Advisory Group (NASAG). NASAG is comprised of high-level Commonwealth, State and Territory transport and planning officials and has been formed to develop a national land use planning regime to apply near airports and under flight paths.

The wind farm guidelines will provide information to proponents and planning authorities to help identify any potential safety risks posed by wind turbine and wind monitoring installations from an aviation perspective.

Potential safety risks include (but are not limited to) impacts on flight procedures and aviation communications, navigation and surveillance (CNS) facilities which require assessment by Airservices.

To facilitate these assessments all wind farm proposals submitted to Airservices must include an Aviation Impact Statement (AIS) prepared by an aeronautical consultant in accordance with the AIS criteria set out below.

AIS must be undertaken by an aeronautical consultant with suitable knowledge and capabilities to provide a reliable and comprehensive report. All data is to be supplied in electronic form. If you are not familiar with any aeronautical consultants, you may wish to view the list on the Civil Aviation Safety Authority (CASA) website:

http://www.casa.gov.au/scripts/nc.dll?WCMS:STANDARD::pc=PC_90412

AIS Criteria

The AIS must provide a detailed analysis covering, as a minimum:

Airspace Procedures:

1. Obstacles
 - Co-ordinates in WGS 84 (to 0.1 second of arc or better)
 - Elevations AMSL (to 0.3 metres)
2. Drawings
 - Overlaid on topographical base not less than 1:250,000. Details of datum and level of charting accuracy to be noted.
 - Electronic format compatible with Microstation version 8i.

3. Aerodromes

- Specify all registered/certified aerodromes that are located within 30nm (55.56km) from any obstacle referred to in (1) above.
- Nominate all instrument approach and landing procedures at these aerodromes.
- Confirmation that the obstacles do not penetrate Annex 14 or OLS for any aerodrome. If an obstacle does penetrate, specify the extent.

4. Air Routes

- Nominate air routes published in ERC-L & ERC-H which are located near/over any obstacle referred to in (1) above.
- Specify two waypoint names located on the routes which are located before and after the obstacles.

5. Airspace

- Airspace classification – A, B, C, D, E, G etc where the obstacles are located.

Navigation/Radar:

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

http://www.eurocontrol.int/surveillance/public/standard_page/sur_WTTF.html

Airservices Review of AIS

Airservices will review the quality and completeness of an AIS and will undertake limited modelling and analysis to confirm the findings and recommendations of the report.

Provided the AIS is of sound quality and is complete in accordance with the above criteria, there will be no charge for the review or limited modelling and analysis.

If the AIS is not of sound quality or is not complete in accordance with the above criteria, no modelling or analysis will be undertaken. Airservices will advise the proponent that the AIS does not meet the requirements and that the proposal cannot be assessed by Airservices.

If Airservices review of an AIS confirms impacts identified in the report (or identifies additional impacts), Airservices will advise the proponent of the impacts and the required mitigating actions (where mitigation is feasible). The proponent will also be advised that there will be charges for any mitigation actions to be undertaken by Airservices.

These charges may be advised at the time but it is likely that a detailed quote will be needed and this will only be provided on request from the proponent.

Please contact Joe Doherty, Airport Development Manager (02) 62685101 or alternatively joseph.doherty@airservicesaustralia.com if you have any questions.

Current as at 5 March 2012

Appendix B

Appendix B - Obstacle Co-ordinates and Elevations

Table 2 Co-ordinates and Elevations

Turbine Number	Latitude			Longitude			Height of ground level at base of tower (m)	Tower Height (152m tall turbines) (m)	Tower Height (152m tall turbines) (FT)
	Degrees	Minutes	Seconds	Degrees	Minutes	Seconds			
1	-29	55	28.27802	115	32	14.14669	276.2	428.2	1404.9
2	-29	55	34.27681	115	31	32.36632	280.7	432.7	1419.7
3	-29	55	41.95303	115	31	59.47701	279.2	431.2	1414.8
4	-29	55	49.31323	115	30	54.44078	240.0	392.0	1286.2
5	-29	56	8.139222	115	30	50.28247	237.0	389.0	1276.3
6	-29	56	11.60579	115	30	29.34526	241.3	393.3	1290.4
7	-29	56	4.975484	115	30	8.969168	262.3	414.3	1359.3
8	-29	56	4.440357	115	29	47.64443	285.1	437.1	1434.1
9	-29	56	13.43116	115	29	10.13876	300.0	452.0	1483.0
10	-29	56	16.63073	115	29	31.38643	292.4	444.4	1458.1
11	-29	56	20.6944	115	29	57.28361	285.7	437.7	1436.1
12	-29	56	20.43889	115	28	49.63143	306.3	458.3	1503.7
13	-29	56	31.62164	115	29	12.95898	317.8	469.8	1541.4
14	-29	56	35.07582	115	29	33.75633	299.3	451.3	1480.7
15	-29	56	38.95131	115	29	54.54778	289.1	441.1	1447.2
16	-29	56	26.66625	115	28	29.13523	315.8	467.8	1534.9
17	-29	56	38.50298	115	28	52.75095	333.2	485.2	1591.9
18	-29	56	50.27479	115	29	10.81158	323.9	475.9	1561.4
19	-29	56	53.79528	115	29	34.55569	295.8	447.8	1469.2
20	-29	56	56.78711	115	30	0.471663	266.0	418.0	1371.5
21	-29	56	38.85032	115	28	12.57532	343.4	495.4	1625.4
22	-29	56	45.28988	115	28	32.87931	336.8	488.8	1603.8
23	-29	56	56.7953	115	28	50.30954	325.8	477.8	1567.7
24	-29	57	8.844611	115	29	9.896138	314.4	466.4	1530.3
25	-29	57	12.61434	115	29	32.70514	291.5	443.5	1455.1
26	-29	57	14.44938	115	29	54.01434	277.0	429.0	1407.5
27	-29	57	10.14137	115	30	15.08003	277.8	429.8	1410.2
28	-29	56	44.7563	115	27	13.62729	277.5	429.5	1409.2
29	-29	56	54.45656	115	27	48.68825	318.1	470.1	1542.4
30	-29	56	57.57323	115	28	13.66879	349.6	501.6	1645.7
31	-29	57	6.789861	115	28	32.55134	337.5	489.5	1606.0
32	-29	57	16.41894	115	28	50.64525	307.7	459.7	1508.3
33	-29	57	32.47821	115	29	5.844861	288.9	440.9	1446.6
34	-29	57	30.35053	115	29	27.06571	281.1	433.1	1421.0

Turbine Number	Latitude			Longitude			Height of ground level at base of tower (m)	Tower Height (152m tall turbines) (m)	Tower Height (152m tall turbines) (FT)
	Degrees	Minutes	Seconds	Degrees	Minutes	Seconds			
35	-29	57	32.15125	115	29	48.18991	289.0	441.0	1446.9
36	-29	57	28.10676	115	30	9.551196	293.0	445.0	1460.0
37	-29	57	33.4406	115	30	30.17513	273.6	425.6	1396.4
38	-29	57	3.333134	115	27	13.33982	271.1	423.1	1388.2
39	-29	57	7.599272	115	27	33.67755	294.0	446.0	1463.3
40	-29	57	16.26755	115	28	12.30083	319.8	471.8	1548.0
41	-29	57	25.62669	115	28	32.26392	328.4	480.4	1576.2
42	-29	57	21.87222	115	27	12.60524	269.7	421.7	1383.6
43	-29	57	32.57386	115	27	30.49458	282.3	434.3	1424.9
44	-29	57	34.84183	115	27	52.24516	299.9	451.9	1482.7
45	-29	57	35.38579	115	28	13.87322	321.8	473.8	1554.5
46	-29	57	40.20067	115	28	42.56144	309.0	461.0	1512.5
47	-29	57	50.16134	115	28	58.45119	290.2	442.2	1450.9
48	-29	57	48.51948	115	29	19.51655	299.2	451.2	1480.4
49	-29	57	49.57529	115	29	40.80222	315.6	467.6	1534.2
50	-29	57	45.76955	115	30	3.130977	303.8	455.8	1495.5
51	-29	57	51.13618	115	30	23.75532	285.2	437.2	1434.5
52	-29	57	39.98302	115	27	8.59437	264.4	416.4	1366.2
53	-29	57	52.09078	115	27	30.0441	291.2	443.2	1454.1
54	-29	57	51.54544	115	28	4.038121	325.6	477.6	1567.0
55	-29	58	4.212399	115	28	26.30268	324.0	476.0	1561.8
56	-29	58	6.135204	115	28	43.69587	302.4	454.4	1490.9
57	-29	58	7.203388	115	29	5.914935	297.3	449.3	1474.2
58	-29	58	8.259848	115	29	30.03703	321.5	473.5	1553.6
59	-29	58	5.544433	115	29	51.0822	325.2	477.2	1565.7
60	-29	58	7.165397	115	30	13.62901	290.6	442.6	1452.2
61	-29	57	58.96617	115	27	9.717819	261.0	413.0	1355.1
62	-29	58	10.47464	115	27	27.14871	272.6	424.6	1393.1
63	-29	58	11.15147	115	27	48.92603	299.2	451.2	1480.4
64	-29	58	9.770404	115	28	9.802308	327.9	479.9	1574.6
65	-29	58	21.73084	115	28	32.78784	310.1	462.1	1516.2
66	-29	58	23.2222	115	28	55.03869	300.8	452.8	1485.6
67	-29	58	23.47281	115	29	16.82353	321.1	473.1	1552.2
68	-29	58	25.30828	115	29	38.09949	326.8	478.8	1570.9
69	-29	58	23.14508	115	29	59.17463	311.2	463.2	1519.8
70	-29	58	23.67881	115	30	23.26854	309.0	461.0	1512.5

Turbine Number	Latitude			Longitude			Height of ground level at base of tower (m)	Tower Height (152m tall turbines) (m)	Tower Height (152m tall turbines) (FT)
	Degrees	Minutes	Seconds	Degrees	Minutes	Seconds			
71	-29	58	17.90504	115	27	7.073871	252.0	404.0	1325.5
72	-29	58	29.40838	115	27	24.05793	263.1	415.1	1361.9
73	-29	58	29.66885	115	27	46.32782	293.5	445.5	1461.7
74	-29	58	27.95198	115	28	11.83674	309.8	461.8	1515.2
75	-29	58	38.4068	115	28	42.27132	305.3	457.3	1500.4
76	-29	58	39.49143	115	29	5.90993	322.9	474.9	1558.1
77	-29	58	42.56712	115	29	27.65306	338.1	490.1	1608.0
78	-29	58	41.18687	115	29	48.97865	341.3	493.3	1618.5
79	-29	58	38.87822	115	30	11.58661	313.3	465.3	1526.6
80	-29	58	46.52887	115	28	11.55195	287.2	439.2	1441.0
81	-29	58	54.41937	115	28	30.90806	304.1	456.1	1496.5
82	-29	58	54.66599	115	28	52.24705	329.0	481.0	1578.2
83	-29	58	56.92482	115	29	13.51827	336.4	488.4	1602.4
84	-29	59	0.010868	115	29	36.1952	342.3	494.3	1621.8
85	-29	58	58.13358	115	29	59.54419	311.2	463.2	1519.8
86	-29	58	54.63676	115	30	23.40227	296.8	448.8	1472.5
87	-29	59	6.318239	115	28	12.18134	292.1	444.1	1457.1
88	-29	59	12.97979	115	28	32.00506	312.6	464.6	1524.4
89	-29	59	18.87185	115	28	52.77413	305.4	457.4	1500.7
90	-29	59	23.56178	115	29	13.59945	308.7	460.7	1511.6
91	-29	59	18.13925	115	29	33.60792	320.9	472.9	1551.6
92	-29	59	16.6574	115	29	57.43724	317.6	469.6	1540.8
93	-29	59	12.6233	115	30	19.73742	315.2	467.2	1532.9
94	-29	59	28.14804	115	28	15.09304	285.2	437.2	1434.5
95	-29	59	33.22893	115	28	35.87506	281.5	433.5	1422.3
96	-29	59	36.69065	115	28	57.16746	292.4	444.4	1458.1
97	-29	59	41.77487	115	29	18.39838	322.8	474.8	1557.8
98	-29	59	36.91325	115	29	39.183	336.9	488.9	1604.1
99	-29	59	35.53302	115	30	0.549116	340.0	492.0	1614.3
100	-29	59	31.61476	115	30	21.61726	314.3	466.3	1529.9

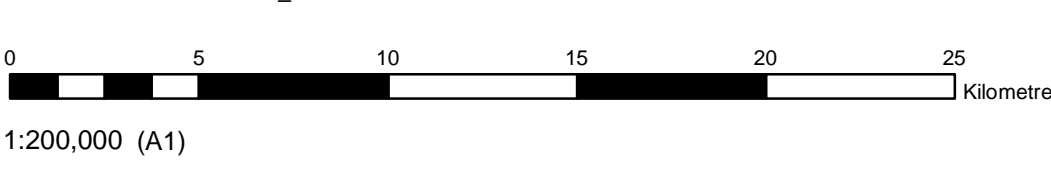
Appendix C

Appendix C – Drawing 60248070-AV-DRG- 001_A



Warradarge Wind Farm

30 Nautical Mile Buffer
60248070-AV-DRG-001_A



Legend

- Waypoint
- Waypoint & VOR
- Turbine Locations
- 30 Nautical Mile Buffer of Turbine Locations (55.56km)
- 50m contours
- Landing Ground
- Air Routes and direction
 - Domestic
 - Regional
- LGAs

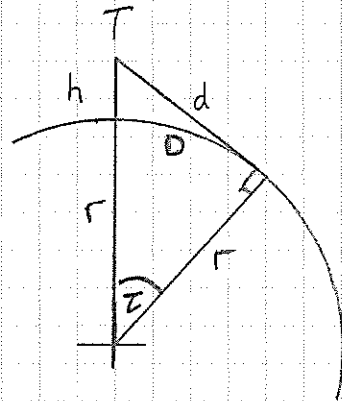
Map Generated from 20230808 10:00:00 2000 Series 9 Topographic Data
Geospatial Australia (GSA)
Vertical accuracy +/- 20m, height datum unknown



Appendix B

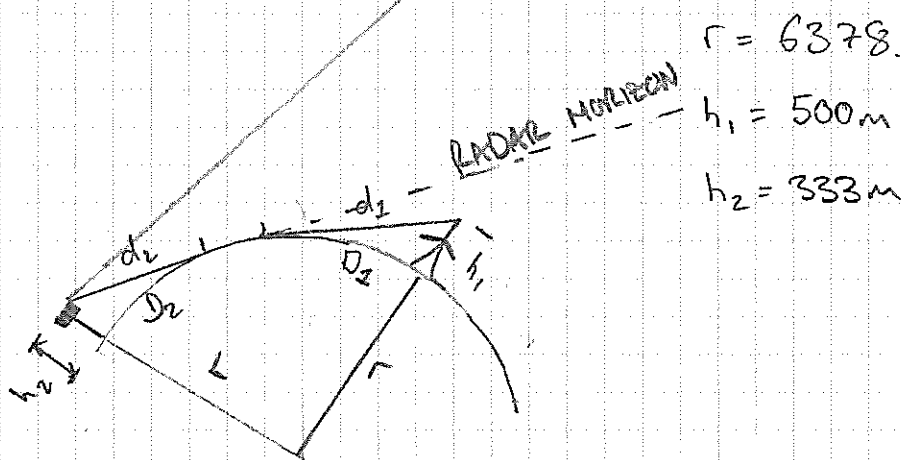
Appendix D - Radar Horizon Calculations

Visual Horizon Calculation



The distance along the Earth's Surface is

$$d = \sqrt{h^2 + 2rh}$$



$r = 6378.1 \text{ km}$ (Equatorial Source NASA)

$h_1 = 500 \text{ m}$

$h_2 = 333 \text{ m}$

Visual Horizon For wind turbine

$$d_1 = \sqrt{(h_1 + 2rh_1)} = 79.86$$

Visual Horizon For Radar

$$d_2 = \sqrt{(h_2 + 2rh_2)} = 64.881$$

$$d_2 = 64.881$$

$$d_1 = 79.86$$

The distance between the radar and wind farm for the wind farm to be inside the radar horizon needs to be less than $79.86 + 64.881 = 144.74 \text{ km}$.

The wind farm is located approximately 230km from the Mt. Kalamunda Radar Station.

Lawrence Derrick & Associates

**WARRADARGE WIND FARM - INVESTIGATION OF
POSSIBLE IMPACTS ON BROADCASTING AND
RADIOCOMMUNICATION SERVICES**

[final]

9th May 2012

**L. J. Derrick B. E. (Elec.) ACMA Accreditation No 008
Lawrence Derrick & Associates
Engineering Consultants & RF Frequency Assigners**

CONTENTS

- 1. BACKGROUND**
- 2. SCOPE OF WORKS**
- 3. LEGISLATION AND GUIDELINES**
- 4. DESKTOP STUDY**
- 5. EMI EFFECTS OF WIND TURBINES**
- 6. DISCUSSION OF OVERSEAS EXPERIENCE**
- 7. BROADCASTING SERVICES IN THE WARRADARGE AREA**
- 8. RADIOCOMMUNICATIONS SERVICES NEAR WARRADARGE SITE**
- 9. WARRADARGE WIND FARM SITUATION - DISCUSSION**
- 10. PRECISION GPS SYSTEMS**
- 11. AUSTRALIAN SQUARE KILOMETRE ARRAY PATHFINDER RADIO TELESCOPE**
- 12. AVOIDANCE OF INTERFERENCE DURING CONSTRUCTION**
- 13. WIND MONITORING MAST LOCATIONS**
- 14. POWER INFRASTRUCTURE ELECTRIC AND MAGNETIC FIELDS**
- 15. FORTUITOUS RECEPTION OF BROADCAST SIGNALS**
- 16. MITIGATION TECHNIQUES**
- 17. FINAL CONCLUSIONS**

ATTACHMENTS

- 1. Warradarge Wind Farm Site Location Map**
- 2. Warradarge Wind Farm Turbine Co ordinates**
- 3. TV Stations & Channels in the Wind Farm Area**
- 4. Radio Link Map 40- 999 MHz Frequencies**
- 5. Radio Link Map above 1000 MHz Frequencies**
- 6. Map of UHF/VHF Link Paths Near Wind Turbines**
- 7. Map of Microwave Link Paths Near Wind Turbines**
- 8. Radio Link Systems Clearance Calculations**
- 9. Summary of Radio Path Clearances Required**
- 10. ACMA Licensees Recommended for Advising**
- 11. Glossary of Technical Terms**

1. BACKGROUND

Verve Energy is proposing to construct a wind farm located on private farming land in Warradarge, approximately 240km north of Perth and 18km east of Eneabba (Wind Farm). A location map is shown in Attachment 1

The proposed Wind farm will consist of up to one hundred (100) wind turbine generators (WTG) with a maximum generating capacity of 250MW. The WTG will have three blades with a nominal hub height of 96m above ground level and maximum rotor diameter of 112m, giving an overall tip height of 152m.

This Report considers the potential impacts of the Warradarge wind farm on radiocommunications and broadcasting in the area.

This Report provides an analysis of each of the radio facilities registered near the wind farm and establishes recommended clearances based on accepted industry criteria for any radio links crossing the wind farm and any required buffer zones for other radiocommunications sites. A study of the signal paths from the main TV stations to the area surrounding the wind farm has been carried out to identify any potential interference to nearby residences.

Comments are also provided on the radio interference and human exposure impacts from electric and magnetic fields from power lines and power transmission infrastructure associated with the wind farm.

2. SCOPE OF WORKS

Verve Energy require a desktop study to be undertaken to determine if there is any likelihood that the Wind Farm will cause interference to the broadcasting; and/or radio communications services (Interference) (Desktop Study).

If there is a possibility that the Wind Farm does cause Interference, the study will:

- (i) identify the turbines or layout that causes Interference; and
- (ii) suggest any steps that could be taken to minimise the impact of the wind turbines.

The Desktop Study will include (but is not limited to) the assessment of the interference of the Wind Farm to a range of broadcasting/radio communications services existing in the area:

3. LEGISLATION AND GUIDELINES

3.1 Commonwealth legislation Under the Australian Radiocommunications Act 1992, “interference” is defined as:

• **In relation to radiocommunications:** Interference to, or with, radiocommunications that is attributable, whether wholly or partly and whether directly or indirectly, to an emission of electromagnetic energy by a device; or

- **In relation to the uses or functions of devices:** Interference to, or with, those uses or functions that is attributable, whether wholly or partly and whether directly or indirectly, to an emission of electromagnetic energy by a device.

In using these definitions, the Radiocommunications Act deals with the radiocommunications interference caused by electromagnetic fields and provides protection for users where such interference is caused. It does not, however, deal with radiocommunications interference caused by physical obstructions.

The most significant impact of wind turbines to radiocommunications and broadcasting are related to physical obstruction or reflection of wanted signals. This report provides best practice guidance about the issues associated with the physical obstruction impacts of wind turbine structures, and details methods for assessing the potential of such impacts. It also advises which stakeholders should be consulted and what sort of information they may require. Mitigation strategies and post-construction monitoring methodologies are also presented. Some guidance on assessing the potential of EMI impacts and stakeholder consultation has been taken from Appendix F of the Environment Protection and Heritage Council's (EPHC) draft National Wind Farm Development Guidelines (Ref. 9).

Radiated EMI can potentially be generated from wind turbine generators and the associated distribution power lines on the site. These issues are also discussed in this report.

3.2 Western Australia Planning Guidelines The Western Australian Planning Commission issued Planning Bulletin Number 67 "Guidelines for Wind Farm Development" in May 2004. This document includes references to the need to consider electromagnetic interference issues in the design of wind farms. A preconstruction survey of TV reception at dwellings within 5 km of turbines is also specified.

3.3 Clean Energy Council (Auswind) Best Practice Guidelines. These Guidelines issued in December 2006 in Appendix 11 also provide guidance on the consideration of the potential impact of wind farms on radiocommunications and broadcasting.

4. DESKTOP STUDY

This desk top study has been carried out on the likely impact of wind turbines and their supporting towers on broadcasting and radiocommunications in the area surrounding the wind farm. This study is based on relevant International Telecommunications Union (ITU) documents and on other professional reports on overseas and Australian experience of wind farm impacts on broadcasting services in the vicinity of any wind turbine structures. For Radiocommunication services sites up to at least 50 Km from the site need to be considered because of the length of point to point paths of up to or exceeding 100 Km.

Using data from the Australian Communications & Media Authority's (ACMA) RADCOM Database, checks have been made on radiocommunication services within at least a 50 km radius of the wind farm to determine if any of the turbine towers could obstruct line-of-site paths or have any likely detrimental effect on

these services. Clearance criteria for ray lines have been indicated for any point to point radio paths crossing or near the wind farm site.

A number of existing ACMA registered radiocommunication services are located in the general area surrounding the wind farm site. To ensure that the locations of turbines will not degrade the performance of radio systems minimum separation distances and exclusion zones have been established for the turbine structures. The residences in the area surrounding the wind farm are potentially provided with TV and FM sound broadcasting services from medium or low power transmitters located at Morawa, Eneabba and Leeman. AM Radio broadcasting services transmitted from Dalwallinu service the area. The TV/Sound broadcasting Licensees providing service to the area have been identified in Attachment 10 facilitating correspondence with the organisations involved to request comments on any for-seen impacts on these services.

5. EMI EFFECTS OF WIND TURBINES

The following is an extract from Ref. 1:

"It is well known that any large structure, whether stationary or moving, in the vicinity of a receiver or transmitter of electromagnetic signals may interfere with those signals and degrade the performance of the transmitter/receiver system. Under certain conditions, the rotor blades of an operating wind turbine may passively reflect a transmitted signal, so that both the transmitted signal and a delayed interference signal (varying periodically at the blade passage frequency) may exist simultaneously in a zone near the turbine. The nature and amount of electromagnetic interference (EMI) in this zone depend on a number of parameters, including location of the wind turbine relative to the transmitter and receiver, type of wind turbine, physical and electrical characteristics of the rotor blades, signal frequency and modulation scheme, receiver antenna characteristics, and the radio wave propagation in the local atmosphere. Other wind turbine components which have been considered to be potential causes of EMI are towers and electrical systems. However, neither of these has been found to be a significant source of interference. Thus, moving blades are the components of most importance in determining EMI levels.

Television Interference from wind turbines is characterised by video distortion that generally occurs in the form of a jittering of the picture that is synchronised with the blade passage frequency.

Effects on FM broadcast reception have been observed only in laboratory simulations."

Point to point links in microwave and lower frequency bands will be affected only if the turbine tower or turbine clearance to the line of site path to the other end of the link is within the second Fresnel zone which is dependent on the operating frequency of the link, the distance of the tower/turbine from the link antenna and the total link distance. D. F. Bacon (Ref. 8) proposes 3 potential degradation mechanisms - near field effects, diffraction and reflection or scattering. The reflection or scattering treatment in the reference suggests greater clearance requirements at positions close to the link terminals than the usually applied to

Fresnel Zone clearance for certain links with low antenna gain. This has been taken into account for this study.

6. DISCUSSION OF OVERSEAS EXPERIENCE

Observations and studies have been carried out for a number of years in particularly in the USA and the UK on the effects of wind turbines on TV and other radiocommunication services. In 1976 the US Energy Research and Development Administration (ERDA) funded the RadLab at the University of Michigan for investigations into these effects and this continued for 7 years. Ref. 1 summarises the results of theoretical and field measurements.

The BBC's Research Department in the UK has also investigated this subject in some depth, and in 1983 a report was issued (Ref. 2). Another Report (Ref. 3) was issued in 1992 after the Research Department had carried out observations from test transmissions at existing wind farms in Denmark in 1991.

In 1992 the ITU issued a Recommendation BT.805 (Ref. 4) on the assessment of impairment caused to analogue television reception by a wind turbine.

In an exchange of emails, Mr. Chris Gandy of the BBC Research Department summarised the conclusions they had come to on this subject as follows - ".....in the UK the only significant broadcast reception difficulties that have successfully been attributed to wind turbines so far have been associated with UHF analogue television, not FM radio and certainly not MF or LF radio. There may be some potential for effects on digital terrestrial television, but possibly only in cases where turbine blades are between the transmitter and the receiver - cases of reflection from the blades are much more common and in the majority of cases should do little damage to our DTT signals because of the guard interval present in each DVB signal. Of course, there will be the odd case where reception was right on the edge of the 'digital cliff' before the turbines were built. Also we have no record of interference with our Digital Radio transmissions in Band III."

Ref. 5 summarises the results of model measurements of the level of interference signals scattered by turbine blades and the supporting tower and confirms some of the backscatter estimates calculated in Ref. 4.

Metal blades were used for some earlier turbines unlike the modern ones where composite material - fibre glass, carbon fibre, plastics are used. In some cases metal exists in the composite material blades for strength reinforcing or for lightning protection. Some references indicate that the composite blades will have a reduced interference potential, however the BBC view is that at UHF TV frequencies the difference will be small.

It is also indicated in some of the reports that due to variable wind speeds and direction, the resulting changes to turbine blade pitch and turbine facing direction will modify any interference levels at a given location in the service area i.e. interference effects would be time variant.

In relation to domestic TV reception in close proximity to wind turbines Ref. 7 issued by the BBC/Ofcom in the UK states that "In practice rarely does the tower or nacelle have any effect on reception; the impact on reception is solely on

account of the rotating turbine blades. As the blades are moving objects, in terms of both their rotational speed and orientation, their effect is variable and hard to predict. When the combined effects of a number of turbines that comprise a wind farm are considered, the result is considerably more difficult to predict

In Ref. 11 a report issued in 2009 summarises measurements taken around an operating wind farm in the UK in relation to the impact on radio links. A main conclusion is “The only mechanism observed, by which wind farms may degrade radio link performance, is that of reflection and scattering from the turbine structure and blades. Such reflected energy may combine destructively with the direct path signal to give deep nulls in the received power level. The impact of such interference is primarily determined by the relative discrimination afforded by the transmitter and receiver aerials. Furthermore, if the wanted path is obstructed (e.g. due to local clutter or intervening terrain) while the turbine is line of sight to both terminals, the impact of such interference will be increased”.

Recently in May 2011 a new recommendation BT.1893 (Ref. 12) on impairment caused to digital television was issued by the ITU following on from the issue of an ITU Report BT.2142 (Ref. 13) in 2009-2010 which provides an extensive analysis of the effect of the scattering of digital television signals from wind turbines. These new documents indicate that back scatter of signals is higher than forward scatter and that static reflections from the tower itself in addition to the blade scatter is significant. These conclusions appear to differ from the earlier ITU report conclusions which were focused on analogue television. The ITU recommendation BT.1893 in Annex 1 presents a simplified model of impairment caused to television reception by a wind turbine. It however requires measurement or prediction of TV signal levels at the centre of the turbine rotor and at the house locations as well as calculation of a scattering coefficient based on the blade area, signal wavelength and distance from the turbine to the house location.

From a study of the above references and others, the following general conclusions are drawn:

- (a) No turbine interference effects are expected to AM MF radio reception.
- (b) There is a very low probability of perceptible interference to FM radio reception
- (c) Some interference may be experienced to analogue TV services and particularly where the path to the TV transmitter for a given receiver location is through the wind turbine blades or where there is a partly obstructed path to the transmitter and there is a clear path to a turbine. These effects may be restricted up to a distance of about 3 km from a single wind turbine in forward scatter directions (receiver on opposite side of the wind farm to the TV station). Backscatter may occur up to 0.5 km or so however as TV receiving antennas have a reasonable signal rejection to the rear it is unlikely that TV reception at dwellings in the back scatter zone will experience any impairment. As analogue TV transmissions will cease by 2013 it is not expected to be an issue by the date of completion of the wind farm
- (d) Digital TV services are unlikely to suffer degraded picture quality, e. g. ghosting, where signals have a margin above threshold levels, however a

reduction in service area could occur due to time varying and static reflected signals. In view of the recent ITU studies, recommendations and report it would require more detailed analysis to provide reliable predictions of impairment for the actual TV services and house locations near the Warradarge wind farm site.

7. BROADCASTING SERVICES IN THE WARRADARGE AREA

From ACMA TV and Sound Broadcasting Station listings, and from a map survey of the area surrounding the Warradarge wind farm site, the following is a general summary of the broadcast transmitter site locations and radio frequency channels which provide cover of the area.

7.1 Analogue and Digital Television

Analogue and digital TV is still currently being transmitted in the area. It is expected that residents in the wind farm area generally view analogue and digital TV from the Morawa National and Commercial transmitting stations located 17km from Morawa. According to the ABC's internet TV prediction facility it may also be possible for some residents to receive TV from the Eneabba and Leeman low power stations. These stations are approx. 17 and 46 km from the nearest wind turbines. A summary of channels available from the stations listed is shown in Attachment 3.

7.2 Analogue Television Cessation

Digital television signals are currently being radiated in parallel with analogue television signals in areas of Australia including Capital Cities and some regional areas. Under the current programme of transition to digital television in Australia, which commenced in 2001, some regional areas now no longer have analogue TV coverage however in WA this transition will not occur until 2013. As the construction and operation of the wind farm will occur post 2013 any remedial action necessary for mitigation of any interference would be to digital television.

7.3 TV Retransmission Stations

From reviewing ACMA TV Broadcasting Data the listed stations including Morawa, Eneabba and Leeman are retransmission stations. Retransmission stations often receive their input signal "off air" from TV main stations. The interference issue is that the path to some of these stations may pass through the wind farm potentially causing interference to the signal which is retransmitted. This is discussed section 9.5 below.

7.4 FM Sound Broadcasting

Morawa and Eneabba FM transmitters service the general area. It is unlikely that these services will be affected by the proposed wind farm project. FM Stations covering this area have therefore not been listed.

7.5 AM Sound Broadcasting

Dalwallinu AM medium frequency (MF) stations will be receivable in the general area. As indicated above, wind farm effects on MF radio are highly unlikely and therefore the stations serving the area have not been listed in detail.

7.6 Satellite Pay Television

Some dwellings in the area may have satellite pay TV or “Free to Air” service installations. Unless a particular subscriber’s antenna reception direction and satellite antenna angle of elevation is closely aligned with a turbine, which is highly unlikely, no impacts on TV reception are expected.

8. RADIOCOMMUNICATIONS NEAR THE WARRADARGE SITE

The wind turbine current grid coordinates for Warradarge are listed in Attachment 2. Maps generated from data in the ACMA database are shown in Attachments 4 & 5. Attachment 4 shows all radio sites and point to point links within at least 50 Km of the wind farm and with operational frequencies in the range 40 – 999 MHz (VHF & UHF). Attachment 5 is a similar map for links in frequency range above 1 GHz (microwave). It should be noted that due to the close spacing of adjacent link sites the site number displayed on the PDF maps may not be the appropriate one for a given point to point link due to overlaying of site labels. The wind farm nominal envelope is shown as a rectangle and wind turbine locations are also shown in the close up mapping.

8.1 Point to Point

A number of point to point links are registered for operation within 50 km of the wind farm site. As shown in the map Attachment 4 there are no VHF/UHF link (<1GHz) paths which actually cross the boundaries of the wind farm.

Attachment 5 indicates that there are also no microwave links (> 1GHz) crossing the wind farm site. Clearance requirements are to be met to ensure turbines are not located close to the ray lines of any links to avoid any impact on their performance. The ray lines passing nearest the wind farm are shown in zoomed up maps in Attachments 6 & 7. The source ACMA database contains data for sites in the AMG 66 datum. All Maps in Attachments 4 to 7 are derived from MapInfo maps which are also displayed in AMG 66 grid references. While the wind turbine grid references listed in Attachment 2 are WGS 84 Datum they are shown in correct relative positions to the radio links in the MapInfo derived maps in Attachments 6 & 7.

The radio link maps have been examined and the links passing the wind farm site and near radio sites have been identified from the ACMA data. The nearest 6 point-to-point links include four in the 400/450 MHz band and two in the 6.7/7.5 GHz band operated by the operators shown in the table below. A summary of the calculated 2nd or 0.6x 1st Fresnel zone clearances at mid-path are shown in Tables 1 & 2. The proposed location of the turbines have been shown in the link maps generated in MapInfo and were used to confirm that distances from radio link ray lines and the turbine tower centre lines meet the clearance criteria derived below.

TABLE 1 - MICROWAVE LINK CLEARANCES

PATH ACMA Site ID's	Total Path Dist. km	Frequency MHz	Operator	*Mid Path 2nd Fresnel Zone Distance m
30747-30720	30.2	7500	Elect. Networks	24.6
30747-30720	30.2	6700	DBNGP (WA)	26

*Corridor Width is total zone width around radio path where no intrusion of blade tip can occur = $2 \times 2^{\text{nd}}$ Fresnel Distance above

TABLE 2 - VHF/UHF LINK CLEARANCES

PATH ACMA Site ID's	Total Path Dist. km	Frequency MHz	Operator	*Mid Path 0.6x 1st Fresnel Zone Distance m
30662-20707	67	400	WA Police	67.3
30739-30731	61.9	400	St Johns Ambulance	64.6
9004256-9004257	71.7	450	Nixon Comms	65.6
30731-30684	85	450	Dept of Enviro & Conserv	71.4

*Corridor Width is total zone width around radio path where no intrusion of blade tip can occur = $2 \times 0.6 \times 1^{\text{st}}$ Fresnel Clearances above

The calculation of the reflection/scattering zone using the Bacon formula (Ref. 8) requires iteration with increasing values of the distance from the path bore sight at each distance from the terminal until the required C/I value is reached. As the radio links pass the wind farm boundaries by 4.7km to 8km scattering of signals into the link receivers turbines will be negligible.

8.2 Cellular Mobile Base Stations

The nearest cellular mobile base stations are registered at sites 30707 (Telstra) and 9012416 (Optus) which are approximately 17 and 20.3 km respectively from the nearest turbines on the wind farm site. At distances well in excess of 1km it is considered that the operation of the turbines will have no significant impact on the cellular mobile coverage; however, it is recommended that Optus and Telstra be advised of the wind farm proposal due to their ongoing rollout of base stations. Contact details are included in Attachment 10.

8.3 Two-Way Mobile

A number of private and Public Utility mobile bases exist in the area surrounding the wind farm site. These bases potentially provide cover to mobiles in a 360 degree arc from their bases. No significant impact from the wind farm on base coverage beyond normal mobile operational performance is predicted in view of the geographic separation between the base antennas and the turbine structures. Of course, a mobile transceiver unit communicating with a base station when the

mobile is located within metres of the wind turbine structures (or indeed near any large building, silo, tower etc) may experience some very local performance change, however moving a short distance would restore performance to normal.

8.4 CB Radio

CB radios are not individually licensed, the equipment being subject to class licensing only. Therefore no records of location or operators of CB radios exist, and the channels are shared without any right of protection from interference. No impact from the wind farm is predicted except perhaps for very local effects to portable or mobile units in the immediate vicinity of the turbines which could be avoided by a small location change of the unit. Some CB repeater stations are listed within the 50 km study area however no site is close enough to the wind farm to cause coverage impairment

8.5 Aviation Services

There are no radar sites listed within the 50 km of the wind farm study area. Air Services have a 407 MHz NDB registered on site 31411 and Morawa Shire Council have a registration for VHF services at Morawa Airport. Due to large separation distance to turbines for this ground to air services of at least 90 km no impact to these services is predicted. The nearest radar facilities are believed to be at Geraldton Airport at about 180 km from the wind farm (may be short distance approach radar) and at Mt Kalamunda, Perth at about 220 km. It is considered both are too distant to have any impact.

8.6 Point to Multipoint (PMP) Systems

There are a number of PMP systems registered in the 50 km radius from the wind farm study area boundaries. The PMP base stations are registered in the ACMA data base however the customer/remote ends are generally not registered for PMP systems, so that it is not possible to check if any turbines are in the paths from the base station to the customer ends. These systems operate both in the VHF and UHF frequency bands and are listed in Table 3 below.

TABLE 3 - POINT TO MULTIPONT SYSTEMS IN THE AREA

Site/Service	Frequency Band MHz	Operator	Comment
Eneabba	450	Elec Networks Corp	
Carnamah	450	Water Corp.	Various Sites
Eneabba	450	Iluka Resources	Various Sites
Eneabba	850	Iluka Resources	Various Sites

Given that the base station locations are remote from the wind farm site there is a low probability that any path to the remote (subscriber or device) site would cross the wind farm. It may however be prudent to advise the operators of the PMP Services of the wind farm proposal. There are no PMP registrations in the microwave frequency bands.

8.7 Radio Sites in Close Proximity to Wind Turbines

No radio sites are located inside the wind farm boundaries and the 3 sites located about 3 to 4 km from the nearest turbine and are not close enough to be considered from a buffer zone point of view. There are no TV/Radio broadcasting or emergency services paging facilities on the near sites which would require consideration of buffer zones

8.8 Bureau of Meteorology Radar and Other Services

No registrations for any Met Bureau radar were found in the 50 km radius search area. There is a weather radar installation registered at Geraldton (site 139890), 180 km distant. The turbines are expected to be beyond line of sight of this radar however it is recommended that the Bureau be advised of the wind farm proposal.

9. WARRADARGE WIND FARM SITUATION - DISCUSSION

From overseas experience, calculations using the University of Michigan method and the topography of the area:

9.1 No interference from the wind farm is expected to the MF and FM sound broadcasting services in the area.

9.2 Study of the ITU reports and other Overseas reports discussed above indicate that some possibility of analogue TV picture degradation exists at times for dwellings located such that wind turbines would potentially exist within a +/- 20 degree sector (Ref. 6) from the TV antenna nominal direction of reception, and up to about 3 km from the turbines. It is however difficult to estimate the additive effects of a number of turbines distributed over some distance and on the effect of the undulating terrain on the ratio of the reflected signal to the main wanted TV signal.

9.3 Due to the undulating terrain around the wind farm and the possible individual choice of a few TV transmitting stations it is difficult to predict where interference may occur. As the nearest medium powered TV stations at Morawa is 75km from the nearest wind turbine signal levels around the wind farm are expected to be low and will vary with actual location due to the terrain. The stations at Eneabba are very low power coverage is also expected to be patchy. It is possible that most residents currently use satellite TV services. A phone survey of residents or field visit would be useful to establish the actual situation just prior to commencement of wind turbine erection. It is expected that conversion to digital only TV will be complete at that stage so that a survey would establish a benchmark for direct comparison with any post operational complaints of TV reception interference.

9.4 As indicated above, digital television is not subject to ghosting degradation in high signal strength areas, however some reduction of service area could result from reflected unwanted signals at the limits of the service area. There may be some isolated areas which are shadowed by local hills resulting in reduced

signal levels; however, such effects are unlikely, but are also difficult to categorically exclude as a possibility.

9.5 The Mowara, Eneabba and Leeman are TV rebroadcast stations. Although rebroadcast stations generally retransmit the TV signals transmitted from a main station it is believed that these particular stations are satellite fed. The off air reception situations are not shown on the ACMA database as licensed links, and therefore do not appear on the link mapping. If their input signals passed near to, or through, the wind farm, some interference to input signals and therefore to the TV service areas of each station could occur. However with a satellite feed any disturbance to the input to these TV rebroadcast stations as a result of the wind farm is very unlikely.

9.6 For satellite pay TV services in the area of the wind farm no interference to these services is likely due to the nearest property being about 1 km away and the high angle of elevation of the path to the satellites.

9.7 The ACMA RADCOM database has been studied for services within at least 50 km of the wind farm to determine if any point to point services will have their paths obstructed by the wind turbine blades or the supporting towers. Maps derived from the ACMA database showing radio sites and links in the general area surrounding the site are shown in Attachments 4 & 5. As shown no links actually cross the wind farm site and the closest radio link path is about 4.7km from the nearest wind turbine. Attachment 8 provides sample calculations of the clearance required to achieve 2nd Fresnel clearance near the turbines for the microwave systems and 0.6×1^{ST} Fresnel zone clearance in the VHF/UHF cases. In Attachment 9 these Fresnel zone distances have been calculated at the mid-point of the link path, where they are at a maximum, to provide some margin for error of radio tower grid references in the ACMA database.

9.8 The closest AirServices (site 31411) and Shire of Morawa radio facilities (site 441430) at Morawa Airport are sufficiently separated from turbines and are of the type not to be interfered with by turbines as they are for ground – air communication and beacons (NDB).

9.9 As shown in table 3 above VHF and UHF Point to Multipoint (PMP) System registrations exist in the study area although base stations are not very close to the wind farm. The operators of this system may be in a position to assess if there are any impacts to their individual customers' services or remote points. It is recommended that these organisations be informed of the wind farm proposal to allow them to assess any potential turbine interference. Contact details are shown in Attachment 10.

9.10 As there are no radio or broadcasting facility sites in or close to the wind farm within about 4 km no buffer zones are required to be specified. Normally a recommended buffer zone for the location of any wind turbine is a circle of radius 800 metres around a radio tower location.

10. PRECISION GPS TRACTOR GUIDANCE SYSTEMS

In some farming areas precision Differential Global Positioning System (DGPS) systems are employed by farmers to carry out plowing, spraying and other tractor

based activities to achieve highly accurate and reproducible tracking. It is not known if there are any systems in operation near the Warradarge wind farm site

The systems sometimes employ a GPS local station and a co-located radio base station on a local hill for transfer of positional correction data to the tractors.

For example the GPS antenna and receiver could be located on a survey marker on the top of a prominent hill with a UHF Radio link transmitter. As the survey marker position is accurately known the position determined by the satellite signals received by the GPS receiver is corrected in real time. This correction data is transmitted over the UHF link to the free running GPS receivers in the tractors, thereby providing a positioning accuracy of say +/-2cm.

With wind turbines close to the local GPS station there are two possible issues which have the potential to impact the operation of the positioning system. According to a supplier of such systems, obstructions in the path to the satellites from the GPS receiver should be avoided, and in particular above five (5) degrees above the horizon.

The second potential impact to the operation of the GPS system is in the radio link between the UHF base station and the tractor receiver. Packets of data lost due to link path disturbances will impact on the positional accuracy of the system. Where tractors are traversing the fields there could be positions where the radio path back to the base station will cross a turbine and potentially cause a disturbance to the transmitted signal.

If any complaints are received a field demonstration would be required to determine if the turbines are impacting on the system. It may be required to collect data on positional accuracy over a period and for plowing operations in different locations. There may also be a time of day issue involved where the number of satellites appearing over the horizon in a short period will be reduced causing reduction in accuracy independent of any turbine effects. It is also reported in one system bulletin that trees and hills surrounding paddocks can cause drop outs. Some systems use a combination of 25 GPS satellites (USA) and 16 Glonass satellites (Russian).

Mitigation could involve shifting the GPS base station to another location or employing alternative sources of the correction data from existing or new sites.

11. AUSTRALIAN SQUARE KILOMETRE ARRAY (SKA) PATHFINDER RADIO TELESCOPE

The following relevant information to the SKA has been extracted from the ACMA web site:

The ACMA established Australia's first Radio Quiet Zone (RQZ) on 11 April 2005. The RQZ aims to maintain the current 'radio-quietness' of a site in remote Western Australia (near Boolardy Station, around 200 km East of Meekatharra). The area has very low levels of radiofrequency energy because of its low population and remote location. The RQZ is intended to facilitate the development and use of new radio astronomy technologies at that location, and support Australia's bid to host the Square Kilometre Array (SKA).

In the period since 2005, the Murchison Radio astronomy Observatory has been developed at the centre of the RQZ. Major national and international radio astronomy projects already under construction at that site include:

- *the Australian SKA Pathfinder telescope - a testing facility for the SKA technology.*
- *the Murchison Widefield Array (MWA) telescope.*

The ACMA introduced several measures to protect radioastronomy services in the RQZ, including a frequency band plan, coordination arrangements and a licence conditions.

The band plan introduced in July 2011, outlines the purpose for which spectrum may be used within 150 km of the Murchison Radio astronomy Observatory (MRO). It also defines geographic zones, applying to the frequency range 70 MHz to 25.25 GHz, as follows:

- *Inner zone: Within 70km of the MRO, radioastronomy services would be the primary service in the zone, with any other services deemed to be secondary. Applicants for new apparatus licences must consult with the MRO before applying for the licence.*
- *Outer zone: The new outer zone would operate within a radius of 70-150km from the MRO. No service is granted primary status. In practical terms, licence applications in this zone will be considered in light of the spectrum plan and the relevant licence condition but the applicant for the licence must consult with the MRO.*

In 2007 the ACMA released RALI MS32 Coordination of Apparatus Licensed Services Within the Mid West Radio Quiet Zone The RALI was developed to refine the Radio Quiet Zone initially created by Spectrum Embargo 41, which has now been replaced by the band plan.

Prospective frequency assignments for transmitters that lie within the scope of the RALI (up to 260km from centre of the RQZ) are analysed to determine whether the use of the planned transmitter might produce signal levels above prescribed thresholds at the MRO. If the analysis finds that potential signals are above the prescribed threshold then the licensee must take reasonable measures to reduce the signal level reaching the centre of the RQZ to below the threshold. For example, transmitter antennas may be modified, alternative transmitter locations may be used to take advantage of terrain shielding, or transmitter EIRP may be reduced.

In cases where the potential signal level reaching the centre of the RQZ (as determined by the method prescribed in the draft RALI) cannot be reduced below the threshold, the prospective licensee shall enter discussions with the users of facilities within the RQZ to achieve a mutually agreeable solution. Where agreement is not possible the ACMA will prescribe a solution.

The conclusion from the ACMA documents above is that there are restrictions to the operation of radiocommunication devices up to 260km from the centre of the

RQZ at latitude 26° 42' 15" South, longitude 116° 39' 32" East (GDA94 datum) as specified in RALI MS 32 (Ref. 14).

There appears to be no restrictions for devices or systems which are not transmitters but may have incidental electromagnetic radiation e.g. wind farm generators and HV power lines. However the nearest turbine is located 373km from the centre of the RQZ which is well in excess of the 260km coordination zone.

There are therefore no foreseen issues with the Warradarge wind turbines and the associated HV power lines as far as the Mid-West Radio Quiet Zone is concerned. If any point to point radio systems are to be established for communications needs for the project and a repeater site was to be established within the 260km coordination zone, consideration would have to be given to the requirements of RALI MS 32.

12. AVOIDANCE OF INTERFERENCE DURING CONSTRUCTION

There is sometimes a potential to cause interference to radio links during construction of wind farms from the use of large construction cranes. These could be erected in locations where the crane tower or boom could traverse across the line of site paths of radio links.

It is understood however that the cranes will normally work within the wind turbine rotor diameter so that no special procedures will be necessary as the location of turbine towers allows for the operational rotor diameter in the clearances specified. If any movement of cranes is contemplated without dismantling avoidance of the operating radio link paths and Fresnel clearances will be needed.

For the Warradarge wind farm with the current layout and no point to point radio link paths crossing or close to the site there is negligible risk to disruption of any radiocommunications

13. WIND MONITORING MAST LOCATIONS

The final location of wind monitoring masts will need to avoid the ray lines of the links identified crossing or near the site with the calculated clearance being maintained. As the monitoring masts would normally be in the vicinity of turbines and due to the considerable separation distances to radio link paths no interference issues are expected

14. POWER INFRASTRUCTURE ELECTRIC AND MAGNETIC FIELDS

The power generated by the wind turbines will be exported to the transmission grid via purpose built substations and high voltage transmission lines using conventional designs meeting standards applying to the State network at large. Substations will be designed and sited to reduce the electric and magnetic fields to acceptable levels at the boundary fence. The internal wind farm reticulation will employ underground cables of up to 33 kV in voltage. These will have no significant EMI emission above ground. The main transmission lines from the wind farm substation to the grid will employ 330 KV overhead lines. All

transmission lines will be built to specifications consistent with the HV lines throughout the State network. The height of the lines and the easement width will be in accordance with power authority recommendations which will ensure magnetic and electric fields will be within acceptable limits for human exposure and for electromagnetic interference levels at dwellings in the area and for accessible public access areas. HV power lines and substations are required to meet the Australian Standard AS/NZS 2344: 1997 Amendment 1:2007 limits for EMI which protects broadcasting and radiocommunications reception from unacceptable interference.

The 330 KV main power lines from the wind farm to the power grid are planned to be supported on 20 pylons of up to 63 metres in height. These structures could potentially cause some minor TV signal reduction for any residents located very close to them. With digital TV any reflected signals will not cause picture ghosting as occurs with analogue TV. The overhead power lines are not expected to obstruct any radiocommunications systems which cross the wind farm however a further check should be made when tower locations are being finalised. The distance of approx 4 km to the nearest radiocommunications site will also ensure that EMI from the power infrastructure will have no impact on radio system receivers at that site.

15. FORTUITOUS RECEPTION OF BROADCAST SIGNALS

On some previous projects Responsible Authorities have imposed conditions such as:

"if the qualitative survey establishes any detrimental increase in interference to reception or transmission measures must be taken to mitigate the interference to return the affected reception or transmission to pre-construction quality" (Waubra Vic Planning Permit No PL-SP/05/0150),

This raises two issues primarily for analogue TV reception, the first being the criteria for interference assessment and the second being the protection of reception of some services outside their designed coverage area - termed fortuitous reception. For analogue television reception which is the most vulnerable service for turbine interference it is usual to apply the ITU grade 4, of a 5 grade impairment scale as the limit of acceptance, which is described as "perceptible but not annoying". On the second point, the ACMA's attitude to protection of reception outside designed service areas is understood to be that the reception is fortuitous and will not be protected. They will therefore plan for reuse of frequencies for new stations which in future may impair reception in areas where it is currently acceptable or useable, often for at least part of the time.

This is, of course, difficult for individuals to accept who, due to their particular location, cannot receive an acceptable service from their planned station. Others may use distant stations to avail themselves of diverse programs. It is not reasonable to attempt to protect these services which are likely to be of low signal level and may vary in quality of reception depending on time of day, weather patterns and season. It is therefore suggested that consideration be given to not mitigate any reception which may be impacted by turbine effects where the receivers are clearly outside the ACMA planned coverage area for the particular

service being received. The coverage areas for TV and Radio stations are usually defined by the ACMA in Licence Area Plans (LAP'S) available on their web site. The ABC also provides predicted service areas for their stations which can be used as a guide for also SBS and commercial stations where the same transmitting sites and similar technical operating specifications are employed.

16. MITIGATION TECHNIQUES

As indicated above, although analogue TV is being transmitted together with some digital services currently analogue will be switched off for the Regional WA stations in the area during 2013. Any mitigation of interference will involve digital television reception as all analogue TV in Australia will be switched off by December 2013.

For individuals who experience any degraded TV broadcasting services due to identified interference from the wind farm, possible techniques to reduce the interference to acceptable limits include:

1. Replacement of receiving antenna system with a higher gain more directive model,
2. Reposition antenna in height or horizontally on the dwelling,
3. Install an antenna elsewhere on the property and cable to dwelling,
4. Change the orientation of antennas to receive an alternative station if available,
5. Provision of an alternative satellite service e.g., the proposed Viewer Access Satellite Television (VAST) (Ref. 10) or Austar Pay TV Service.

Potential point to point system and mobile base coverage conflict is not expected if turbines remain located within the current site boundaries so no mitigation will be required.

Any minor affects to MF broadcasting would occur within 10's of metres of the turbines only and with a buffer zone of at least 500m to any dwelling, no corrective action will be required.

17. FINAL CONCLUSIONS

Interference to MF and FM sound broadcasting is not expected.

There are currently no potential conflicts between any point to point radio system paths identified above and the wind turbines. These conclusions are based on the current wind turbine locations with grid references shown in Attachment 2. If any turbines are re-positioned within the current wind farm boundaries no conflict with current radio link ray lines or radio sites is predicted. However if further proposals are developed for wind turbine locations occurs outside current boundaries further checks would be required to ensure either horizontal or vertical clearances to the link ray lines are maintained. There are no radio sites close enough to the wind turbines to require buffer zones to be specified.

Mobile radio and other radiocommunication services in the area are not expected to be significantly impacted by the wind farm or its operation.

Analogue TV will have been switched off by the date of wind turbine erection so interference to current analogue TV services is not an issue. Digital TV is not susceptible to visible ghosting degradation where the signal level is above a minimum threshold. The area surrounding the wind farm is expected to be a low signal area and satellite TV may already be used by residents in the area.

Alternatively a satellite service could be considered if digital TV reception is unsatisfactory in individual cases. In particular, the proposed Viewer Access Satellite Television (VAST) Service announced by the Government recently would be available to provide a full complement of digital channels including a regional news channel.

Overseas experience indicates that EMI produced by the wind farm generators and controls is not a problem with reputable world class wind turbine manufacturers and therefore no electrical noise measurements from the electrical generators are warranted.

It is recommended that operators of point to point radio systems that are near the wind farm site, PMP operators identified in section 8.6 above, the Commercial Television Station operators in the area, Broadcast Australia for the ABC and SBS and Air Services be advised of the wind farm project to enable these organizations to confirm that there are no potential interference issues seen to be relevant to their operations. A summary list of recommended licensees is shown in Attachment 10.

It is also recommended that a survey be carried out of TV reception at homesteads within 10 km of the wind farm boundaries after all TV stations have been converted to digital operation (post December 2013) and before turbines are erected. This will serve as a benchmark for comparison with any complaints of TV reception after the wind farm is operational. It may be sufficient to carry out a phone survey only if residents in the area use satellite only TV services.

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ATTACHMENT 2 –WARRADARGE WIND FARM TURBINE COORDINATES

WGS84 Datum

Zone 50		
Turbine	East	North
1	358,808	6,688,679
2	357,690	6,688,480
3	358,420	6,688,253
4	356,679	6,688,004
5	356,575	6,687,423
6	356,015	6,687,309
7	355,466	6,687,506
8	354,894	6,687,515
9	353,892	6,687,225
10	354,463	6,687,134
11	355,159	6,687,018
12	353,345	6,687,002
13	353,975	6,686,666
14	354,534	6,686,567
15	355,093	6,686,455
16	352,798	6,686,803
17	353,436	6,686,447
18	353,925	6,686,091
19	354,563	6,685,991
20	355,259	6,685,908

21	352,359	6,686,422
22	352,906	6,686,231
23	353,378	6,685,883
24	353,908	6,685,519
25	354,521	6,685,411
26	355,093	6,685,362
27	355,656	6,685,502
28	350,781	6,686,219
29	351,725	6,685,933
30	352,396	6,685,846
31	352,906	6,685,569
32	353,395	6,685,279
33	353,809	6,684,790
34	354,377	6,684,863
35	354,944	6,684,815
36	355,515	6,684,947
37	356,070	6,684,790
38	350,781	6,685,647
39	351,328	6,685,523
40	352,367	6,685,270
41	352,906	6,684,989
42	350,769	6,685,076
43	351,253	6,684,753
44	351,837	6,684,691
45	352,417	6,684,682
46	353,188	6,684,544

47	353,618	6,684,243
48	354,182	6,684,301
49	354,753	6,684,276
50	355,350	6,684,401
51	355,905	6,684,243
52	350,669	6,684,517
53	351,249	6,684,152
54	352,160	6,684,181
55	352,762	6,683,799
56	353,229	6,683,746
57	353,825	6,683,721
58	354,472	6,683,697
59	355,035	6,683,788
60	355,640	6,683,746
61	350,707	6,683,933
62	351,179	6,683,585
63	351,763	6,683,572
64	352,322	6,683,622
65	352,943	6,683,262
66	353,540	6,683,224
67	354,124	6,683,224
68	354,695	6,683,175
69	355,259	6,683,249
70	355,905	6,683,241
71	350,644	6,683,349

72	351,104	6,683,001
73	351,701	6,683,001
74	352,384	6,683,063
75	353,204	6,682,752
76	353,838	6,682,727
77	354,422	6,682,640
78	354,993	6,682,690
79	355,598	6,682,769
80	352,384	6,682,491
81	352,906	6,682,255
82	353,478	6,682,255
83	354,049	6,682,193
84	354,658	6,682,106
85	355,283	6,682,172
86	355,921	6,682,288
87	352,409	6,681,882
88	352,943	6,681,684
89	353,502	6,681,510
90	354,062	6,681,373
91	354,596	6,681,547
92	355,234	6,681,601
93	355,830	6,681,733
94	352,496	6,681,211
95	353,055	6,681,062
96	353,627	6,680,963
97	354,198	6,680,814

98	354,753	6,680,971
99	355,325	6,681,021
100	355,888	6,681,149

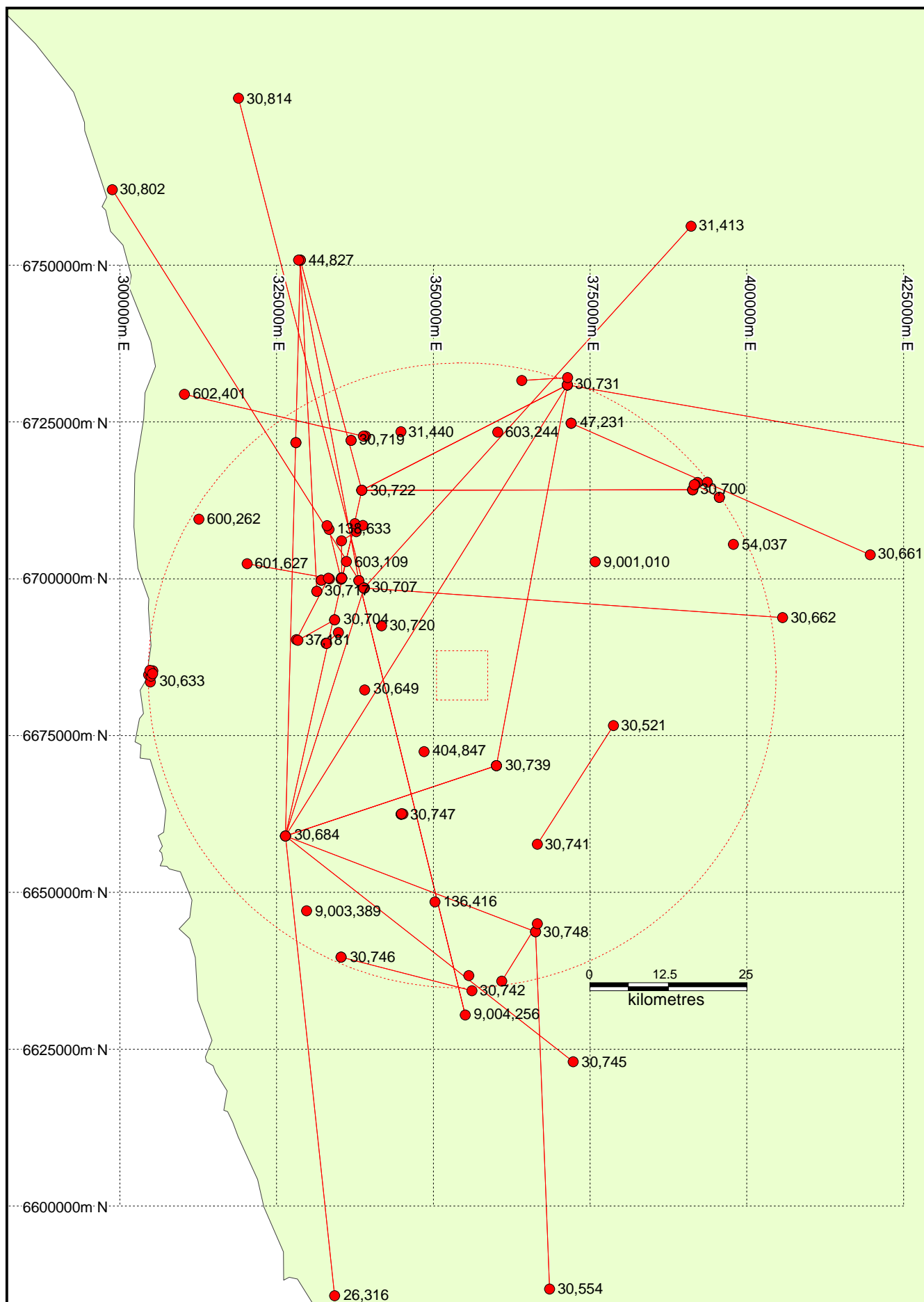
ATTACHMENT 3 - TELEVISION STATIONS & CHANNELS – WARRADARGE WIND FARM AREA

Transmitter Location/service	Operator	Analog Channels	Digital Channels	Comment
Mount Campbell / Morawa	SBS	-	40H	UHF
	ABC	8H	7H	VHF
	GTW	30H	-	UHF
	WOW	36H	-	UHF
Ocean Hill/Eneabba	SBS	40H	-	UHF
	ABC	46H	-	UHF
	WAW	43H	-	UHF
	WOW	49h	-	UHF
1 km south of Leeman or Indian Ocean Drive/ Leeman	SBS	60H	-	UHF
	ABC	5AH	6H	VHF
	WAW	66H	-	UHF
	WOW	63H	-	UHF

Source: ACMA Radio and Television Broadcasting Stations (Internet Edition, Jan 2012)

ATTACHMENT 4 - Radio Link Map 40- 999 MHz Frequencies

See separate PDF Map



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TITLE:

40-999 MHz Assignments As Extracted from RRL Database

FILENAME: 40-999 MHz Warradarge Windfarm

DATE: 20/12/2011

PROJECT: Warradarge Windfarm

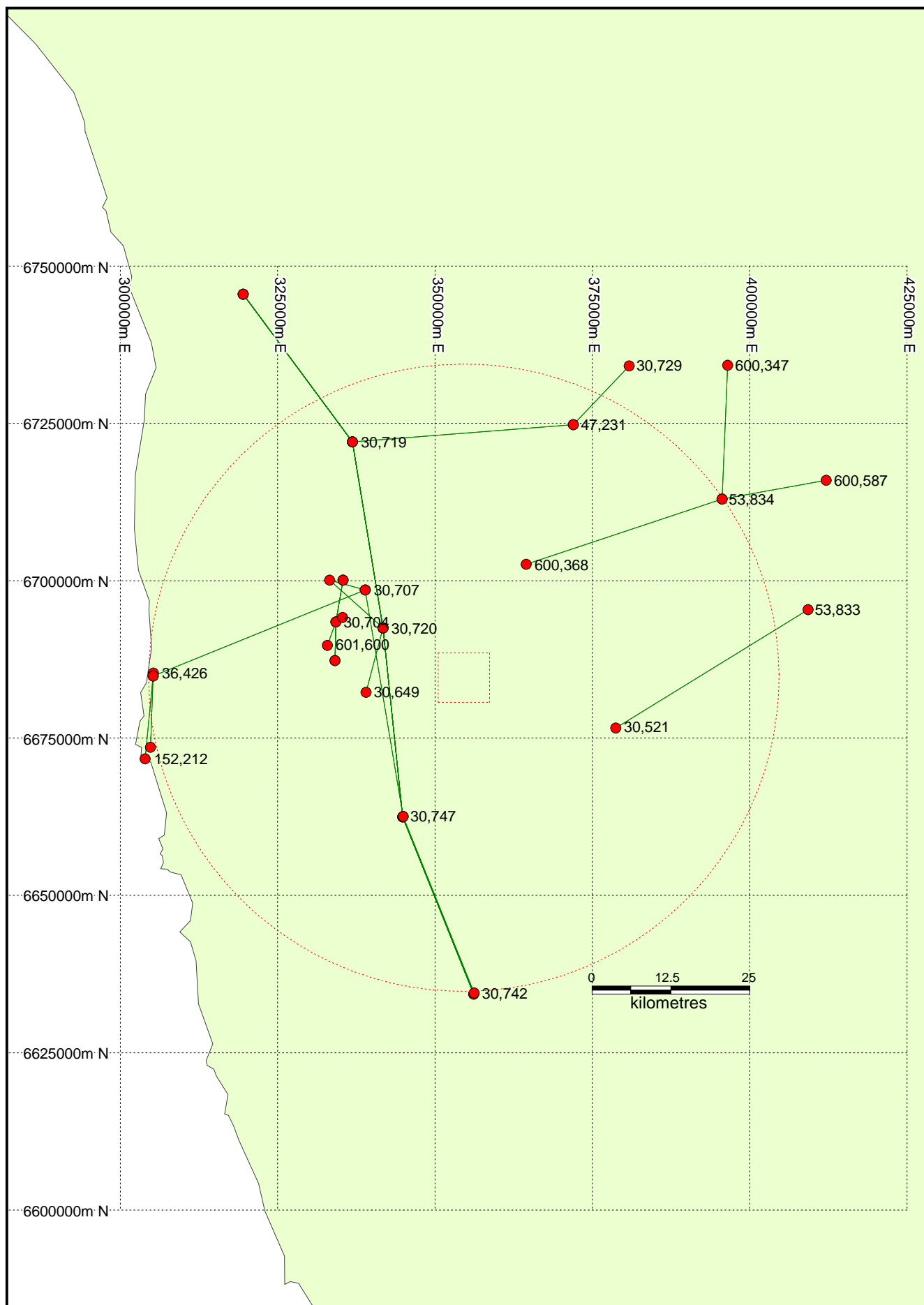
SCALE: N/A

DRWG NO: 1 of 2

BY: SEA

ATTACHMENT 5- Radio Link Map above 1000 MHz Frequencies

See separate PDF Map



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TITLE:

Above 1 GHz Assignments As Extracted from RRL Database

FILENAME: Above 1 GHz Warradarge Windfarm

DATE: 20/12/2011

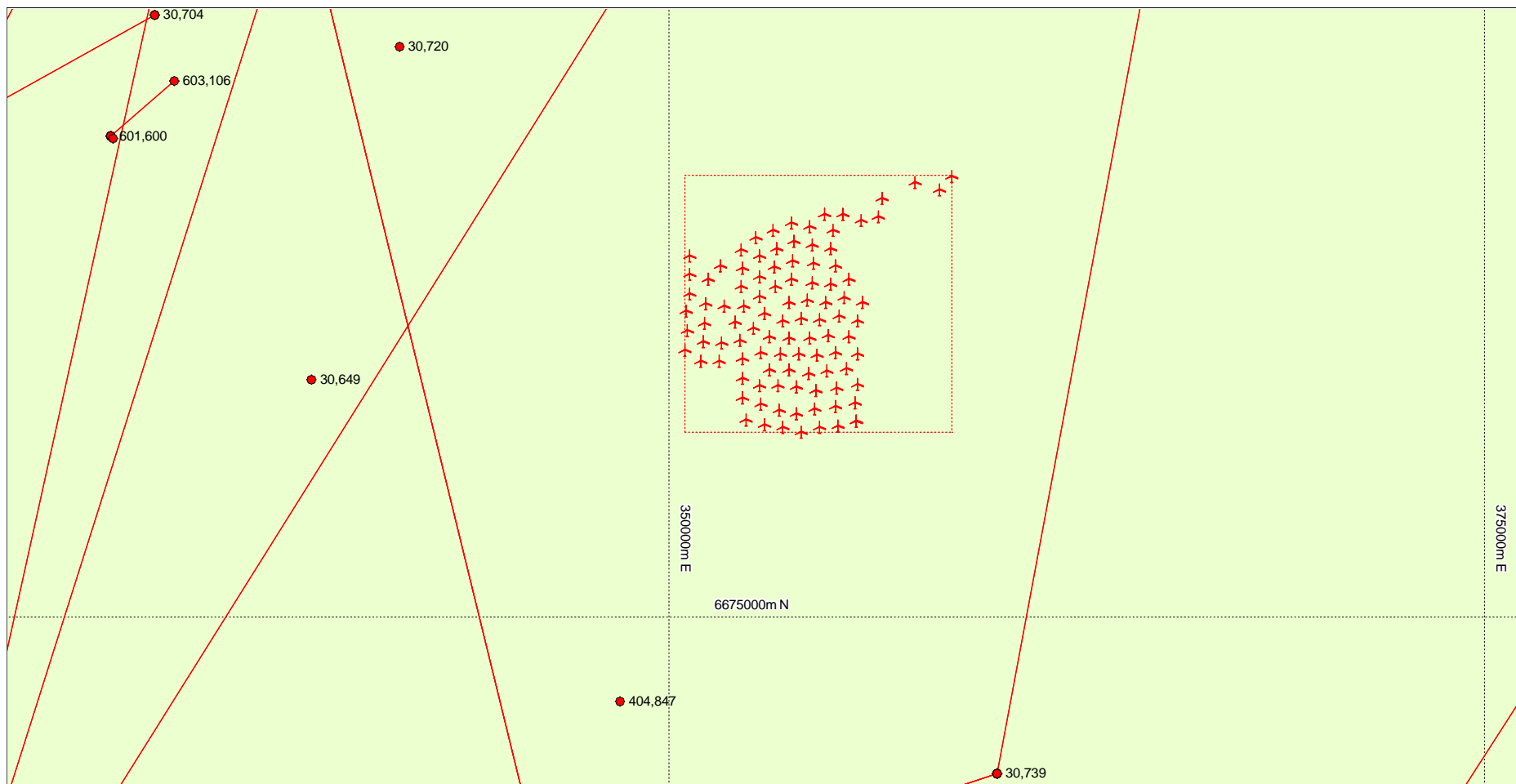
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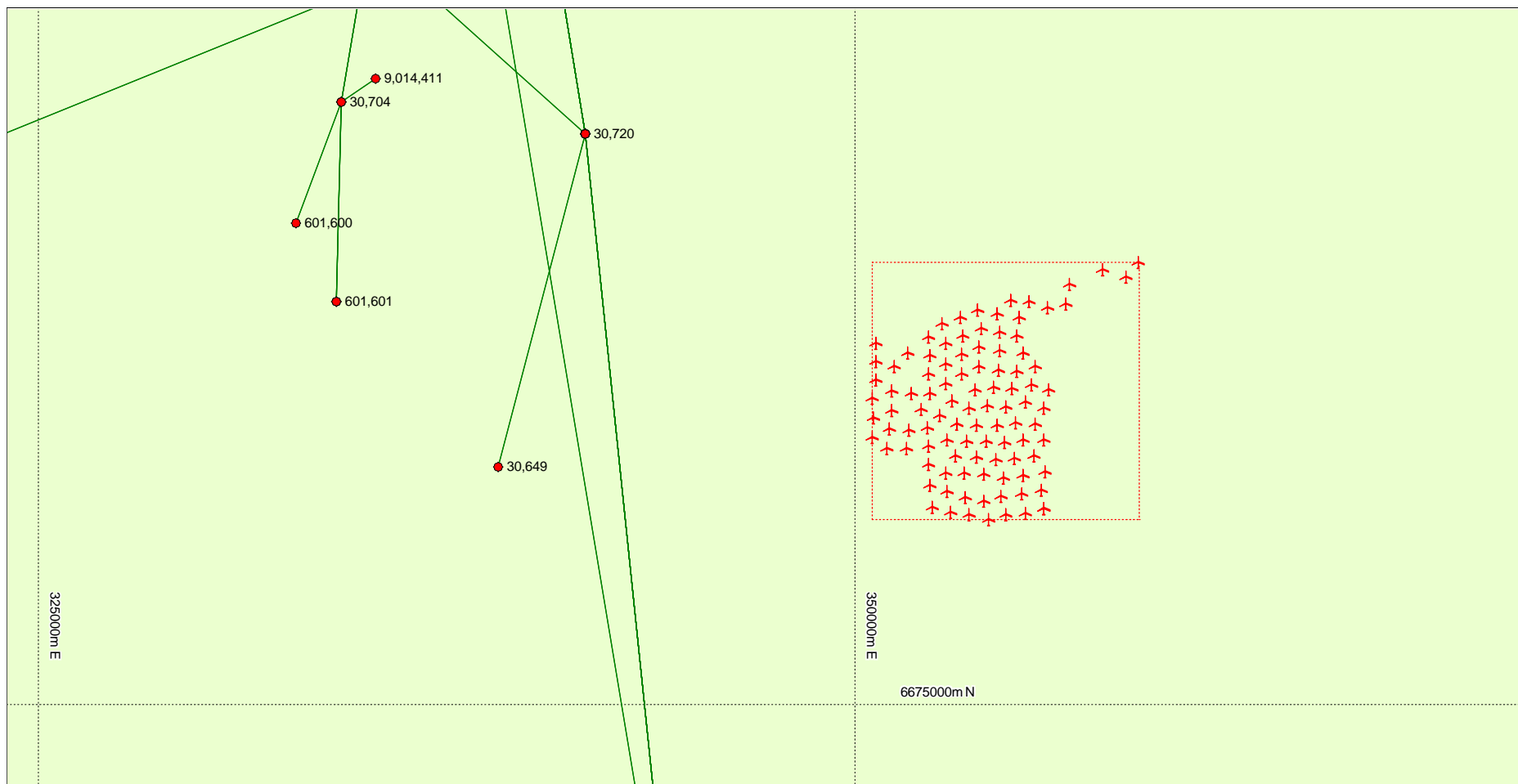
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BY: SEA

ATTACHMENT 6 – Map of VHF/UHF Radio Link Paths Near Wind Turbines



ATTACHMENT 7 – Map of Microwave Radio Link Paths Near Wind Turbines



ATTACHMENT 8 – RADIO LINK CLEARANCE CALCULATIONS

In the event of a microwave point to point system passing near a turbine the recommended clearance from link ray line to turbine blade tip is the Second Fresnel zone radius calculated using the following formula:

$$Y_{\min} = \sqrt{2\lambda D_1(1 - D_1/D_2)} \quad (\text{Ref. 1})$$

Example Only

- Site 1 ID 204434 to Site 2 ID 9001068

Operator: Optus
 Frequency Band 15000 MHz
 Calculated Path Length : 17.85 km
 Clearance to WTG at 3.7 km from near site.
 2nd Fresnel Clearance D1

$$\begin{aligned} D_1 &= \text{SQRT}(2 \times \lambda \times d_1 \times (1 - d_1/d_2)) \\ &= \text{SQRT}(2 \times (300/15000) \times 3700(1 - 3.7/17.85)) \\ &= 10.83 \text{ metres} \end{aligned}$$

The required clearance from the ray line to a tower centreline is $50 + 10.83 = 60.83$ metres (at 3.7 metres from the microwave tower)

For a VHF/UHF point to point system the recommended clearance from the link ray line to turbine blade tip can be relaxed to $0.6 \times 1^{\text{st}}$ Fresnel Zone clearance as there is less disturbance at the lower frequencies due to blade movements or obstructions generally.

Example only

- Site 1 ID 10712 to Site 2 ID 10652

$$Y_{\min} = 0.6 \sqrt{\lambda D_1(1 - D_1/D_2)}$$

Operator: NSW Fire
 Frequency Band 450 MHz
 Calculated Path Length: 38.3 km
 Clearance at mid path
 $0.6 \times 1^{\text{st}}$ Fresnel Clearance D1

$$\begin{aligned} D_1 &= 0.6 \times \text{SQRT}(\lambda \times d_1 \times (1 - d_1/d_2)) \\ &= 0.6 \times \text{SQRT}((300/450) \times 19150(1 - 19.15/38.3)) \\ &= 47.94 \text{ metres} \end{aligned}$$

The required clearance from the ray line to a tower centreline is $50 + 47.94 = 97.94$ metres at mid path (19.15 km from either end of link path.)

ATTACHMENT 9- SUMMARY OF RADIO LINK CLEARANCE REQUIREMENTS

TABLE A HORIZONTAL CLEARANCE ZONES REQUIRED

Path ACMA SITE ID's	Operator	Coords Site A GDA 94 Zone 50	Coords Site B GDA 94 Zone 50	*Total Clearance Zone Width metres
30662-20707	WA Police	E405838 N6693948	E339088 N6698677	246.6
30739-30731	St Johns Ambulance	E360188 N6670348	E371538 N6731048	241.2
9004256-9004257	Nixon Comms	E355237 N6630595	E338277 N6699840	243.2
30731-30684	Dept of Enviro & Conserv	E371538 N6731048	E326538 N6659148	254.8
30747-30720	Elect. Networks	E345003 N6662621	E341885 N6692623	161.2
30747-30720	DBNGP (WA)	E345003 N6662621	E341885 N6692623	164

*Total clearance zone width is total zone width centered on radio path outside which the wind turbine tower centre lines must be located. A rotor diameter of 112 metres is assumed.

TABLE B SUMMARY OF ACTUAL HORIZONTAL CLEARANCES

Path	Hor.Clearance Required m	Clearance to Tower Centre Required m 56 m blades	Est. Current Hor. Clearance Nearest Turbines m	Hor Clearance Yes/No
30662-20707	67.3	123.3	8600	Yes
30739-30731	64.6	120.6	4700	Yes
9004256-9004257	65.6	121.6	8000	Yes
30731-30684	71.4	127.4	6300	Yes
30747-30720	24.6	80.6	7700	Yes
30747-30720	26	82	7700	Yes

ATTACHMENT 10 - ACMA LICENSEES RECOMMENDED FOR ADVISING

OPERATOR	ADDRESS 1	ADDRESS 2	Service Type*
Electricity Networks Corporation e	GPO Box L921 Attn: Comms Operations & Maintenance	PERTH WA 6842	PP & PMP
DBNGP (WA) Nominees Pty Ltd	PO Box Z5267	SAINT GEORGES TERRACE WA 6831	PP
Western Australian Police Service	2 Swanbank Road	MAYLANDS WA 6051	PP
St John Ambulance Australia WA	PO Box 183	BELMONT WA 6984	PP
Nixon Communications Pty Ltd	2/38 Lord St	GLADSTONE QLD 4680	PP
Department of Environment and Conservation	Locked Bag 104	BENTLEY DC WA 6983	PP
Water Corporation	Box 100 (MESB - Henry Oosterbaan)	LEEDERVILLE WA 6902	PMP
Iluka Resources Limited	GPO Box U 1988	PERTH WA 6845	PMP
Telstra Corporation Limited	Locked Bag 3708 (C/- R Preston)	BRISBANE QLD 4000	Cellular Mobile
Shire of Carnamah	PO Box 80	CARNAMAH WA 6517	Broadcasting
Australian Broadcasting Corporation	Attention D Jadeja GPO Box 9994	SYDNEY NSW 2001	Broadcasting
Optus Mobile Pty Limited	PO Box 888 (C/- Tony Huang, Terry Laws & Jay Wickr	NORTH RYDE NSW 1670	PP
Singtel Optus Pty Limited	PO Box 888 (Attn Brendan Jones)	MACQUARIE PARK NSW 2113	Cellular Mobile
WIN Television WA Pty Ltd	Locked Bag 8800	WOLLONGONG NSW 2500	Broadcasting
Geraldton Telecasters Pty Ltd	PO Box	878 DICKSON ACT 2602	Broadcasting
Shire of Morawa	PO Box 14	MORAWA WA 6623	Broadcasting
ABC - Andrew Clements -	clements.andrew@abc.net.au		Broadcasting
SBS Hugh James -	hugh.james@sbs.com.au		Broadcasting
Broadcast Australia Salvatore.Mattera	salvatore.mattera@broadcastaustralia.com.au		Broadcasting

Airservices Australia	PO Box 367 (Attention Bruce Bilton)	CANBERRA CITY ACT 2601	Aviation Radar & Other
Bureau Of Meteorology	GPO Box 1289 (Comms Section)	MELBOURNE VIC 3001	Weather Radar

*PP – Point to Point Radio Systems

*PMP – Point to Multipoint Radio Systems

* Broadcasting includes TV and/ or AM/FM Radio

ATTACHMENT 11- GLOSSARY OF TECHNICAL TERMS

VHF	Very High Frequency
UHF	Ultra High frequency
EMI	Electromagnetic Interference
VHF Channels	TV Channels 0 to 12 (45 - 230 MHz)
UHF Channels	TV Channels 28 - 46 (526 - 820 MHz)
Band 111	VHF TV Channels 5A - 12
First Fresnel Clearance	Distance to obstructions from the ray line on a radio path which does not produce any additional loss above free space loss
FM	Frequency Modulation
AM	Amplitude Modulation
MF	Medium Frequency
LF	Low Frequency (not used for sound broadcasting in Australia)
GSM	European Digital Cellular Mobile System
CDMA	Code Division Multiple Access Cellular Mobile System
ITU	International Telecommunications Union
ACMA	Australian Communications & Media Authority
CB Radio	Citizens Band Radio
VOR	VHF Omnidirectional Range (short range air Navigation aid)
NDB	Non Directional Beacon



Form 2 – Responsible Authority Report (Regulation 17)

Property Location:	Lots 10850 & 10853 Garibaldi Willis Road and Lots 10848 & 10851 Rose Thomson Road, Warradarge
Development Description:	Warradarge Wind Farm
Proposed Amendments:	Request to extend timeframe on Condition 2 to 31 August 2022
DAP Name:	Mid-West/Wheatbelt Joint Development Assessment Panel
Applicant:	Synergy
Owner:	Lot 10850 Garibaldi Willis Road and Lots 10848 and 10851 Rose Thomson Road, Warradarge – Judeen Nominees Pty Ltd Lot 10853 Garibaldi Willis Road, Warradarge – Gary Marshall Chivers and Vicki Gail Chivers
Value of Amendment:	Not Applicable
LG Reference:	A1492/A1493
Responsible Authority:	Shire of Coorow
Authorising Officer:	Simon Lancaster
Department of Planning File No:	DP/12/00625
Report Date:	26 May 2017
Application Receipt Date:	4 May 2017
Application Process Days:	21 days
Attachment(s):	Attachment 1 – JDAP Minutes relating to Original Determination 31 August 2012 <i>provided as Attachment 1 to previous Agenda Item</i> Attachment 2 – JDAP Agenda relating to Original Determination 31 August 2012 <i>provided as Attachment 2 to previous Agenda Item</i> Attachment 3 – Request to extend timeframe on Condition 2 to 31 August 2022 as submitted by Applicant dated 1 May 2017 <i>provided as Attachment 3 to previous Agenda Item</i> Attachment 4 – Location Plan (Drawing No.WAW-AA-GA-G/002 SH001) <i>provided as Attachment 4 to previous Agenda Item</i> Attachment 5 – Site Plan overlaid upon Aerial Photograph (Drawing No. WAW-AA-GA-G/001 SH001) <i>provided as Attachment 5 to previous Agenda Item</i> Attachment 6 – Wind Turbine Elevation Plan (Drawing No. WAW-AA-PR-S/001 SH001) Attachment 7 – Transmission Line Tower Elevation Plan (Drawing No. WAW-SS-PT-

	<p>E/001 SH001) <i>provided as Attachment 6 to previous Agenda Item</i></p> <p>Attachment 8 – Development Area Plan (Drawing No. WAW-AA-GA-G/001 SH003) <i>provided as Attachment 7 to previous Agenda Item</i></p> <p>Attachment 9 – Photomontage from both Garibaldi Willis Road (Drawing No.61-27826-SK004) and Rose Thomson Road (Drawing No.61-27826-SK006) <i>provided as Attachment 8 to previous Agenda Item</i></p> <p>Attachment 10 – Schedule of Submissions <i>provided as Attachment 9 to previous Agenda Item</i></p> <p>Attachment 11 – Copy of Submissions <i>provided as Attachment 10 to previous Agenda Item</i></p> <p>Attachment 12 – Copy of original application <i>provided as Attachment 11 to previous Agenda Item</i></p>
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Officer Recommendation:

That the Mid-West/Wheatbelt Joint Development Assessment Panel resolves to:

1. **Accept** that the DAP Application reference DP/12/00625 A2370465 as detailed on the DAP Form 2 dated 1 May 2017 is appropriate for consideration in accordance with regulation 17 of the *Planning and Development (Development Assessment Panels) Regulations 2011*;
2. **Approve** the DAP Application reference DP12/00625 A2370465 as detailed on the DAP Form 2 date 1 May 2017 in accordance with Clause 68 of the *Planning and Development (Local Planning Schemes) Regulations 2015* and the provisions of Parts 8-10 of the Shire of Coorow Local Planning Scheme No.3, for the proposed minor amendment to the approved condition 2 to extend the timeframe from 31 August 2017 to 31 August 2022, as it is considered reasonable that projects of this nature can encounter delays relating to factors including financing requirements, applicant restructuring, Commonwealth and State Government review, project scheduling and other matters.

Amended Condition

2. The approved development shall be substantially commenced prior to 31 August 2022 and if the development is not substantially commenced the approval shall lapse and be of no further effect. Where an approval has so lapsed, no development shall be carried out without the further approval of the responsible authority having first been sought and obtained.

Advice Notes

All other conditions and requirements detailed on the previous approval dated 31 August 2012 shall remain unaltered.

Details: outline of development application

Zoning	RS:	Not Applicable
	TPS:	Rural
Use Class:		Wind, Solar or Tidal Energy Facility ('A' use)
Strategy Policy:		Not Applicable
Development Scheme:		Not Applicable
Lot Sizes:		Lot 10848 – 1,441.4ha Lot 10850 – 2,001.7ha Lot 10851 – 1,825.7ha Lot 10853 – 2,012.0ha
Existing Land Use:		Rural
Value of Development:		\$600million

The JDAP approved an application on 31 August 2012 to establish 100 wind turbines with an operational life of 25 years on farming land located between Garibaldi Willis Road and Rose Thomson Road, approximately 15km east of the Brand Highway and approximately 15km south-east of Eneabba.

The application was supported by the Shire of Coorow Council at its 15 August 2012 meeting following advertising.

The Warradarge Wind Farm site boundary covers 5,010ha (3,800ha for the wind turbine area and 1,210ha for the transmission line corridor) with an actual utilised area of 82.5ha, meaning that the remaining area would continue to be used for agricultural production or retained as remnant vegetation. The site was selected due to its proximity to the existing 330kV transmission line, the reliability of the wind resource (it is expected that the wind farm would generate electricity approximately 90% of the time), the relatively low number of habitable buildings (and the large lot sizes and zoning in this area also reduce potential for further residences in the immediate area), and the previously cleared state of the majority of the site (with only 0.7ha of vegetation estimated as being required to be cleared and this clearing would not include any Priority Ecological Communities or Threatened Ecological Communities and field research does not suggest that this contains roosting sites for Carnaby's Cockatoos).

The turbines would have a tower (hub) height of 100m and an overall (blade) height of 152m. The wind farm would also require 5 x 100m high monitoring masts. The wind turbines would be connected via underground cabling and 7.5ha of gravel access tracks (with an additional 1ha of gravel access track serving the transmission line). A fenced 6.25ha substation compound would be located in the north-west corner of the wind farm site as the connection point onto the 330kV transmission line. The compound would house a 22 to 330kV switchyard and transformers, a 367.2m² single storey relay and metering building, a 875m², 9.2m high site office and workshop, car parking area and a 50m high steel lattice communications mast.

The application also sought to establish a 330kV spur transmission line running south-east for a distance of 10km off the Eneabba-Karara transmission line to enable connection of the Warradarge Wind Farm into the South-West Interconnected System. The northern section of the spur transmission line would be located within the Shire of Carnamah and the southern 4.5km section would be located within the Shire of Coorow. The transmission line would require 22 steel lattice towers

measuring 50-63m in height with approximately 500-600m spacing between each tower.

The applicant originally advised that should approval be granted for the development, the wind farm was intended to be operational by 2015 and the 2 year construction phase of the project would require a 1ha construction compound containing a lay down area, site offices, amenities and first aid buildings. The likely turbine delivery route to the Warradarge Wind Farm site would be from Geraldton port, via the Brand Highway turning east at Warradarge onto the Coorow-Green Head Road, and then turning north along the Garibaldi-Willis Road to the site entrance.

A copy of the complete application for the total Warradarge Wind Farm project was provided separately to JDAP members with the 31 August 2012 Agenda on disc format due to the large (43MB) size of the application. The complete submitted development application report included the following technical documents:

- Planning and Context Statement (Urbis);
- Landscape and Visual Impact Assessment (GHD);
- Flora, Vegetation and Fauna Assessment (Biota Environmental Sciences);
- Noise Impact Assessment (Herring Storer Acoustics);
- Background Noise Monitoring (Herring Storer Acoustics);
- Investigation of Possible Impacts on Broadcasting and Radiocommunication Services (Lawrence Derrick and Associates);
- Aviation Impact Statement Assessment (AECOM);
- Planning Compliance Report (Urbis);
- Verve Health and Safety Policy (Verve Energy);
- Verve Environmental Policy (Verve Energy);
- Draft Environmental Management Plan (Verve Energy); and
- Stakeholder Consultation Report (Verve Energy).

This has again been provided to JDAP Members, as Attachment 12.

In support of their original proposal the applicant advised:

“The 100 turbine wind farm would produce on average every year, up to 875 million Kilowatt-hours (kWh) of electricity which is equivalent to the average annual electricity needs of 140,000 West Australian homes. The wind farm would also prevent at least 700,000 tonnes of CO2 from entering the atmosphere annually.

The final number, make and model of the wind turbines that will comprise the wind farm is not yet finalised and therefore development approval is sought for a 100 turbine wind farm and all associated infrastructure to be located within the wind farm envelope. To minimise the environmental impact of the development there are number of excluded areas where no turbines or associated infrastructure will be located. The Proposal footprint within the wind farm envelope is on cleared land and does not require further clearing of vegetated areas. Important vegetated areas that contain Threatened Ecological Communities and Priority Species have been intentionally avoided.

The exact route of the 10km transmission line is not yet finalised but a likely route corridor has been selected based on Western Power's connection requirements. Up to 0.7 hectares of vegetation may require clearing for the transmission line and this will be subject to a clearing

permit through the Department of Environment and Conservation. The likely transmission line route has been surveyed and contains no Threatened Ecological Communities and the Priority 4 species has been intentionally avoided.

The design of the wind farm has taken into account the location of nearby residential premises to ensure that the operational noise from the wind farm is predicted to meet the noise limits for wind farm developments at these locations. The noise limits at relevant receivers is 35 dB(A) or the background noise (LA90,10 minute) plus 5 dB(A), whichever is the greater.

The wind farm location and design complies with the Visual Landscape Planning Manual of Western Australia. The wind farm has been shown to be in a compact area acceptable from a landscape and visual perspective provided that the wind farm is limited to 100 turbines up to 152m high within the wind farm envelope. The majority of impacts have been mitigated through the wind turbine and wind farm design.

The location of the wind farm has been assessed to determine whether any impacts are likely on air safety, radiocommunications and broadcasting and the results of these surveys are that no impacts are expected.

The proposed Warradarge Wind Farm will be a significant project for the Shires of Coorow and Carnamah and for Verve Energy. The Warradarge Wind Farm feasibility study to date has found that a wind farm can be built at the proposed site that meets the technical, social and environmental constraints imposed on it. The majority of the impacts associated with the wind farm have been mitigated through site selection and design.”

Background:

The subject site has not previously been subject to the lodgement of a major development application (excepting the 31 August 2012 JDAP Determination) and is presently used for farming purposes.

Legislation and Policy:

Legislation

Planning and Development Act 2005;
Planning and Development (Development Assessment Panels) Regulations 2011 (Regulation 17);
Planning and Development (Local Planning Schemes) Regulations 2015 (Schedule 2 Part 9);
Shire of Coorow Local Planning Scheme No.3 (Table 1, Parts 8, 9 and 10);
Environmental Protection (Clearing of Native Vegetation) Regulations 2004 (Regulation 5).

State Government Policies

WAPC Planning Bulletin No.67 - Guidelines for Wind Farm Development.

Local Policies

Not Applicable.

Consultation:

Public Consultation

Council resolved at its 18 July 2012 meeting to advertise the application for a Wind Farm and 330kV transmission line upon Lots 10850 and 10853 Garibaldi Willis Road and Lots 10848 and 10851 Rose Thomson Road, Warradarge for a period of 21 days with the matter to be returned to its 15 August 2012 meeting for its further consideration.

Given that both the wind farm application within the Shire of Coorow and the accompanying transmission line application within the Shire of Carnamah were required to be submitted to a Development Assessment Panel and to avoid confusion for consulted parties, the total Warradarge Wind Farm application was advertised concurrently by the Shire of Coorow and the Shire of Carnamah. The advertising period ran from Friday 20 July 2012 until Friday 10 August 2012 with an advisory sign being displayed on-site during the advertising period. Notices were displayed in the Geraldton Guardian on 20 July 2012 and the Mid West Times on 26 July 2012, and the Mid West Times also ran an article on the Warradarge Wind Farm development application on 2 August 2012. A copy of the development application was displayed at the Shire of Carnamah office and the Shire of Coorow (Leeman) office.

The application was advertised for public comment for a period of 21 days, rather than the minimum 14 days as required by the Scheme, to provide greater opportunity for all parties to make comment.

In addition to the required advertising actions listed above, at the commencement of the advertising period, all landowners within 5km of the Warradarge Wind Farm Transmission Line alignment were written to by the Shires and provided with a complete copy of the application and invited to make comment.

The applicant also undertook extensive public consultation as outlined in Section 2.3 of their submitted development application report, including direct contact, production of newsletters, mail-outs and e-mails, newspaper notices, surveys, and public information sessions.

10 submissions were received in relation to the Warradarge Wind Farm application. 8 of these submissions were received from government agencies all offering no objection to the application (with some providing minor technical comment that was incorporated into the conditions of approval and advice notes). 2 submissions were received in objection to the application from neighbouring landowners, and these largely related to the perceived impact upon their properties arising from noise and visual appearance.

A Schedule of Submissions was prepared for the Council's and JDAP's consideration in 2012 and this is included as Attachment 10 to this report, the Schedule identified the respondents, summarised the matters raised, provided individual comment upon the matters raised, and a recommendation in regard to each. The applicant was provided with a copy of the submissions received, in order to have the opportunity to respond to the issues raised, and a copy of the applicant's responses to the issues raised in objection were inserted into the Schedule of Submissions also. Copies of the received submissions have been provided in Attachment 11.

Consultation with other Agencies or Consultants

At the commencement of the advertising period for the original application the following agencies were written to and provided with a complete copy of the application and invited to make comment:

- Alinta Gas;
- Civil Aviation Safety Authority;
- Department of Agriculture and Food;
- Department of Environment and Conservation;
- Department of Indigenous Affairs;
- Department of Mines and Petroleum;
- Department of Planning;
- Department of Regional Development and Lands;
- Department of State Development;
- Department of Transport;
- Department of Water;
- Fire and Emergency Services Authority;
- Main Roads WA;
- Mid West Development Commission;
- State Heritage Office;
- Telstra;
- Water Corporation; and
- Western Power.

The applicant also undertook direct consultation with an extensive range of government departments and service authorities prior to lodgement of the development application, and this was detailed in Section 2.2 of their submitted development application report. The applicant's prior consultation and the submissions received during the advertising period identified no significant agency concerns with the Warradarge Wind Farm project.

Given that the type, location and scale of the proposed development details, inclusive of its location and scale are unchanged from the previous application, that was previously supported by Council, and approved by the JDAP, and the applicant's request relates merely to the commencement timeframe, the Council of the Shire of Coorow did not consider that this matter should be re-advertised.

Planning Assessment:

The original application was assessed by the JDAP on 31 August 2012 under Shire of Coorow Town Planning Scheme No.2. The assessment of the application against the Scheme No.2 criteria is included within Attachment 2 being the 31 August 2012 JDAP Agenda.

Shire of Coorow Local Planning Scheme No.3 was gazetted on 27 October 2015, subsequent to the JDAP Determination.

It is noted that the zoning of the land subject to this JDAP application remains unchanged, being zoned 'Rural'.

It is further considered that the provisions of Scheme No.3 do not present a substantial departure from those of Scheme No.2 as relevant to this application, and would allow for conditional approval of the application were it to be received now.

Nonetheless an assessment against the relevant provisions of Scheme No.3 is provided below for comparative purposes to the Scheme No.2 assessment contained within Attachment 2.

Shire of Coorow Local Planning Scheme No.3

The subject properties are zoned 'Rural' under Shire of Coorow Local Planning Scheme No.3 ('the Scheme').

Section 4.2.7 of the Scheme lists the objective for the 'Rural' zone as being:

"The objective of the Rural Zone is to provide for a range of rural pursuits such as broadacre and diversified farming which are compatible with the capability of the land and retain the rural character and amenity of the locality."

Given that the proposed wind farm would require minimal clearing only (0.7ha) and would not require loss of undue land area from agricultural production it was not considered that the proposed application is contrary to the farming/agricultural production aspect of the objectives for the 'Rural' zone.

The development of a wind farm would be considered to have impact upon the rural appearance of an area, but it should be noted that the Wind Farm is in proximity to the existing Eneabba to Karara 330kV transmission line that runs through this area. Further, the previous establishment of the Emu Downs and Walkaway Wind Farms could be argued as creating a growing familiarity and acceptance of applications of this type in the rural areas of the Mid West, and the surrounding landscape is not specifically identified as a place of scenic value in either the Coorow or Carnamah Schemes.

The application, as lodged, would meet the definition of a 'Wind, Solar or Tidal Energy Facility' which is listed as an 'A' use within the 'Rural' zone under Table 1 of the Scheme, with this being defined as "means that the use is not permitted unless the local government has exercised its discretion by granting planning approval after giving special notice in accordance with clause 9.4" under Section 4.3.2 of the Scheme.

The requirements of Section 9.4 of the Scheme relating to the advertising of applications was complied with, and exceeded, in the receipt and assessment of the application in 2012.

'Wind, Solar or Tidal Energy Facility' is defined under Schedule 1 of the Scheme as follows:

“means premises used to generate electricity by wind force, solar power or tidal action and includes any turbine, panel, building or other structure used in, or in conjunction with, the generation of electricity by wind force, solar or tidal activity but does not include turbines or panels used principally to supply electricity for a domestic property, rural use of the land or anemometers.”

Section 10.5 of the Scheme notes the following:

“10.5. Term of planning approval

10.5.1. Where the local government grants planning approval for the development of land —

- (a) the development approved is to be substantially commenced within 2 years, or such other period as specified in the approval, after the date of the determination; and*
- (b) the approval lapses if the development has not substantially commenced before the expiration of that period.*

10.5.2. A written request may be made to the local government for an extension of the term of planning approval at any time prior to the expiry of the approval period in clause 10.5.1.”

The JDAP approval dated 31 August 2012 was for a period of 5 years, and the written request (as contained on JDAP Form No.2) and the accompanying correspondence (provided as Attachment 3) were received prior to 31 August 2017.

Given that the proposed 100 turbines, 5 monitoring masts, 1 communications tower and 22 transmission towers are not for agricultural use, and would be in excess of 9m in height, then Section 5.16 of the Scheme must also be considered in the assessment of this application:

“Height and Appearance of Buildings

With the exception of buildings and structures required for agricultural use in Rural Zones, no building in excess of two storeys or a height of 9 metres above natural ground level shall be erected within the Scheme Area.

Council may approve buildings which exceed the height specified after considering information provided and any submissions made by persons owning or having an interest in land affected directly or indirectly by the proposed building:

- Will be in harmony with the general character of buildings in the locality;*
- Will not be detrimental to the amenity or character of the locality or the quality of environment or the townscape.*
- Will observe the required setbacks from the boundaries of the lot on which it is to be constructed and will not prejudice the siting, design, aspect and privacy of buildings on other nearby lots.*
- Will not impair the potential for development of other vacant blocks in the vicinity with particular regard to amenity, aspect and views.*

- *Has been designed in harmony with the natural land form of the site.*

Any such decision shall only be made by an absolute of Council.”

All Shire of Coorow Council resolutions in relation to this matter have been resolved by an absolute majority.

It was considered that the local economic benefits and the wider regional and state benefits to the environment presented by the project, and the analysis provided by the submitted Landscape and Visual Impact Assessment, provide sufficient grounds for consideration of the application.

Portions of Section 10.2 of the Scheme may also be considered relevant to this application:

“The local government in considering an application for planning approval is to have due regard to such of the following matters as are in the opinion of the local government relevant to the use or development the subject of the application:...

- ...(c) any approved statement of planning policy of the Commission;...*
- ...(e) any relevant policy or strategy of the Commission and any relevant policy adopted by the Government of the State;...*
- ...(i) the compatibility of a use or development with its setting;*
- (j) any social issues that have an effect on the amenity of the locality;*
- (k) the cultural significance of any place or area affected by the development;*
- (l) the likely effect of the proposal on the natural environment and any means that are proposed to protect or mitigate impacts on the natural environment...*
- ...(n) the preservation of the amenity of the locality;*
- (o) the relationship of the proposal to development on adjoining land or on other land in the locality including but not limited to, the likely effect of the height, bulk, scale, orientation and appearance of the proposal;...*
- ...(q) the amount of traffic likely to be generated by the proposal, particularly in relation to the capacity of the road system in the locality and the probable effect on traffic flow and safety;...*
- ...(y) any relevant submissions received on the application;*
- (z) the comments or submissions received from any authority consulted under clause 10.1.1;*
- (za) any other planning consideration the local government considers relevant.”*

Shire of Coorow Local Planning Strategy

The original application was assessed against the provisions of the Shire of Coorow Local Planning Strategy (2001).

The current Shire of Coorow Local Planning Strategy (“the Strategy”) was endorsed by the WAPC on 11 September 2015, subsequent to the approval of the Warradarge Wind Farm by the JDAP on 31 August 2012.

The Warradarge Wind Farm project accords with the following objective of the Strategy:

“To promote the development of the Shire’s renewable energy sources, particularly wind power, to better utilise rural land and increase employment and income generating opportunities.” (page 5)

The project is also specifically referenced in Section 5.9 – Rural Land Use and Development, Section 8.5 – Climate Change and the Natural Environment, and Section 8.6 – Renewable Energy of the Strategy:

“Renewable energy is also emerging as a major industry within the Shire, and one that can exist complementary to the primary rural land use. The \$600m 100-turbine Warradarge wind farm approved in 2012 provides an example of an alternative energy operation in the Shire, and encourages further investment in the future.” (page 38)

“Possible reduced rainfall is likely to have a marked impact on inland agricultural and grazing areas, which may threaten their viability without expensive irrigation systems.

Conversely, the shift towards more sustainable energy sources as part of the response to a changing climate offers to opportunity to create employment and alternative income opportunities for rural areas suited to wind energy. This is evidenced by the existing approval for a major wind farm in Warradarge. Opportunities exist in the longer term for the development of solar, tidal and geothermal resources in the Shire.” (page 68)

“8.6 Issue 7 – Renewable Energy

Renewable energy offers a major potential future source of employment and income for the Shire. There is scope for investigation into wind, solar, geothermal and tidal activity in the future.

The forthcoming completion of the Mid West Energy Project will provide new, high capacity access into the South West Interconnected System, and minimise transmission costs for new energy projects in the region.

Verve has approved plans for a \$600m wind farm in Warradarge, within the Shire at its northern boundary. The 250MW wind farm could power up to 140,000 homes and have up to 100 turbines reaching up to 152m in height. The timing of the wind farm is currently unknown, however is dependent on issues such as the price of electricity, funding, and policy settings.

Nevertheless the proposal demonstrates the renewable energy resources within the Shire and the approval in place should be a good indicator to other potential proponents that these projects are viable and achievable within the Shire.

Consultation with agencies and the Shire indicates that the impact of wind farms on existing farming operations is minimal – with only a small amount of land required for the turbines and access trails. The impacts of solar or geothermal operations have not yet been tested in the Shire.

While there are questions on the visual impact of wind farms, there is also the argument that they offer a positive visual impact, even to the point where they can provide a tourist point of interest, particularly if a look out is provided.” (page 69)

WAPC Planning Bulletin No.67 - Guidelines for Wind Farm Development

The WAPC released Planning Bulletin No.67 in 2004 as a guide for the assessment of wind farm developments. The application was prepared with regard to the issues outlined in Planning Bulletin No.67 including landscape and visual assessment, noise assessment, other amenity impacts, vegetation and fauna, site analysis, and consultation. It was considered that the Warradarge Wind Farm project would meet with the requirements of Planning Bulletin No.67.

Annexure 8 to the original development application (provided as Attachment 12) provided a Planning Compliance Report that included a Compliance Matrix demonstrating the application’s ability to meet the requirements of Planning Bulletin No.67.

Environmental Protection (Clearing of Native Vegetation) Regulations 2004

The proposed wind farm is estimated to require the clearing of 0.7ha of native vegetation. It is noted that there may be exemption under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* given that the proposed clearing would be under 5 ha and does not impact upon any threatened ecological communities and the alignment has been selected to avoid a Priority 4 species in this area.

Section 5 of the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* addresses the issue of prescribed clearing with Regulation 5 Item 1 as follows:

“Clearing of a site for the lawful construction of a building or other structure on a property, being clearing which does not, together with all other limited clearing on the property in the financial year in which the clearing takes place, exceed 5 ha, if —

- (a) the clearing is to the extent necessary; and*
- (b) the vegetation is not riparian vegetation.”*

Officer Comments

It is not considered that there are any significant areas of non-compliance.

The Schedule of Submissions (Attachment 10) that was reviewed by the JDAP in its assessment of the original application provided detail on the issues raised in relation to the proposed Warradarge Wind Farm. The Schedule noted that the objections largely concerned the issues of noise and visual appearance.

Noise

The Noise Impact Assessment prepared for the applicant by Herring Storer Acoustics logged the existing background noise on-site (over a period of six weeks) and models the proposed noise impact (and low frequency noise and infrasound projections) and concluded that the Warradarge Wind Farm would meet with the requirements of the

Environmental Protection (Noise) Regulations 1997 and the 'Wind Farms—Environmental Noise Guidelines—July 2009' (Environmental Protection Authority of South Australia) these being the guidelines recognised by the Department of Environment Regulation. The modelling was undertaken using the conservative criteria of the wind turbine design that emits greatest noise (noting that this design may not be utilised for this project) and incorporated all wind conditions. The closest residence to the application would under the most noise conducive conditions experience 35dB(A) which is in compliance with the relevant regulations and guidelines for noise sensitive premises. It should be noted that in the event that the modelling is found to be inaccurate (undervalued) upon operation of the wind farm it would be the responsibility of the operator to modify the turbine(s) until compliant with the *Environmental Protection (Noise) Regulations 1997*.

The Noise Assessment did indicate that there are some land areas within the 35dB(A) noise contour (being the minimum background noise criteria) which are owned by non-participants of the wind farm development. These areas are within Lots 1, 10849, 10854, 10877, 10878, 10855 and 11017 and this presents a risk to the applicant in the absence of a statutory buffer, as noise sensitive premises would be permitted to 'encroach' into the 35dB(A) noise contour by the Scheme. In relation to this issue, Sections 1.9.3-1.9.5 of the submitted development application report made the following comment:

"Verve Energy has negotiated secure tenure through Option agreements to lease the above lots for the purposes of the Proposal. These leases contain a noise buffer clause that allows for noise to exceed the greater of either 35dB(A) or 5dB(A) above background noise, in areas of land away from noise sensitive premises, such as in-situ houses. This ensures that no future noise sensitive premises will be constructed throughout the life of the wind farm in areas of the Lots where the wind farm may exceed the allowable noise limits.

Verve Energy is negotiating wind farm neighbour agreements with the owners of adjacent Lots (Lots 10849, 10854, 10877 and 10878) to ensure the areas of these lots where the wind farm will be generating noise exceeding 35dB(A) or 5dB(A) above background noise, whichever is greater, will not cause any conflict with any possible future noise sensitive premises.

It should be noted that the final design of the wind farm and its capacity will be dependent on these agreements. Should one or more wind farm neighbour agreements not be reached this will not affect the ability to operate a wind farm, only the position and overall number of turbines within the wind farm envelope."

Further to this, the applicant, upon being made aware of the objections received provided further information on 10 August 2012 and 23 August 2012 that was included within the Schedule of Submissions. The correspondence reiterated the applicant's intent to try and negotiate Neighbour Agreements that agree that no new homes or other noise sensitive receiver premises would be constructed during the lifetime of the wind farm in the identified areas. The applicant also stated that in the event that Neighbour Agreements cannot be reached then they can either:

- a) Relocate the relevant wind turbines to alternative non-optimal locations such that the Warradarge Wind Farm will never exceed the noise limits imposed by the Environmental Protection Authority (EPA) on nearby land; or

- b) Accepting the commercial risk that if the applicant proceeds with the optimal locations for the wind turbines within the project area and if a new house or other noise sensitive property is built near the wind farm, the wind turbines may need to have their output turned down at night to meet the statutory noise limits imposed by the EPA.

Annexure 8 to the submitted development application (Attachment 12) provided a Planning Compliance Report that includes a Compliance Matrix demonstrating the application's ability to meet the requirements of the Environmental Protection Authority – Wind Farms Environmental Noise Guidelines (South Australia) (Noise Guidelines), this being a guide in the assessment of wind farms pending the adoption of a formal policy in Western Australia.

It should also be noted that in addition to the development approval process under the *Planning and Development Act 2005* administered by the Local Government and the Development Assessment Panel, the applicant is also subject to the environmental approval process under the *Environmental Protection Act 1986* administered by the Department of Environment Regulation and the Environmental Protection Authority. The applicant must comply with the requirements of the EPA, the *Environmental Protection Act 1986* and the *Environmental Protection (Noise) Regulations 1997* both for the construction and operational phases irrespective of any conditions related to noise applied through the planning approval.

Visual Appearance:

The second major issue raised in objection to the proposed Warradarge Wind Farm, concerned the issue of visual appearance (the Schedule of Submissions included as Attachment 10 provided further detail on the issues of objection).

The Landscape and Visual Assessment prepared by GHD for the applicant demonstrated that the Warradarge Wind Farm and associated transmission line would not be visible from the Eneabba townsite and would be largely obscured from the Brand Highway. The Visual Assessment did conclude that the visual impact of the Wind Farm would be high within 5km of the site, i.e. the Garibaldi Willis Road and Rose Thomson Road areas, and intervening vegetation and variation in topography will reduce the visibility of the Wind Farm significantly as the radius extends out to 15km, then 25km.

The Landscape and Visual Assessment for the Warradarge Wind Farm (Annexure 2 to the submitted application) confirmed that the development would be visible from the immediately neighbouring properties, and that repositioning of the turbines within the development area would not alter this.

However, it should be noted that the proposed Warradarge Wind Farm site is in proximity to the existing Eneabba to Karara 330kV transmission line that runs through this area which already has a visual impact on the surrounding rural landscape. Further the area in which the proposed wind farm would be sited is not specifically identified as a place of scenic value in either the Coorow or Carnamah Schemes or strategic level planning document.

It might also be argued that the previous establishment of the Emu Downs and Walkaway Wind Farms to the south and north of the Warradarge site has created a growing familiarity and acceptance of applications of this type in the rural areas of the

Mid West, with their economic and energy outputs understood and could even be considered as a point of interest for locals and tourists, rather than a visual blight.

Options/Alternatives

The Shire of Coorow does not consider that there is a reasonable and fair basis for the refusal of the request for an extension of the timeframe for commencement of the development.

The commencement of the Warradarge Wind Farm project would further boost the Mid West region's position as the renewable energy exporting hub for the state of Western Australia, when considered along with the already operational Walkaway Wind Farm, Emu Downs Wind Farm and Greenough Solar Farm, and further to this the approved Chapman Solar Farm and the further potential of a tidal energy project at Horrocks Beach and the Coronation Beach/Oakajee Wind Farm.

Council Recommendation

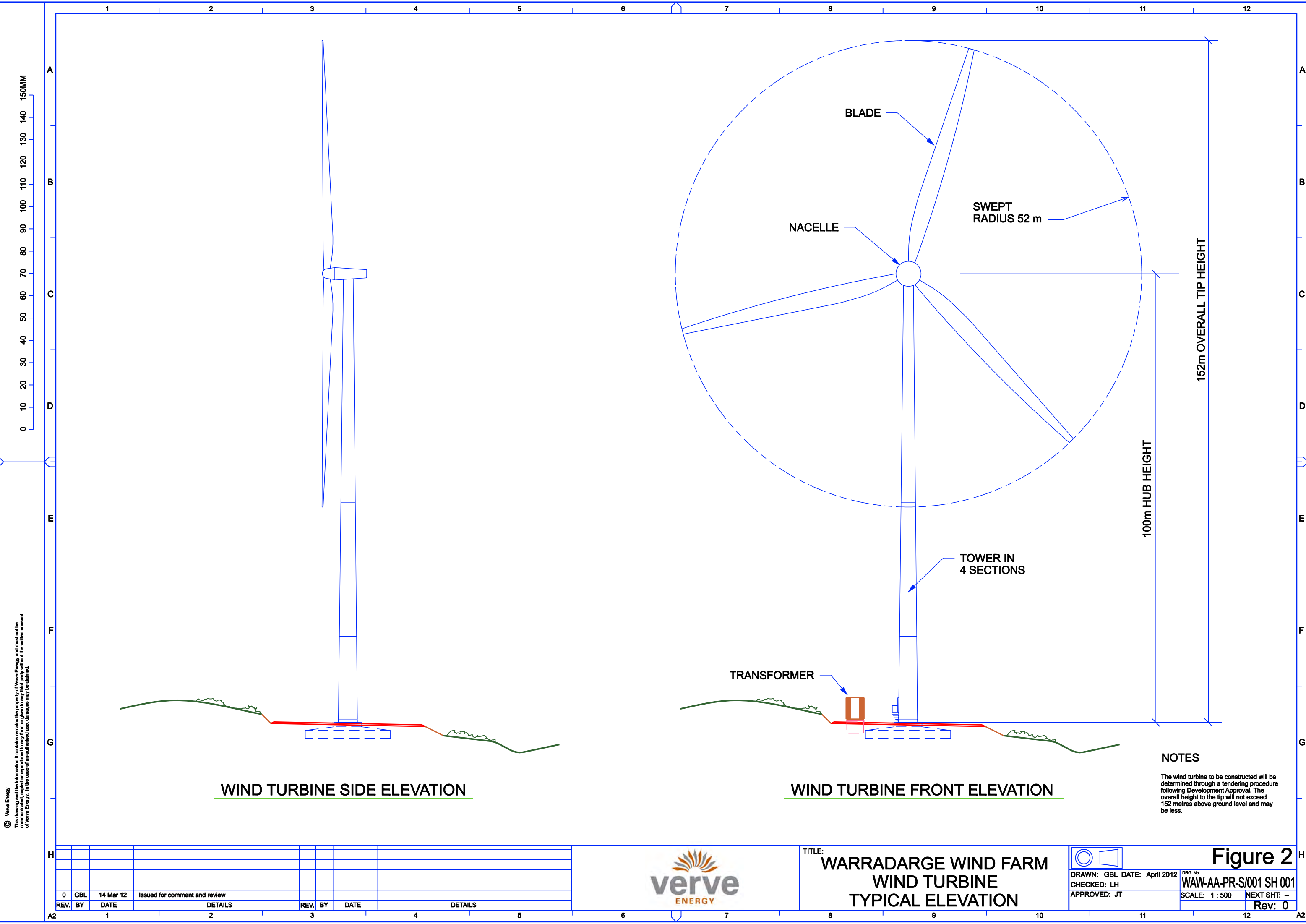
The applicant's request dated 1 May 2017 seeking a 5 year extension to the approval period was presented to the meeting of the Shire of Coorow Council held on 17 May 2017 where it was resolved:

"That Council advise the Development Assessment Panel that it supports the applicant's request for an amendment to Condition 2 of Development Approval DP/12/00625 A2370465 to extend approval for the proposed Warradarge Wind Farm Development for a further 5 years (new commencement date of 31 August 2022)."

Conclusion:

The Shire of Coorow recommends that condition 2 be amended as follows:

- "2. The approved development shall be substantially commenced prior to 31 August 2022 and if the development is not substantially commenced the approval shall lapse and be of no further effect. Where an approval has so lapsed, no development shall be carried out without the further approval of the responsible authority having first been sought and obtained."



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