



Palmer Wind Farm



Variation Application Report

Tilt Renewables Australia Pty Ltd

27 February 2024

→ The Power of Commitment



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Executive summary

This Variation Application Report has been prepared to support Tilt Renewables' application to vary Development Plan Consent (DA 711/072/14, 2014) (Variation Application) for a proposed wind farm development in Palmer, South Australia (the Approved Project).

Tilt Renewables has reviewed the Approved Project layout and identified opportunities to optimise the development with consideration of recent improvements in wind turbine technology. The design review has reduced the maximum number of wind turbines, increased the maximum blade tip height, and optimised the location of civil and electrical elements (the Varied Project).

Tilt Renewables now seeks to progress a Variation Application to incorporate the key aspects of the design review and to allow for recent improvements in wind turbine technology.

The assessments undertaken for the Varied Project to determine the impact of the changes from the Approved Project found that compared to the currently approved development:

- There would be no increased impact to aviation safety
- Despite the change to blade tip height, the reduction in total number of wind turbines would result in an approximately 26% reduction in the total rotor swept area. The revised layout also results in four fewer wind turbines in or near woodlands. The combined effect of these two changes reduces the potential risks for birds and bats.
- The impact on cultural heritage and historic heritage matters remains unchanged
- The impact on Electromagnetic Interference remains unchanged
- There is likely to be a reduced impact on fauna
- There would be an increase in the area of native vegetation removed, however the majority of the vegetation proposed to be removed is of poor quality and efforts have been made to avoid and minimise impacts to high quality native vegetation as much as practicable
- Due to the significantly reduced Project Area, the overall visual impact to the region would be reduced. The larger and taller turbines increase the visual effect in the local area; however, this is offset by a decrease in the visual effect across the sub-regional and regional area due to the reduction in the number of turbines. Overall, the Varied Project results in a significant reduction in visual effects.
- The predicted noise levels have generally decreased, with 76 residences likely to experience a decrease in noise level and seven residences likely to experience a noticeable increase in noise level (5 non-associated residences and 2 associated residences). Despite the increase in noise level at those seven residences, the relevant noise criteria would still be achieved at all 83 residences.
- The projected shadow flicker exceedance would be diminished
- There would be a significantly reduced impact on traffic including a significant reduction in trip generation, and including a greater than 50% reduction in trips of heavy and oversize overmass vehicles

In conclusion, the results of the various impact assessments demonstrate that the overall impact of the Varied Project is similar to or lower than that of the Approved Project. The Varied Project is highly consistent with the Performance Outcomes sought by the Planning & Design Code and displays considerable merit.

The Palmer Wind Farm will provide renewable energy for South Australia and the national grid, along with opportunities for the local region in terms of employment. It is considered that the variation to the Approved Project warrants approval.

Contents

Executive summary	i
List of abbreviations	1
1. Introduction	2
1.1 Purpose of this report	4
1.2 Scope and limitations	4
1.3 Assumptions	4
2. The Project	5
2.1 Subject Land and Locality	5
2.2 Project Description	10
2.3 Project History	11
3. Variation Application	13
3.1 Comparison of Approved and Varied Projects	13
3.2 Basis for variation	16
3.3 Stakeholder engagement	18
3.3.1 Community engagement	18
3.3.1.1 Peramangk People	19
3.3.1.2 Response to feedback	19
3.3.2 Engagement with Government	20
3.3.3 Next steps	22
4. Assessment of impacts	23
4.1 Aviation Impact Assessment	23
4.2 Ecology	23
4.2.1 Flora	24
4.2.2 Fauna	24
4.2.3 Native Vegetation Clearance	25
4.2.4 Bird and Bat Risk Assessment	26
4.3 Cultural Heritage Assessments (Aboriginal and historic)	26
4.4 Electromagnetic Interference (EMI) Assessment	27
4.5 Landscape and Visual Impact Assessment (LVIA)	27
4.6 Noise Impact Assessment (including construction, traffic, and operational noise)	28
4.7 Shadow Flicker and Blade Glint Assessment	28
4.8 Traffic Impact Assessment	29
5. Procedural Matters	31
5.1 Assessment approach	31
5.1.1 The Application	31
5.1.2 Assessment Pathway	31
5.1.3 Relevant Authority	31
5.1.4 Referrals	31
6. Planning assessment	32
6.1 Land use definition	32
6.2 Code assessment	32
6.3 Zone	34

6.3.1	Rural Zone	34
6.4	Overlays	36
6.4.1	Gas and Liquid Petroleum Pipelines Overlay	36
6.4.2	Hazards (Bushfire – Medium Risk) Overlay	39
6.4.3	Hazards (Flooding – Evidence Required) Overlay	42
6.4.4	Heritage Adjacency Overlay	44
6.4.5	Key Outback and Rural Routes Overlay	46
6.4.6	Murray-Darling Basin Overlay	51
6.4.7	Native Vegetation Overlay	51
6.4.8	Prescribed Water Resources Area Overlay	54
6.4.9	River Murray Tributaries Protection Area Overlay	54
6.4.10	State Heritage Place Overlay	54
6.4.11	Water Resources Overlay	56
6.5	General Development Policies	59
6.5.1	Clearance from Overhead Powerlines	59
6.5.2	Design	59
6.5.3	Infrastructure and Renewable Energy Facilities	59
6.5.3.1	Renewable Energy Facilities (Wind Farm)	60
6.5.4	Interface between Land Uses	60
7.	Conditions of Consent and Statement of Commitments	62
7.1	Current conditions for the Approved Project	62
7.2	Statement of Commitments	66
8.	Conclusion	68
9.	References	70

Table index

Table 1	Palmer Wind Farm Parcels (Varied Project)	7
Table 2	Comparison of the Varied Project Details with the Approved Project Details from the Amended Consolidated Particulars of Development	13
Table 3	Number of dwellings in proximity to the Approved Project compared to the Varied Project	16
Table 4	Approved wind farms with a tip height of 220 m or taller	17
Table 5	Summary of engagement with community groups	18
Table 6	Summary of engagement with Government	20
Table 7	Comparative Assessment of projected total one-way trip generation	29
Table 8	Response to Performance Outcomes of the Rural Zone	34
Table 9	Response to Performance Outcomes for the Gas and Liquid Petroleum Pipelines Overlay	36
Table 10	Response to Performance Outcomes for the Hazards (Bushfire – Medium Risk) Overlay	39
Table 11	Response to Performance Outcomes of the Hazards (Flooding – Evidence Required) Overlay	42
Table 12	Relevant State and Local Heritage Places	44
Table 13	Response to Performance Outcomes of the Heritage Adjacency Overlay	44
Table 14	Response to the Performance Outcomes of the Key Outback and Rural Routes Overlay	46

Table 15	Response to Performance Outcomes of the Native Vegetation Overlay	51
Table 16	Response to the Performance Outcomes of the State Heritage Place Overlay	56
Table 17	Conditions imposed upon the Development Plan Consent by the ERDC and proposed Variation	62
Table 18	Proposed variations to Statement of Commitments	66
Table 19	Comparison of land parcels between Approved Project and Varied Project	74

Figure index

Figure 1	Varied Project – Wind Farm Location	3
Figure 2	Comparison of Varied Project Area with the Approved Project Area	6
Figure 3	Varied Project Local context	9
Figure 4	Overview of project history	12
Figure 5	Hierarchy of Policies – Part 1, Planning and Design Code	33
Figure 6	Planning Zones	35
Figure 7	Gas and Liquid Petroleum Pipelines Overlay	38
Figure 8	Hazards (Bushfire – Medium Risk) Overlay	41
Figure 9	Hazards (Flooding – Evidence Required) Overlay	43
Figure 10	Heritage Adjacency Overlay	45
Figure 11	Key Outback and Rural Routes Overlay	50
Figure 12	Native Vegetation Overlay	53
Figure 13	State Heritage Places Overlay	55
Figure 14	Water Resources Overlay	58

Appendices

Appendix A	Ministerial Call-In Letter
Appendix B	Approved Project Parcels
Appendix C	Approved vs Varied Project Layout Figures
Appendix D	Development Plans
Appendix E	Statement of Commitments
Appendix F	Aviation Impact Assessment
Appendix G	Cultural Heritage (Aboriginal and Historic) Assessment
Appendix H	Electromagnetic Interference (EMI) Assessment
Appendix I	Flora and Fauna Impact Assessment
Appendix J	Native Vegetation Clearance Report
Appendix K	Bird and Bat Risk Assessment
Appendix L	Landscape and Visual Impact Assessment
Appendix M	Noise Impact Assessment
Appendix N	Shadow Flicker and Blade Glint Assessment
Appendix O	Traffic Impact Assessment

List of abbreviations

BoM	Bureau of Meteorology
CEMP	Construction Environment Management Plan
CFS	South Australian Country Fire Service
Cwth	Commonwealth
DCCEEW	Department of Climate Change, Energy, the Environment and Water (Cwth)
DEM	Department for Energy and Mining (SA)
DEW	Department for Environment and Water (SA)
DIT	Department for Infrastructure and Transport (SA)
DTI PLUS	Department for Trade and Investment, (Planning and Land Use Services Directorate), (SA)
EMI	Electromagnetic Interference
EPA	Environment Protection Authority (SA)
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i> (Cwth)
ERDC	Environment, Resources and Development Court (SA)
INTG	Iron-grass (<i>Lomandra sp.</i>) natural temperate grasslands
LVIA	Landscape and Visual Impact Assessment
NPW Act	<i>National Parks and Wildlife Act (1972)</i> (SA)
PBGW	Peppermint Box (<i>Eucalyptus odorata</i>) grassy woodlands
PDI Act	<i>Planning, Development and Infrastructure Act 2016</i> (SA)
RTCC	Radar Terrain Clearance Chart
SA	South Australia
SCAP	State Commission Assessment Panel (SA)
TEC	Threatened Ecological Community
WTG	Wind turbine generator
ZTVI	Zone of Theoretical Visual Influence

1. Introduction

This Variation Application report for the Palmer Wind Farm Project (the Project) has been prepared by GHD Pty Ltd (GHD) on behalf of Tilt Renewables Australia Pty Ltd as Trustee for Palmer Wind Farm Project Trust (Tilt Renewables).

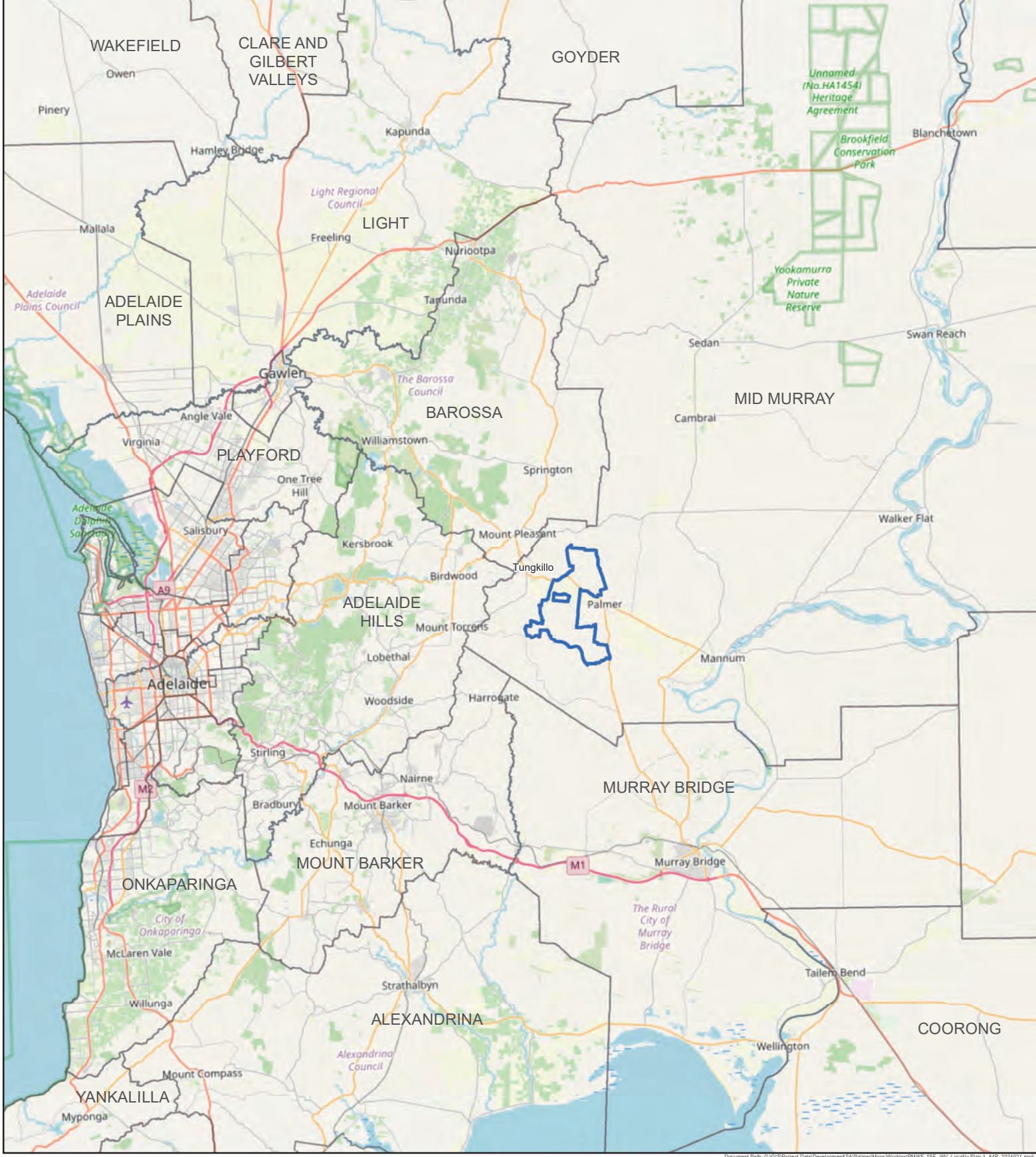
The Palmer Wind Farm is proposed to be located approximately 50 kilometres (km) east of Adelaide, to the west of Palmer (Figure 1) and would generate enough clean energy to power up to 144,000 South Australian homes. The Project would include wind turbine generators (WTGs) and associated infrastructure such as substations and internal overhead lines and would connect into the existing switching yard at Tungkillo. The Project would bring investment and benefits focused on the surrounding community.

Tilt Renewables obtained Development Plan Consent for the Project (DA 711/072/14, 2014) from Mid Murray Council in December 2015¹. Following an appeal against the decision, the South Australian Environment, Resources and Development Court (ERDC) granted Development Plan Consent for the Project (with a layout incorporating up to 103 WTGs, with a maximum tip height of 165 metres (m)) on 7 March 2018² (the Approved Project). The South Australian Supreme Court upheld the decision of the ERDC on 15 November 2019.

Following work to optimise the wind farm and adopt significant technological improvements that have been made since grant of the original Development Plan Consent for the Approved Project, Tilt Renewables proposes to vary the Approved Project to reduce its footprint and the number of WTGs from up to 103 WTGs to up to 40 WTGs and increase the maximum tip height from up to 165 m to up to 220 m (the Varied Project). Consistent with the Approved Project, the Varied Project is expected to generate approximately 288 megawatts (MW) of electricity, which will be fed into South Australia's electricity network via internal electrical transmission infrastructure to the existing Tungkillo Switching Station operated by ElectraNet.

¹ The Applicant for the Development Plan Consent was Trustpower Australia Holdings Pty Ltd, a former entity name of Tilt Renewables.

² *McLachlan & Ors v Mid Murray Council & Tilt Renewables Australia Pty Ltd* [2018] SAERDC 15.



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Legend

- Project Area
- Local Government Area

Note 1. Design for discussion purposes only and subject to further revision

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Palmer Wind Farm
Figure 1. Varied Project - Wind Farm Location



1.1 Purpose of this report

This report has been prepared by GHD for Tilt Renewables based upon information provided by Tilt Renewables to GHD. This report will be included by Tilt Renewables as part of a lodgement package for a Development Application for the variation of the existing Development Plan Consent for the Project.

1.2 Scope and limitations

This application has been prepared by GHD Pty Ltd (GHD) for Tilt Renewables Pty Ltd (Tilt Renewables) and may only be used and relied on by Tilt Renewables and the responsible authority to whom the application for a variation to a planning consent must be made to, and any referral authorities to whom the responsible authority must refer the application to (as required by the *Planning, Development and Infrastructure Act 2016*), for the purpose agreed between GHD and Tilt Renewables as set out in section 1.1 'Purpose of this report'.

The opinions, conclusions, and any recommendations in this application are based on assumptions made by GHD and described within this application. GHD disclaims liability arising from any of the assumptions being incorrect. GHD otherwise disclaims responsibility and liability to any other person or entity other than Tilt Renewables arising in connection with this application for a variation to a planning consent. GHD also excludes implied warranties and conditions, to the extent legally permissible.

GHD has prepared this application based on information provided by Tilt Renewables and others that was available at the time of preparation of this application. GHD has not independently verified or checked this information beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the application which were caused by errors or omissions in that information. GHD has no responsibility or obligation to update this application to account for events or changes occurring subsequent to the date that the application was prepared.

1.3 Assumptions

GHD has made the following assumptions during the writing of this Variation Application report:

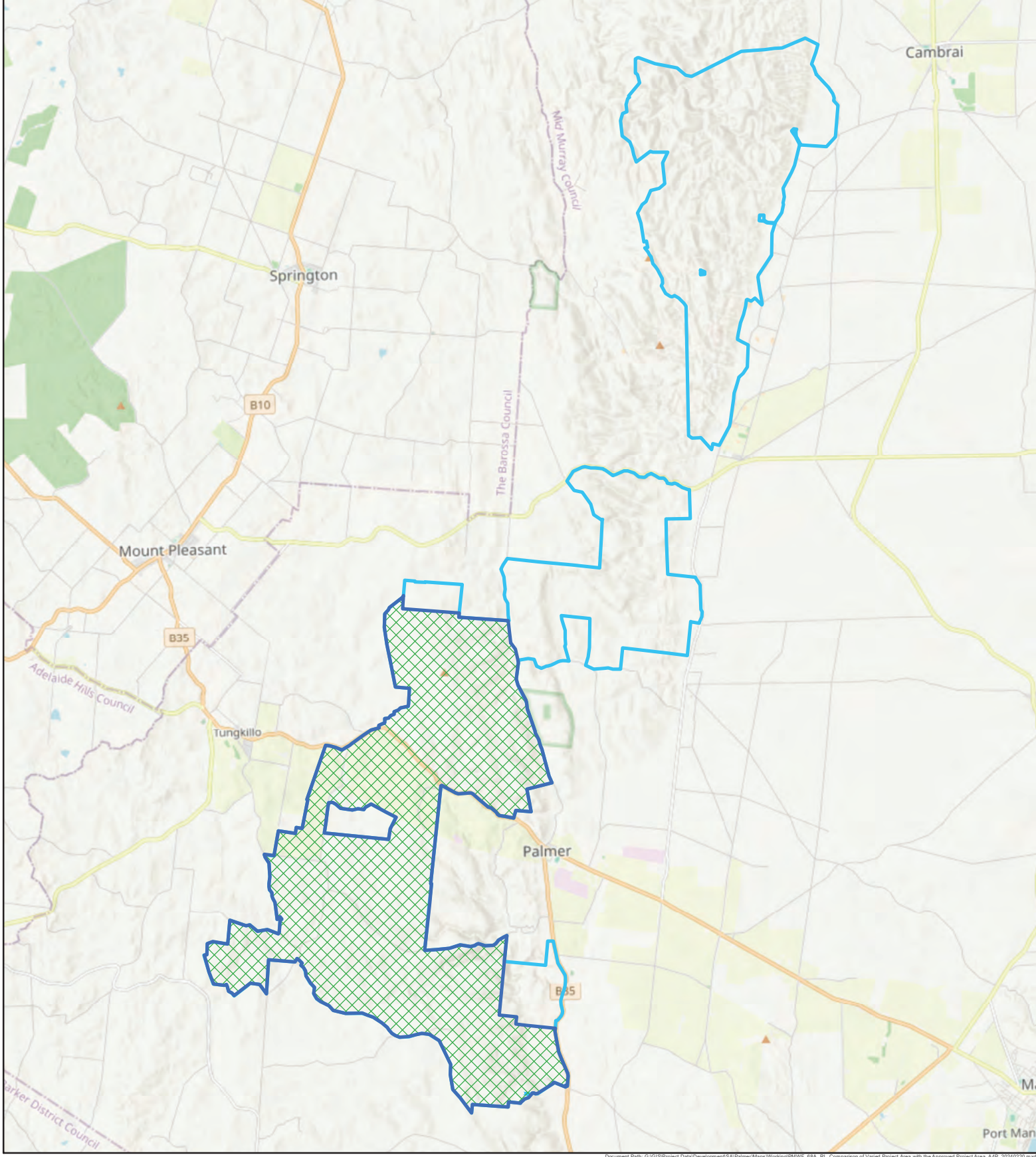
- *All, technical specialist reports and other related documents and data provided by Tilt Renewables (including shapefiles and associated metadata) have been assumed to be accurate and are not required to be independently verified.*

2. The Project

2.1 Subject Land and Locality

The Project is located approximately 50 km east of the Adelaide CBD, between Tungkillo to the west, and Palmer to the east. Both Tungkillo and Palmer are small communities that are primarily residential, with some non-residential land uses typical of communities of this size including schools, hotels and general stores.

The Approved Project incorporated 3 clusters of WTGs described as Area A, Area B and Area C located on several land parcels listed in Appendix B. The locations of Area A, Area B and Area C can be seen in the comparative layout plans in Appendix C. The Varied Project reduces the Approved Project Area by removing Area A, and some parcels from Areas B and C.



Legend

- Varied Project Area
- Approved Project Area

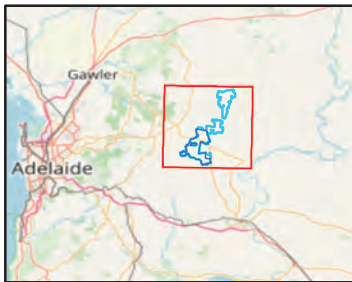
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Palmer Wind Farm

Figure 2. Comparison of Varied Project Area with the Approved Project Area



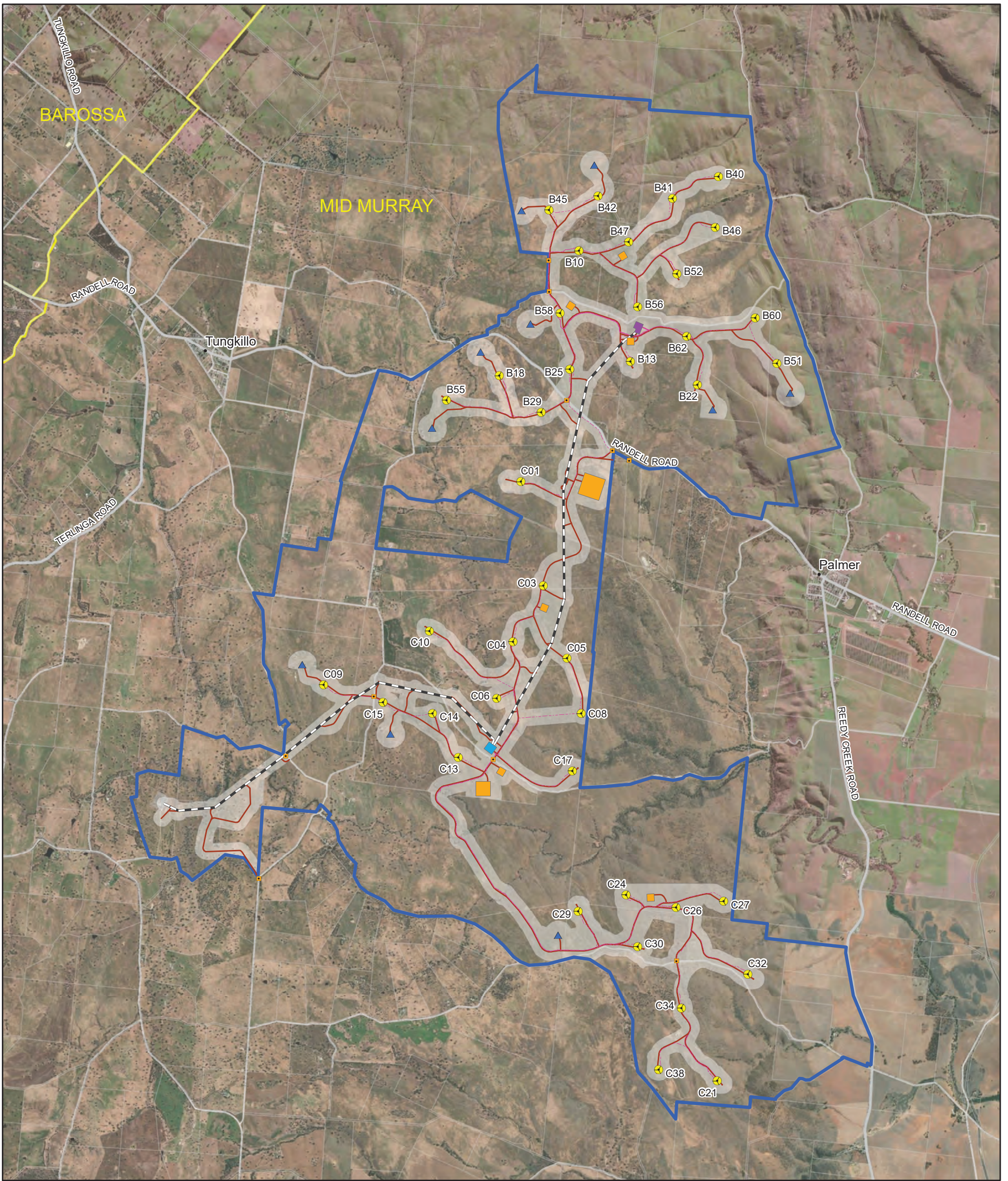
Figure 2 shows a comparison of the Varied Project Area and the Approved Project Area.

The Varied Project Area will be contained on the parcels detailed in Table 1 and is depicted in Figure 3.

Table 1 Palmer Wind Farm Parcels (Varied Project)

Parcel	Title Reference
D26866 A1	5144/864
D20944 A74	5153/319
F157755 A30	5297/468
F157755 A31	5297/468
F157755 A32	5297/468
F157755 A33	5297/468
H171000 S481	5385/990
H171000 S482	5385/990
F169891 A142	5404/721
F204303 A91	5405/94
F204303 A92	5405/94
F204303 A93	5405/94
F204303 A94	5405/94
F204303 Q95	5405/94
F204303 Q96	5405/94
D47145 A62	5408/141
H171000 S214	5409/144
F157574 A39	5421/814
F157582 A47	5421/813
F157583 A48	5421/812
H171000 B480	5421/815
H171000 S241	5433/293
H171000 S242	5433/294
H171000 S243	5433/702
H171000 S211	5473/924
H171000 S72	5479/260
H171000 S358	5578/297
F169873 A124	5732/435
F217815 A200	5756/275
F217815 A201	5756/276
F217815 A202	5756/277
F217815 A203	5756/278
F217815 A204	5756/279
F217815 A205	5756/280
H170500 S344	5761/336
H171000 S513	5762/33
F218333 A17	5844/707

Parcel	Title Reference
F218333 A18	5844/707
F218333 A19	5844/707
F218333 A20	5844/707
F218333 A21	5844/707
F218333 A22	5844/707
F169981 A232	5861/704
R4658 AA	5866/948
F43319 A23	5874/60
F169983 A234	5876/758
D1648 A9	5895/897
F169884 A135	5895/323
D20944 A75	5897/853
F169886 A137	5899/987
F43319 A20	5906/60
F43319 A21	5906/61
F43319 A22	5906/62
F43319 A26	5906/64
F43319 Q24	5906/63
F43319 Q25	5906/63
H171000 S483	6055/389
H171000 S485	6055/390
F157552 A17	6081/943
H171000 S488	6088/441
D17736 A102	6120/424
D113198 A10	6184/936
D119394 A20	6217/616
D119394 A21	6217/618
D120933 A201	6230/76



Legend

- Indicative WTG Location
- ▲ Indicative Permanent Met Mast Location
- Indicative Site Access Point
- Indicative Access Track
- - - Indicative Underground Cable
- - - Indicative 275kV Transmission Line
- Indicative Construction Compound/Batch Plant/Laydown Area
- Indicative Northern Substation/O&M Facility
- Indicative Southern Substation
- Varied Project Area
- Micrositing Area - WTGs and Other Infrastructure
- State Roads
- Other Roads
- Local Government Areas

Note 1. Indicative design for discussion purposes only and subject to further revision

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Palmer Wind Farm

Figure 3. Varied Project - Local Context



The land parcels which form the basis of the Varied Project Area are typical of the rural environment of the Eastern Mount Lofty Ranges, with undulating hills throughout. Rocky outcrops are present throughout the Varied Project Area along with scattered patches of vegetation and trees.

Within and surrounding the Varied Project Area land parcels are used for rural activities. Most of these parcels are used for grazing purposes, with there being no evidence of any large-scale cropping within or in proximity to the Varied Project Area.

Tilt Renewables has confirmed that during the construction and operation of the Varied Project, parcels within the Varied Project Area can continue to support land uses such as grazing, except where required for construction safety or areas of infrastructure required for the operation of the Varied Project.

2.2 Project Description

Both the Approved Project and Varied Project consider the development of a wind farm within the subject land and fundamentally the elements of the development remain unchanged from the Approved Project. Tilt Renewables is not proposing additional project components that were not considered as part of the assessment and approval of the Approved Project.

The Project aims to take advantage of the elevation of the Mount Lofty Ranges that enables the capture of favourable wind resource. Technical design parameters associated with the advancement of wind turbine technology and changes to the regulatory framework for the development of renewable energy projects (e.g. setback distances specified by the Planning and Design Code (the Code)), have been factored into layout of the key project components that are proposed as part of the Varied Project.

The Variation Application proposes a reduction in the maximum number of wind turbines from 103 to 40, with an associated 48% reduction to the Project Area, from approximately 11,733 hectares (ha) to approximately 6,057 ha. Due to advancements in technology since 2014, the reduced number of turbines will maintain a similar energy generation capacity (approximately 288 MW) to the Approved Project.

The Varied Project is summarised as follows:

- Up to forty (40) WTGs distributed approximately 13 km from north to south along the flank of the Eastern Mount Lofty Ranges, in a Varied Project Area of approximately 6,057 ha
- The WTGs are three-bladed, variable speed, pitch regulated machines with a rotor and nacelle mounted on a cylindrical steel tower
- WTGs distributed in two clusters:
 - Area B (central) – 19 WTGs
 - Area C (southern) – 21 WTGs
- Maximum overall height of the WTGs (to blade tip) of up to 220 m
- Overall electricity generation capacity of approximately 288 MW
- Each WTG sited within a hardstand area of approximately 80 m x 40 m
- A network of internal access tracks of up to 10 m carriageway width, linking wind farm infrastructure and to provide access to and from public roads
- Underground 33 kilovolt (kV) transmission cables and fibre optic cabling
- Overhead 33 kV transmission lines comprised of up to 2 circuits (6 conductors) on a single pole with steel poles of up to 30 m in height and spaced approximately 250-300 m apart
- Overhead 275 kV transmission line approximately 12 km in length, comprised of lattice towers up to 55 m high and spaced approximately 300-600 m apart
- Substation, operations, and maintenance facilities occupying a total site area of approximately 5.5 ha and consisting of:
 - Two permanent 33 kV / 275 kV substations, each approximately 150 m x 150 m
 - Operations and Maintenance Facility of approximately 100 m x 100 m and including buildings, car park, and workshop

- Up to 5 permanent meteorological masts (met masts) approximately 130 m in height along with up to 5 temporary met masts placed at WTG sites and to be dismantled prior to operational status being achieved

A comparison of changes between the Approved Project and the proposed Varied Project is provided in section 3.1.

2.3 Project History

Plans for the Project were originally developed by Trustpower Australia Holdings Pty Ltd, prior to its change of name to Tilt Renewables Australia Pty Ltd in 2016.

Investigations into the Project were commenced in 2009, with a Development Application lodged with the Mid Murray Council pursuant to the *Development Act 1993* in February 2014 for a layout of 114 wind turbines. Following grant of the Development Plan Consent in December 2015, the approval was appealed, and the Approved Project was updated to address matters raised. This resulted in a 103-wind turbine layout being approved by the ERDC in March 2018, subject to conditions set out in the ERDC Orders dated 7 March 2018³.

The South Australian Supreme Court upheld the decision of the ERDC on 15 November 2019.

The Approved Project is therefore described in the document entitled 'Amended Consolidated Particulars of Development', referred to as 'exhibit 2R1' in the ERDC Orders. The conditions that apply to the Approved Project are the conditions set out in the ERDC Orders. The ERDC Orders are discussed in relation to the Varied Project at Section 7.

An overview of the history of the Project is provided in Figure 4.

³ *McLachlan & Ors v Mid Murray Council & Tilt Renewables Australia Pty Ltd* [2018] SAERDC 15.

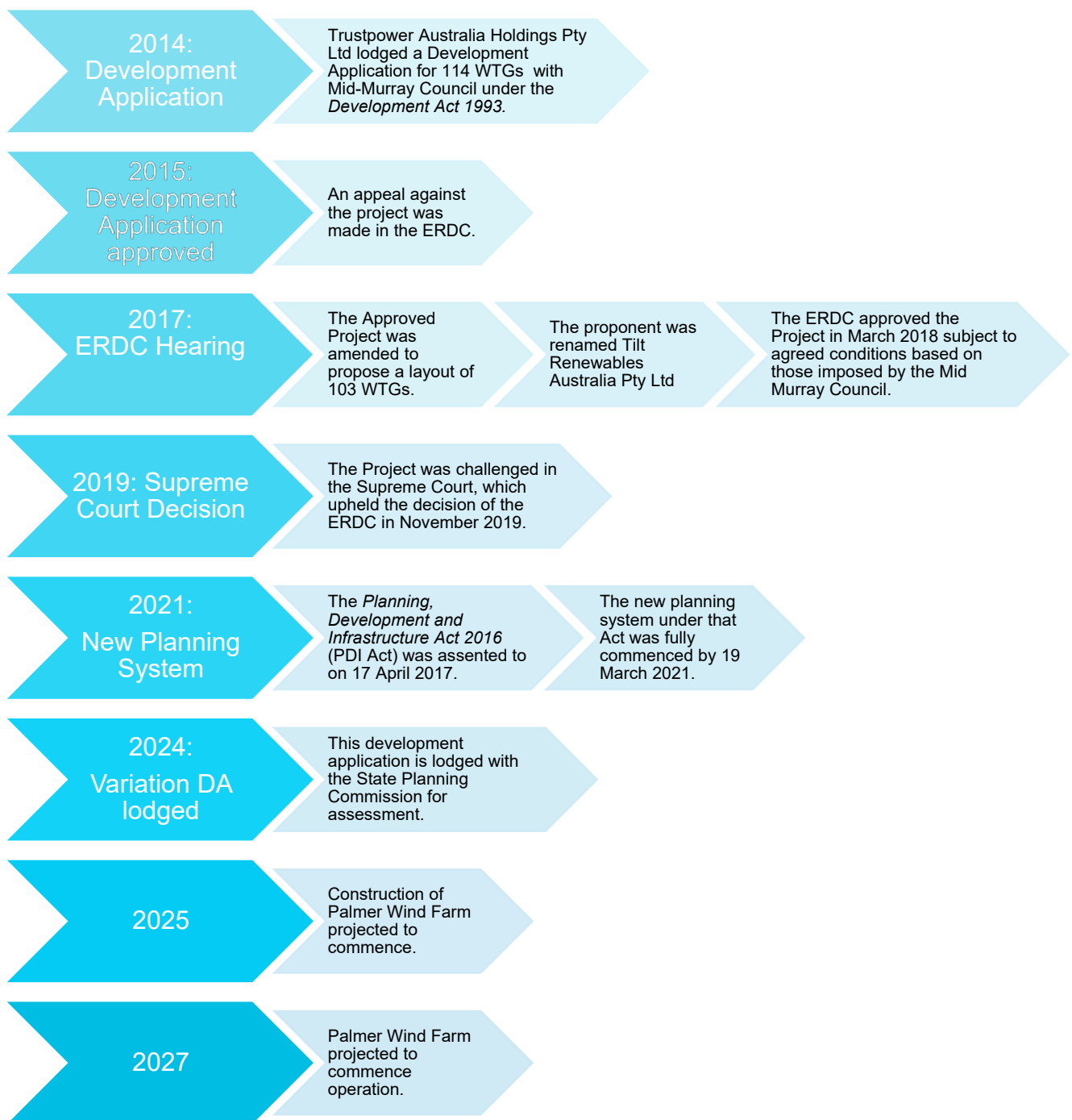


Figure 4 Overview of project history

Following the Supreme Court decision, Tilt Renewables undertook a review of the design and layout of the Approved Project to optimise the favourable wind conditions of the site and advances in wind turbine technology since the lodgement of the original Development Application in 2014.

Furthermore, since the lodgement of the original Development Application, the *Planning, Development and Infrastructure Act 2016* (the PDI Act) has superseded the *Development Act 1993*. The PDI Act, associated regulations and legislative instruments therefore form the basis for the assessment of the Variation Application.

3. Variation Application

Since the approval of the Approved Project, Tilt Renewables has undertaken a review of the design and layout of the Approved Project to optimise the favourable wind conditions of the site and advances in wind turbine technology since the original Development Application was lodged in 2014.

The initial application for the Approved Project was lodged with Mid Murray Council, in accordance with the provisions of the *Development Act 1993*. Since then, the introduction of the PDI Act has facilitated the introduction of the Code which now replaces the policy previously contained in Development Plans. As part of the Code’s introduction, the State Planning Commission included a revision and update to the policy relating to renewable energy projects.

Tilt Renewables is lodging a Variation Application pursuant to the PDI Act to amend the Approved Project to reduce the size of the Project Area, reduce the maximum number of turbines, increase the maximum blade tip height, and other associated changes to the internal wind farm infrastructure within the Varied Project Area.

Following consultation with Mid Murray Council and the Department for Trade and Investment (Planning and Land Use Services Directorate), the Minister for Planning called in the Project on 3 June 2023 for the Variation Application to be assessed by the State Planning Commission in accordance with Section 94(2)(g) of the PDI Act. This pathway was determined by the Minister for Planning who considered that it was ‘otherwise necessary or appropriate for the proper assessment of the proposed development’ (refer to Appendix A).

3.1 Comparison of Approved and Varied Projects

A comparison of the specific infrastructure elements that form the Varied Project to those initially proposed as part of the Approved Project is provided in Table 2.

Table 2 Comparison of the Varied Project Details with the Approved Project Details from the Amended Consolidated Particulars of Development

Element	Approved Project	Varied Project
Wind Farm	Up to 103 WTGs and associated infrastructure across three clusters. The indicative layout comprises the following distribution: – Area A (northern) – 15 WTGs; – Area B (central) – 50 WTGs; and – Area C (southern) – 38 WTGs Approximate generation capacity of up to 340 MW (depending on the final turbine selected)	Up to 40 WTGs across two clusters. The indicative layout comprises the following distribution: – Area B (central) – 19 WTGs; and – Area C (southern) – 21 WTGs Approximate generation capacity of up to 288 MW (dependent on capacity at Tungkillio Switchyard).
Wind Turbines	Maximum Height (to blade tip) – 165 m. Blade Length –approximately 65 m. Tower/Hub Height –approximately 100 m. Footings may be either a mass concrete footing (raft style), piled type rock anchors or a combination of both. Depending on final design the footings will be 21 – 22 m diameter (mass concrete) or 8 – 12 m diameter for a rock anchor type.	Maximum Height (to blade tip) – 220 m. Blade Length – max. 90 m. Tower/Hub Height – max. 130 m. WTG Foundation – approximate diameter of 26 m (dependent of final turbine design and site-specific loads assessment).
WTG laydown & Hardstand area	An area of approximately 50 m x 30 m around each turbine for footings and crane hardstand areas and an additional 20 m x 20 m adjacent the turbine footings for laydown area. The footings and hardstand area will be a permanent feature. The laydown area will be revegetated following construction.	WTG Hardstand (inclusive of foundation) – approximately 80 m x 40 m. Blade Laydown Area –approximately 20 m x 92 m. Auxiliary Crane & Boom Pad –approximately 45 m x 16m

Element	Approved Project	Varied Project
External Electrical Transformers	A pad mounted enclosed transformer (kiosk) located at the base of each turbine. Approximate dimensions (4 m long x 2 m wide x 2 m high).	Not required as transformers are located within the nacelle of the selected turbine.
Site Access	On-site access tracks will be up to 10 m wide to accommodate construction activities and cranes.	The carriageway of on-site access tracks will be up to 10 m wide to accommodate construction activities and cranes.
Underground 33 kV and fibre optic cabling	Trench width approximately 500 millimetre (mm) per circuit and depth –approximately 1.2 m (minimum of 900 mm coverage over top of cable). Trench impact area of 5 m width for a single cable alignment + 1 m for each additional cable.	Trench width approximately 500 mm per circuit and depth –approximately 1.2 m (minimum of 900 mm coverage over top of cable). Trench impact area of 15 m width for a single cable alignment + 3 m for each additional cable.
Overhead 33 kV transmission lines	Comprise up to 2 circuits (6 conductors) on a single pole line with steel poles of up to 30 m in height and spaced approximately 250 – 300 m apart. There will be an underground / overhead terminal station at the poles where the underground 33 kV cables terminate and transition to the overhead line. Associated minor connection equipment and structures as may be required to transition between underground and overhead lines.	Comprise up to 2 circuits (6 conductors) on a single pole line with steel poles of up to 30 m in height and spaced approximately 250 – 300 m apart. There will be an underground / overhead terminal station at the poles where the underground 33 kV cables terminate and transition to the overhead line. Associated minor connection equipment and structures as may be required to transition between underground and overhead lines. Where pole and/or tower locations are located away from the site access tracks, 4 m wide access tracks to the pole and/or tower will be required. Pole hardstands –approximately 25 m x 25 m.
Overhead 275 kV transmission line	Approximate total length of 10 km. It will comprise of either lattice towers up to 46 m high (similar to existing high voltage towers in the area) or steel or spun concrete monopoles and spaced approximately 275 – 375 m apart. The impact areas will be up to 10 m x 10 m for the lattice towers and 5 m x 5 m for the monopole locations.	Approximate total length 12 km. It will comprise of lattice towers up to 55 m high (similar to existing high voltage towers in the area), spaced approximately 300 – 600 m apart. Where pole and/or tower locations are located away from the site access tracks, 4 m wide access tracks to the pole and/or tower will be required. Lattice tower impact area –approximately 30 m x 30 m.
Substation and Operations and Maintenance Facilities	One permanent 33 kV / 275 kV substation with approximate dimensions of 150 m x 150 m co-located with a permanent Operations and Maintenance Facility of approximately 100 m x 100 m. Total area approximately 3.25 ha. The Operations and Maintenance Facility will include: <ul style="list-style-type: none"> – Buildings (including office, control room, staff facilities) – Car park area for staff and visitors – Workshop 	Two permanent 33 kV / 275 kV substation with approximate dimensions of 150 m x 150 m co-located with a permanent Operations and Maintenance Facility of approximately 100 m x 100 m. Total area approximately 5.5 ha. The Operations and Maintenance Facility will include: <ul style="list-style-type: none"> – Buildings (including office, control room, staff facilities) – Car park area for staff and visitors – Workshop

Element	Approved Project	Varied Project
Meteorological masts	Up to seven permanent masts These will be approximately 100 m in height and at the same height as the constructed WTG hub height.	Up to five permanent masts (noting that while there are 10 indicative locations depicted in the Varied Project layout, up to 5 of the 10 will be installed). These will be approximately 130 m in height and at the same height as the constructed WTG hub height. Up to 5 temporary calibration masts These will be approximately 130 m in height and at the same height as the constructed WTG hub height (noting that there are 9 indicative locations depicted in the Varied Project layout, up to 5 of the 9 will be installed).
Temporary Construction Compounds	One main temporary construction compound of up to 300 m x 300 m in area. The size will depend on the facilities required which may include: <ul style="list-style-type: none"> – Site office and staff facilities – Amenities – workshops – Car park – Laydown area (20 m x20 m) Up to three additional smaller, satellite temporary construction areas mainly used for laydown areas and staff offices / amenities.	One main temporary construction compound of up to 300 m x 300 m in area. The size will depend on the facilities required which may include: <ul style="list-style-type: none"> – Site office and staff facilities – Amenities – workshops – Car park – Laydown area Two temporary substation construction compounds, one up to 100 m x 100 m and one up to 200 m x 200 m in area. Up to five (100 m x 100 m), satellite temporary construction areas mainly used for laydown areas.
Concrete Batching Plants	Up to three temporary concrete batching plants of around 100 m x 100 m may be required (if concrete is not sourced offsite).	Up to three of the satellite temporary construction areas may include a temporary concrete batching plant (with an approximate area of 100 m x 100 m (if concrete is not sourced offsite)).
Public Road Improvements	Access routes for all over-dimensional vehicles will be limited to those specified in the Traffic Management Plan. Roads and intersections will be upgraded to meet load and safety standards as required and agreed in the management plan. Public road access will require road upgrades to a width of 6 m and a 1 m shoulder either side where needed. Localised widening in excess of 6 m may be required to support transport and construction activity such as passing bays. All public roads will be left in good repair following construction as agreed in the management plan. All access routes will be subject to Department for Infrastructure and Transport (DIT) and Council agreement.	Access routes for all over-dimensional vehicles will be limited to those specified in the Traffic Impact Assessment for the Varied Project (refer to Appendix O). Roads and intersections will be upgraded to meet load and safety standards as required and agreed in the management plan. Public road access will require road upgrades to a width of 6 m and a 1 m shoulder either side where needed. Localised widening in excess of 6 m may be required to support transport and construction activity such as passing bays. All public roads will be left in good repair following construction as agreed in the management plan. All access routes will be subject to DIT and Council agreement.

As discussed further in the Variation Application, proximity to the wind farm infrastructure is a key determinant of the likely impacts associated with the Varied Project (refer to Section 4). The siting and design of infrastructure has been undertaken such to both maximise the separation distance between nearby dwellings and project infrastructure and align with the setback requirements of the Code.

A comparison of the number of dwellings⁴ in proximity to two critical elements of the Varied Project, the wind turbines and the overhead transmission line, compared to that of the Approved Project are shown in Table 3 for reference.

⁴ It is noted that as part of the planning for the Variation Application, Tilt Renewables undertook a process to validate historical datasets in relation to dwellings in existence (or subject to planning approval) in the vicinity of the Varied Project Area. Due to the larger number of

Table 3 Number of dwellings in proximity to the Approved Project compared to the Varied Project

Element		Number of dwellings within separation distance	
		<1.5 km	1.5km to 3km
Wind turbines	Approved Project	28	160
	Varied Project	16	67
	Difference	-12	-93
Overhead transmission line	Approved Project	83	77
	Varied Project	22	39
	Difference	-61	-38

As identified in Table 3, the Varied Project would result in a significant reduction in the number of wind turbines and the occurrence of the proposed overhead transmission line in proximity to nearby dwellings. For example, there would be a 58% reduction in the number of dwellings within 3 km of a wind turbine as part of the Varied Project and a 49% reduction in the number of dwellings within 3 km of the overhead transmission line. It is noted that of the 16 dwellings within 1.5 km of a wind turbine proposed as part of the Varied Project, all respective landowners have an agreement in place with Tilt Renewables for the development of the Project.

3.2 Basis for variation

Since the initial approval of the Project in 2015, notable advancements in wind turbine technology have emerged. It has therefore become necessary to amend the Approved Project to keep pace with opportunities to enhance energy generation efficiency while using fewer WTGs and reducing impacts on the environment and surrounds. Tilt Renewables has optimised the design of the Approved Palmer Wind Farm in response to this opportunity, resulting in a reduction of 63 WTGs whilst maintaining a similar amount of clean energy output. Using the more efficient WTG models now proposed as part of the Varied Project will ultimately result in lower cost energy from the Project, with clear benefits to the end user and energy consumer while enabling the most beneficial use of the land.

The height of the WTGs of the Approved Project (up to 165 m in height) included some of the largest wind turbines on the market at the time of application. Wind farm technology, as is true for the broader renewable energy generation sector, is a rapidly evolving industry. Increased global uptake is driving greater efficiency which is resulting in larger and more efficient wind turbine models that can produce energy at a lower cost per unit.

The additional information provided in this Variation Application reflects a level of maturation of the wind industry in both South Australia and more broadly in Australia. Since the design of the Approved Project, trends in wind farm technology have seen the industry move to the use of larger turbines with greater blade tip heights, which allow significantly more energy generation per turbine.

Table 3 below lists several wind farms in Australia which have already been approved or constructed with larger turbines. The burgeoning wind farm industry now includes several large-scale projects in South Australia that have completed construction with many lessons learned, particularly in terms of constructability.

dwellings within the townships of Palmer and Tungkillo, representative dwellings have been used to inform residents of the likely impacts of the Varied Project. Specifically, representative dwellings are shown for the Township Zone (R128) and Rural Neighbourhood Zone (R286) of Palmer and the Township Zone (R287) and Rural Neighbourhood Zone (R289) of Tungkillo. All dwellings within the Rural Zone have been recorded as individual dwellings and assessed on this basis.

Table 4 Approved wind farms with a tip height of 220 m or taller

Project	Location	Approved Turbine Tip Height (m)	# Turbines	Year of approval
South Australia				
Yorke Peninsula Energy Hub (formerly Ceres Wind Farm)	Yorke Peninsula	220	100	2019
Goyder South Hybrid Renewable Energy Facility (Stages 1A/1B, 2/3)	South of Burra	240	163	2021
Crystal Brook Wind Farm	3.5 km north of Crystal Brook	240	25	2019
Victoria				
Golden Plains Wind Farm	South and south-east of Rokewood in the Golden Plains Shire	230	228	2018
Murra Warra Wind Farm (Stage I and II)	Northwestern Victoria, 25 km north of Horsham	220	99	2016
Wimmera Plains Energy Facility	10 km northeast of Horsham in western Victoria	247	52	2021
New South Wales				
Yanco Delta Wind Farm	Jerilderie in the Riverina region	270	208	2023
Uungula Wind Farm	14 km east of Wellington	250	97	2021
Queensland				
Clarke Creek Wind Farm	150 km north-west of Rockhampton	220	195	2018
Kaban Green power Hub	Atherton Tablelands	226	28	2018
Forest Wind	Australia's largest exotic pine plantation, between Maryborough and Gympie, in the Wide Bay region	295	226	2020

Tilt Renewables has also been able to apply recent construction experience to the design of the Varied Project as it is currently constructing the 396 MW Rye Park Wind Farm (NSW) and has in recent years completed construction of the 336 MW Dundonnell Wind Farm (VIC), the 133 MW Waipipi Wind Farm (New Zealand) and the 453 MW Coopers Gap Wind Farm (QLD). Lessons learnt at an industry wide level and through Tilt Renewables' direct experience have been used to inform the design, construction and likely disturbance assumptions for the Varied Project.

The Varied Project reflects the outcomes of ongoing design optimisation of the Project, with specific detailed design activities informing the internal layout of the wind farm infrastructure, connection infrastructure and the transport route selection. Key design parameters significant to the layout of the wind farm include:

- Redesign of wind farm infrastructure to support the safe and practical construction of fewer larger wind turbines and allow for ongoing maintenance during operation of the Varied Project. Accordingly, WTG hardstand areas and construction laydown areas have been expanded to safely accommodate the storage, manoeuvring and assembly of larger WTG components.
- Two substations have been included in the Varied Project to reduce the amount of underground cabling that would have otherwise been required to connect all WTGs to one substation (which would have been the case for the Approved Project). This will reduce ground disturbance associated with underground cabling and also reduce the electrical losses associated with the Project. Consequently, this has resulted in the re-design of the overhead 275 kV transmission line route to facilitate the connection of the two substations to the existing Tungkillo Switchyard.

- The met mast locations have been re-selected in-line with the varied WTG layout to ensure wind monitoring data is most effectively captured

These variations not only align with technological advancements, but enhance the overall efficiency and sustainability of the wind farm, whilst generally reducing the extent of impacts to the environment and the surrounding area. These changes sought as part of the Varied Project align with the contemporary requirements of other nearby and approved renewable energy projects in South Australia.

The Variation Application is based on extensive additional site and design information and reflects the outcomes of additional consultation with near neighbours, the broader community and agencies. This provides rigour and certainty to the Varied Project and the Variation Application.

The development layout of the Varied Project remains subject to further detailed design work which will continue up to the construction phase. Any further changes made to the Varied Project during ongoing detailed design will remain within the proposed micro-siting areas authorised under the conditions of the Development Plan Consent (refer to section 7.1).

3.3 Stakeholder engagement

3.3.1 Community engagement

Consultation on the Varied Project began in February 2023 and continues in 2024. All stakeholders were encouraged to review the Varied Project design and to provide feedback.

Key consultation activities included:

- E-newsletter updates to the email distribution list
- Project website updates at www.palmerwindfarm.com.au
- Briefings and letters to Mid Murray Council and councillors
- Briefings to local community groups
- Advertisements in the Barossa Leader and Murray Valley Standard in May and October 2023
- Drop-in sessions held in Palmer, Tungkillo and Mount Pleasant. The sessions were held on the following dates:
 - 29 May 2023
 - 15 November 2023
 - 16 November 2023
- Letters to more than 650 neighbours adjoining the proposed wind farm site:
 - Round 1 – February 2023
 - Round 2 – October 2023
- Meetings and phone calls with direct neighbours and other members of the community

Tilt Renewables engaged with several specific community groups as summarised in Table 5.

Table 5 Summary of engagement with community groups

Stakeholders	Key feedback from stakeholder
Eastern Mount Lofty Ranges Landscape Guardians	<ul style="list-style-type: none"> – General opposition to the Varied Project – The need to avoid areas of key ecological and heritage significance – Requests for further information about photomontages, potential noise, environmental impacts and mitigation measures that would be put in place
Lavender Federation Trail & South Australian Recreation Trails Inc.	<ul style="list-style-type: none"> – Opportunities for the Varied Project to support enhancements to the Lavender Federation Trail during construction and operation

Stakeholders	Key feedback from stakeholder
Mid Murray Landcare SA & River Murray International Dark Sky Reserve	<ul style="list-style-type: none"> – Aviation lighting and the implications for the International Dark Sky Reserve – A letter from Mid Murray Landcare SA was received which details their values relating to the preservation of the night sky where the Dark Sky Reserve applies. The letter outlines the importance of avoiding obstacle lighting on WTGs to ensure the Dark Sky Reserve is not disrupted. Their values align with the goals that have been expressed by the management team of the River Murray International Dark Sky Reserve as well as Mid Murray Council at separate meetings.
Bodhipala Monastery	<ul style="list-style-type: none"> – Opportunities to improve the design to better reflect Monastery's on site activities – Considerations for the construction process

While the level of contact with the community was high, there was a moderate level of interest in the Varied Project once people understood that the proposal would reduce the Project Area by over 5,000 ha. The majority of the interest in the Varied Project was localised to the surrounding communities including Palmer, Tungkillo and to the immediate north of the Varied Project.

General discussion points that arose during consultation with the general public include:

- Support for the reduction in turbines and Project Area
- Opposition to wind and solar in the region
- Support for wind farms and renewable energy sources
- Concerns about the construction and operation of the Varied Project, with a focus on potential environmental, noise and visual impacts and how these would be managed
- Interest in benefit sharing initiatives
- General and specific questions about the Varied Project

Tilt Renewables has a high level of engagement with landowners directly associated with the Varied Project. These landowners have regular contact with Tilt Renewables regarding development of the Project on their land and have had input into the basis of design for the Varied Project to ensure compatibility with their ongoing property management requirements. Consent letters from landowners associated with the Varied Project for the lodgement of this Variation Application have been provided with the application.

3.3.1.1 Peramangk People

Since the grant of Development Plan Consent for the Approved Project, Tilt Renewables re-commenced contact with the Peramangk People in September 2022 via phone calls and emails. In those communications Tilt Renewables offered the Peramangk People an opportunity to discuss how the Peramangk People would like to be involved in the Varied Project, noting their previous involvement throughout the planning of the Approved Project. Various emails and phone calls to the Peramangk People have continued from 2022, throughout 2023 and into 2024.

Project update letters were sent to the Peramangk People in November 2023. An online meeting was held with Tilt Renewables, South Australian Native Title Services and a representative from Peramangk on Monday 18 November 2023 to discuss the Varied Project and the heritage matters relating to the Peramangk People.

Tilt Renewables will seek to continue engagement with the Peramangk People throughout the approvals process and during the construction phase of the Varied Project, to ensure involvement of the Peramangk People in line with agreements with Tilt Renewables with the aim of protecting Aboriginal cultural heritage.

3.3.1.2 Response to feedback

Tilt Renewables has taken an iterative approach to the Varied Project design to incorporate feedback from the community and key stakeholders. This feedback has resulted in:

- The removal of three additional turbines in Area B of the Varied Project
- Changes to the layout of the Varied Project as a result of input and review from associated landowners
- Engagement with community members about sites identified to be of potential cultural or environmental significance
- Initiatives considered for inclusion in the Benefit Sharing Plan

- Stakeholder needs incorporated into planning for the delivery phase
- Production of additional photomontages for the Bodhipala Monastery, located to the north of the Varied Project Area
- The community being given access to visual and acoustic specialists at drop-in sessions to discuss any concerns and to explain how mitigation measures would work

Stakeholder questions, feedback and concerns related to construction and operation will continue to be addressed as the Varied Project continues through to delivery.

3.3.2 Engagement with Government

Tilt Renewables engaged with stakeholders within both local and state government and a timeline of these engagements is presented in Table 6.

Table 6 Summary of engagement with Government

Stakeholder	Date	Key items discussed
Mid Murray Council – meeting with Jake McVicar (Director Development and Community Services)	02/10/22	<ul style="list-style-type: none"> – Tilt Renewables company update – Discussed the proposed variation application and planning pathway – Discussed engagement approach
Mid Murray Council – Councillor briefing	21/03/22	<ul style="list-style-type: none"> – Introduction to Tilt Renewables – Briefing on the approved Project and the history of the Project since 2009 – Discussed the proposed variation application and planning pathway – Discussed engagement approach
DTI PLUS – online meeting with Simon Neldner (Team Leader – Environmental Impact Assessment) and Laura Kerber (Senior Planning Officer)	19/12/22	<ul style="list-style-type: none"> – Introduction to Tilt Renewables – Briefing on the approved Project and the history of the Project since 2009 – Discussed the proposed variation application (44 turbine layout) and request to seek assessment by State Commission Assessment Panel (SCAP)
DTI PLUS – online meeting with Simon Neldner and Laura Kerber	12/04/23	<ul style="list-style-type: none"> – Discussed progress and updates to the Project design since previous meeting – Agreed that SCAP is the appropriate responsible authority, however the authority responsible for granting an extension of time required confirmation. – Discussed proposal to obtain Ministerial Call-in
Mid Murray Council – face to face meeting at Council's office with Jake McVicar	18/04/23	<ul style="list-style-type: none"> – Briefing on the history of the approved Project – Briefing on the proposed variation application – Confirmed that SCAP was the responsible authority in relation to the Variation Application. It was Mid Murray Council's preference for SCAP to also be the responsible authority for any extensions of time (note that this was not the final outcome due to the outcome detailed in the Ministerial Call-in letter)
Mid Murray Council – phone call with Jake McVicar	03/05/23	<ul style="list-style-type: none"> – Discussion regarding the matter of who the responsible authority should be for the Variation Application. Mid Murray Council's view was that the relevant authority for assessing the variation application should be the same authority for granting an extension of time (an email confirming this discussion was sent to Jake McVicar on 05/05/23)
DTI PLUS – Email to Robert Kleeman	05/05/23	<ul style="list-style-type: none"> – Request for Ministerial Call-In of the Palmer Wind Farm Project including letter
Community drop-in sessions at Tungkillio Memorial Hall	29/05/23	<ul style="list-style-type: none"> – Jake McVicar and the Mayor of Mid Murray Council attended community drop-in sessions
DTI PLUS – Email from Office of Minister Champion	05/06/23	<ul style="list-style-type: none"> – Letter of correspondence received from the Hon Nick Champion MP, Minister for Trade and Investment, Minister for Housing and Urban Development and Minister for Planning confirming "a call-in to the Commission is appropriate for the proper assessment of the proposal"

Stakeholder	Date	Key items discussed
Mid Murray Council – Email to Jake McVicar and Simone Bailey (Mayor of Mid Murray Council)	14/06/23	<ul style="list-style-type: none"> – Email to Simone Bailey and Jake McVicar providing a copy of the letter from the Minister confirming the Minister is calling in the proposed variation application to the current planning approval for assessment by the State Planning Commission
Mid Murray Council – face-to-face meeting/site visit with Simone Bailey	05/07/23	<ul style="list-style-type: none"> – Mayor of Mid Murray Council requested to visit one of Tilt Renewables Wind Farms. The Mayor visited Dundonnell Wind Farm (Victoria) on 5 July 2023 alongside James Beckett (Manager, Environment and Planning at Tilt Renewables).
DTI PLUS – online meeting with Simon Neldner and Troy Fountain	20/07/23	<ul style="list-style-type: none"> – Following the confirmation that the Minister is calling in the proposed variation application for the Project, Tilt Renewables met with Troy Fountain as Manager of Commission Assessment (as well as Simon Neldner again) to brief him on the Varied Project – Provided an overview of the key findings from desktop technical assessments comparing the Approved Project to the proposed Varied Project
Mid Murray Council – online meeting with Jake McVicar, David Hassett (Director, Infrastructure and Field Services)	01/08/23	<ul style="list-style-type: none"> – Tilt Renewables met with Mid Murray Council alongside transport consultants, Stantec, to discuss Condition 3 of the ERDC Orders regarding a ‘driver safety assessment’ – Council confirmed that a thorough assessment of roads was already undertaken during the Approved Project application and confirmed they would be satisfied for the condition to be addressed in a section within the Transport Impact Assessment report that would form part of the Variation Application
Mid Murray Council – online meeting with Jarrod Bielby	19/09/23	<ul style="list-style-type: none"> – New Mid Murray Council representative (Jarrod Bielby) was briefed on the Varied Project and key findings from technical investigations to date, due to the previous representative’s (Jake McVicar) departure to Barossa Council
DTI PLUS – online meeting with Simon Neldner and Troy Fountain	01/11/23	<ul style="list-style-type: none"> – Meeting to discuss how the Project micro-siting area/development corridor has been applied over wind turbines and other infrastructure and intended use of the micro-siting area
Community drop-in sessions at Tungkillio Memorial Hall, Palmer Collier Park Hall and Mount Pleasant Soldiers Memorial Hall	15/11/23 – 16/11/23	<ul style="list-style-type: none"> – Representatives from Mid Murray Council attended community drop-in sessions including Jarrod Bielby, the Mayor, and various Councillors – Jake McVicar, representative for Barossa Council, attended the drop-in sessions
DTI PLUS facilitated online ‘pre-lodgement’ meeting with EPA, CFS, DIT, DEW, DEM	20/11/23	<ul style="list-style-type: none"> – Pre-lodgement meeting with referral authorities relevant to applicable overlays for the Variation Application – Discussion of proposal and key findings from technical assessments – Opportunity for relevant authorities to provide early feedback on the Project design/proposal
DTI PLUS – face-to-face meeting with Simon Neldner and other DTI staff	23/01/24	<ul style="list-style-type: none"> – Meeting to confirm the Variation Application requirements – Confirmation was provided on how to lodge the Variation Application online and key documents or information that must be included with the application – Confirmation of the application fee for a Variation Application was provided – Confirmation of the assessment process including key timing around verification, assessment, referral and public notification
Department for Infrastructure and Transport (DIT) – face-to-face meeting with Mark Hryciuk, Victor Ling and Reece Loughron	23/01/24	<ul style="list-style-type: none"> – Meeting to present the draft Traffic Impact Assessment, consideration of technical requirements of the proposed site access locations on Randell Road – DIT advised on particular matters to be addressed in the Traffic Impact Assessment and the Traffic Management Plan (should the Varied Project be approved). Further details of the key discussion points are included in the consultation section of the Traffic Impact Assessment at Appendix O.

It is noted that further to the above agency consultation, Tilt Renewables has had technical communications with third parties as relevant for the Varied Project. These organisations include but are not limited to ElectraNet, SA Power Networks, SA Water and SEA Gas. Discussions with these parties have been centred around the technical design aspects of the Varied Project and potential interactions with third party assets. Tilt Renewables has considered the technical consultation as part of the development of the Varied Project and has not identified any aspects which may affect the overall viability of the Varied Project throughout this consultation.

3.3.3 Next steps

Tilt Renewables will continue to engage with the local community and key stakeholders throughout the planning stage of the Varied Project and during the lead up to a decision on construction timing. The focus of this consultation will be to demonstrate how the Project has responded to feedback, provide an update on public exhibition, the construction process and the Benefit Sharing Plan for the Project.

4. Assessment of impacts

Tilt Renewables commissioned several specialist assessments to support this Variation Application. The specialist assessments sought to analyse and compare the extent of change to the applicable environmental and social aspects relevant to the Approved Project and Varied Project. Appropriately, the technical impact assessments did not seek to assess the Varied Project as an entirely new development.

Given that this is a Variation Application to an Approved Project and certain aspects of the Project are unchanged from the Approved Project, Tilt Renewables has not sought to duplicate all specialist assessments completed for the Approved Project. This includes certain aspects of the Project for which there is clear and consistent evidence supporting the previous conclusions of assessments for the Approved Project (e.g. adverse health effects, impacts to property values and safety of renewable energy facilities).

The specialist assessment reports are provided in full in the appendices as referenced in this section of the report.

4.1 Aviation Impact Assessment

Aviation Projects was engaged to undertake an Aviation Impact Assessment (refer to Appendix F).

The Aviation Impact Assessment concluded that the Varied Project will not result in any increased impact to aviation safety as compared to the Approved Project.

Based on a comprehensive analysis and assessment, Aviation Projects concluded that the Varied Project will not affect any Procedures for Air Navigation Services - Aircraft Operations PANS-OPS surfaces or obstacle limitation surfaces at the certified aerodromes of Adelaide Airport, Parafield Airport and Edinburgh military aerodrome.

Importantly it was also noted that there are no active verified or unverified Aircraft Landing Areas located within 3 nautical miles (nm) of the Varied Project, and the Varied Project will not affect any route or grid lowest safe altitude.

The Aviation Impact Assessment confirms that the Varied Project will not penetrate any protection areas associated with aviation facilities. It is anticipated there will be no impact to radar facilities due to the distance and intervening terrain between the Varied Project and the primary and secondary radar facilities located at Adelaide airport.

The Radar Terrain Clearance Chart (RTCC) is used by air traffic controllers to determine the minimum altitudes that can be assigned by aircraft being vectored by Air Traffic Control within 40 nm of Adelaide Airport. Airservices Australia have assessed the Varied Project and confirmed there will be an impact to Adelaide's RTCC from six WTGs in Area C. Airservices Australia will need to increase the RTCC sector height to accommodate the Varied Project. A request was made to Airservices Australia on 6 February 2024 and is currently under evaluation by Airservices Australia.

A total of nine recommendations are made by Aviation Projects to address notification and reporting, marking of WTG's and met masts, lighting of WTG's and met masts, overhead transmission lines and triggers for review.

Based on the risk assessment of the Varied Project, it was concluded that WTGs will not require obstacle lighting to maintain an acceptable level of safety to aircraft. This was also the conclusion of the aeronautical assessment conducted for the Approved Project. CASA will review the proposed WTG development and may make a recommendation for obstacle lighting; however, this would not be mandatory.

4.2 Ecology

From 2012 to 2021, EBS Ecology (EBS) conducted several ecological desktop and field assessments to support approvals for the Project. EBS have further supported Tilt Renewables in completing a Flora and Fauna Impact Assessment to identify potential impacts of the proposed Varied Project on Flora and Fauna (refer to Appendix I). The report combines findings from previous ecological studies, an updated desktop assessment and further flora and fauna field surveys (between 2022 and 2024) to map the vegetation associations across the Varied Project Area.

Native vegetation in the area has been extensively cleared, with most of the footprint containing grasslands with large outcrops of rocks and boulders. Woodland vegetation and habitat for woodland birds is generally restricted within smaller patches and located within the south of the Varied Project Area.

4.2.1 Flora

A total of 14 vegetation associations were mapped across the Varied Project Area from further flora surveys undertaken in Spring 2022 in accordance with the Bushland Assessment Method. A total of 19 sites were surveyed using this method, with locations chosen based on differences in vegetation composition and condition, with additional targeted searches undertaken for potential Threatened Ecological Communities (TECs) listed under the *Environment Protection and Biodiversity Conservation Act 1999 (Cwth)* (EPBC Act).

Of the five TECs potentially occurring within the Project Area, a single TEC was identified within the Varied Project Area, being approximately 29.6 ha of Peppermint Box (*Eucalyptus odorata*) grassy woodlands of South Australia (PBGW) with the siting of infrastructure completely avoiding impacts to the TEC. The reduction to the Varied Project Area has seen the additional avoidance of impacts to the Iron-grass Natural Temperate Grassland of South Australia TEC, which is known to occur in the north of Area B (now outside the Varied Project Area).

No EPBC Act listed threatened flora species were identified as 'likely' or 'highly likely' to occur in the Project Area and no EPBC Act listed flora species have been identified in surveys undertaken to date either for the Varied Project or the historical surveys undertaken for the Approved Project.

Past and contemporary surveys identified three flora species as threatened under the *National Parks and Wildlife Act 1972* (NPW Act) within the Varied Project Area, being:

- Pink Gum (*Eucalyptus fasciculosa*) (Rare status)
- Hairy-tails (*Ptilotus erubescens*) (Rare status)
- Slender Mint (*Mentha diemenica*) (Rare status)

Hairy-tails and Slender Mint were recorded in 2013 but were not recorded within the Varied Project Area during 2022 surveys.

The Varied Project has been designed to minimise works in the southern extent of the Varied Project Area, in line with EBS' recommendation, to avoid potential impacts on identified Rare Pink Gum Woodland as far as practicable. The Varied Project has undergone multiple iterations in order to finalise the layout with minimal impact to native vegetation with avoidance of approximately 91.5% of the Rare Pink Gum Woodland that is identified within the Varied Project Area.

4.2.2 Fauna

Targeted and opportunistic fauna surveys have been conducted for the Varied Project between 2022 and 2024. Initial surveys were intended to validate the historic survey records, including the presence and use of previously recorded Wedge-tailed Eagle and Peregrine Falcon nest locations, with additional survey effort focussed on bird utilisation of the Varied Project Area and targeted threatened species.

The assessment has identified the primary class of fauna likely to be present within the Varied Project Area are bird species, with the only other conservation significant species likely to occur within the Varied Project Area being the Grey-headed Flying-fox (*Pteropus poliocephalus*) (EPBC Act – Vulnerable; NPW Act - Rare) and Common Brushtail Possum (*Trichosurus vulpecula*) (NPW Act - Rare). Some other conservation significant reptiles, amphibians and mammals are assessed to be possibly occurring within the Varied Project Area.

With respect to bird species, EBS established fourteen bird survey sites within the Varied Project Area and have been undertaking seasonal bird surveys since Spring 2022. Two species protected under the EPBC Act were identified as occurring in the Varied Project Area based on both historical surveys for the Approved Project and surveys undertaken for the Varied Project:

- Diamond Firetail (*Stagonopleura guttata*) (Vulnerable)
- Southern Whiteface (*Aphelocephala leucopsis*) (Vulnerable)

An additional species was observed outside of the Varied Project Area, and as such was determined as likely to occur within the Varied Project Area:

- Hooded Robin (*Melanodryas cucullata cucullata*) (EPBC Act: Endangered; NPW Act: Rare).

Two of these species are also protected under the NPW Act; the Diamond Firetail (Vulnerable) and the Hooded Robin (Rare).

Four additional fauna species listed as threatened under the NPW Act were identified within the Varied Project Area in both the historical surveys for the Approved Project and surveys undertaken for the Varied Project:

- Peregrine Falcon (*Falco peregrinus*) (Rare)
- White-winged Chough (*Corcorax melanorhamphos*) (Rare)
- Elegant Parrot (*Neophema elegans*) (Rare)
- White-bellied Cuckooshrike (*Coracina papuensis robusta*) (Rare)

Tilt Renewables has commitments and conditions on the Approved Project in relation to setbacks to both Wedge-tailed Eagle (*Aquila audax*) and Peregrine Falcon (*Falco peregrinus*) nest locations (refer to Section 7). Targeted searches for Wedge-tailed Eagle and Peregrine Falcon nests were conducted at previously surveyed nests, in addition to searches for new nest locations. A total of 12 Wedge-tailed Eagle nests and 5 Peregrine Falcon nests were originally found during the 2013 surveys in Areas A, B and C. The nests in Area B and C were validated in March 2022 where possible⁵.

Of the 10 Wedge-tailed Eagle nests in or near the Approved Project Area, all WTE nests with the exception of one nest are located outside the Varied Project Area. The Varied Project design has ensured that a 1 km buffer has been applied from turbines to WTE nests. The Varied Project Area also avoids 2 additional Peregrine Falcon nests, compared to the Approved Project, and the two remaining nest sites located within the Varied Project Area are between 1 km and 1.5 km from the nearest turbine of the Varied Project.

Additional ecological matters identified by the desktop assessment and past and current surveys include migratory birds (10 species), Wedge-tailed Eagle nests, Peregrine Falcon nests, and introduced weeds declared under the *Landscape South Australia Act 2016*.

4.2.3 Native Vegetation Clearance

EBS Ecology was engaged to prepare a Native Vegetation Clearance Report (refer to Appendix J), which will support a further application to clear native vegetation under the *Native Vegetation Regulations 2017*.

The total proposed clearance amounts to 350.93 ha of native vegetation, which would be classified as Level 4 clearance. Most of the proposed clearance (301.28 ha) is located in the poorer quality grassland areas, representing 87% of the total clearance area. Areas with good quality vegetation are avoided, such as those identified as PBGW TEC and areas of native vegetation within gorges.

A modest increase in clearance is required compared to the Approved Project. This is due to a number of factors relating to the design of the Project, including larger WTGs which consequently require larger hardstand areas and construction laydown areas to safely accommodate the storage, manoeuvring and assembly of larger WTG components. The greater disturbance area is also reflective of the level of maturation of the wind industry in both South Australia and more broadly in Australia, and lessons learnt at an industry wide level and through Tilt Renewables' direct experience which have informed the design, construction and likely disturbance assumptions for the Varied Project.

As noted, the design of the Varied Project has avoided high quality areas of native vegetation wherever possible. Existing access tracks will be used where possible (noting the designs and geometry requirements for the transportation of WTG components) to further minimise impacts to native vegetation. Areas of temporary vegetation clearance will be rehabilitated according to strategies detailed within a Construction Environmental Management Plan (CEMP) that will be written for the Project.

⁵ Note where nest locations were unable to be validated, Tilt Renewables has taken a conservative approach and continued to site infrastructure and wind turbines with relevant setbacks assuming that the nests are active.

4.2.4 Bird and Bat Risk Assessment

EBS Ecology was engaged to undertake a Bird and Bat Risk Assessment (refer to Appendix K).

The assessment found that the Varied Project would result in a 26% reduction in the total rotor swept area of the Varied Project when compared to the Approved Project. In addition, the proposed Varied Project layout results in both four fewer WTGs in or near woodlands and an increase in ground clearance to the rotor swept area, which lowers the risk to woodland birds. The combined effect of these changes reduces potential collision risk for woodland birds and bats.

The Varied Project seeks to reduce impacts on sensitive areas for birds and bats, including by removing all wind turbines from Area A (noted to be an area with a high density of Wedge-tailed Eagle and peregrine Falcon nests), maintaining and increasing the current setbacks to nests for these species to 1 km in Areas B and C and reducing the overall number of wind turbines proposed in Area C, being both in proximity to known Wedge-tailed Eagle and Peregrine Falcon nests and noting that Area C has a higher proportion of woodland.

Primarily due to potential impacts to bird species listed under the EPBC Act, Tilt Renewables will lodge a referral under the EPBC Act for the Varied Project to determine whether the Project will require formal assessment and approval under the EPBC Act. Tilt Renewables has consulted with the Department of Climate Change, Energy, the Environment and Water (DCCEEW) with regards to the Varied Project and will seek to refer the Varied Project in accordance with the provisions of the EPBC Act following submission of the Variation Application.

4.3 Cultural Heritage Assessments (Aboriginal and historic)

Independent Heritage Consultants (IHC) was engaged to undertake a gap analysis and heritage desktop assessment for the Varied Project (refer to Appendix G). Further to the gap analysis and heritage desktop assessment, IHC was engaged by Tilt Renewables to prepare a Heritage Impact Assessment (HIA) in relation to the State Heritage Listed Granite Boulders Geological Site (SHR 13197) located adjacent to and partially within the Varied Project Area (refer to Appendix G).

The Varied Project Area has previously been subject to detailed archaeological and ethnographic surveys that were undertaken for the Approved Project between 2009-2014 by Australian Cultural Heritage Management (ACHM) and Peramangk representatives. As part of these surveys for the Approved Project, ACHM recorded over 300 potential archaeological sites within the Approved Project Area. No ethnographic sites were recorded at this time.

IHC overlaid the ACHM site data and Approved Project Area with the proposed micro-siting areas within the Varied Project Area. The analysis identified that 48 of the sites recorded by ACHM fall within the Varied Project Area. IHC undertook a site verification archaeological inspection for the Varied Project layout. This inspection identified no new Aboriginal heritage sites within the micro-siting area of the Varied Project Area. All of the ACHM sites were inspected, and none were found to be Aboriginal archaeological sites.

As the Varied Project Area falls within the original area surveyed and consulted on by ACHM and Peramangk representatives and will not impact any ethnographic sites, no further ethnographic/anthropological surveys are deemed to be required.

The archaeological inspection did not identify any new Aboriginal archaeological sites within the Varied Project Area.

In relation to Historic Heritage, the Varied Project is to be located on land adjacent to the State Heritage Listed Granite Boulders Geological Site located on the Adelaide-Mannum Road in Palmer. There are no proposed modifications or direct impacts to this site. Works are to be managed to avoid indirect impacts and all temporary disturbance associated with the construction of the Varied Project will be rehabilitated once works are complete. State heritage sites are further discussed in Section 6.4.4.

The previously approved development application, was required to be considered by the South Australian State Heritage Unit, who determined the following in relation to the Approved Project:

- The Project and ancillary development will not affect the significant fabric of the State Heritage Place, as the works are located a considerable distance away
- The setting of the Granite Boulders Area Geological site is considered to be limited by its landscape and allotment boundary. The proposed works, including substation, operations, maintenance, transmission lines and construction facilities, are located on land adjacent to the Geological Site. The nearest turbine is 750 m distance from the heritage place and therefore will not have any adverse impact on the setting of the State heritage place.

The HIA undertaken for the Varied Project concluded that the proposed works have been designed to be appropriate to the setting and minimise project impacts to the geological formation that constitutes the listing. The Varied Project will have minor impacts on the cultural values of the Granite Boulders Geological site. However, increased access to and rehabilitation of the adjacent areas are likely to enhance the importance of the place to the community.

4.4 Electromagnetic Interference (EMI) Assessment

GHD was engaged to undertake an Electromagnetic Interference Assessment (refer to Appendix H).

This assessment found that the Varied Project does not give rise to any EMI. This was the same conclusion reached for the Approved Project and therefore there is no change between the Approved Project and the Varied Project.

The assessment confirmed that no WTGs sit within a point-to-point radio link Fresnel exclusion zone and there will be no impact to existing point-to-point links.

GHD does not foresee any electromagnetic interference impact that would degrade land mobile radio signals or AM/FM narrowcast or broadcast signals as a result of the Varied Project.

As was the case for the Approved Project, television reception at certain dwellings located in the scattering zones may be affected by the Varied Project. This will be mitigated by pre- and post-construction TV signal surveys undertaken to confirm any impacts from the wind farm and implementation of appropriate measures to rectify any confirmed impacts.

Any effect on the mobile telephone and broadband internet broadcast from the Varied Project will be minimal.

The Varied Project will have nil to negligible effects on aircraft navigation signals, trigonometric systems, amateur radio systems, earth stations, scientific radio systems, maritime radio systems and Radiodetermination stations.

There are no meteorological radars within a 50 km radius of the Varied Project Area and the closest radar (Adelaide, Buckland Park) is approximately 65 km away, however, the assessment identified that the location of the Varied Project is within one of the Bureau of Meteorology's (BoM) weather watch radar (and the Approved Project location would therefore also be located within this radar).

Feedback from BoM indicated that the Varied Project is high risk to the BoM's radiocommunication assets, including its weather radar network, and recommended options that can mitigate these risks. BoM indicated that Mannum would likely lose weather radar coverage from the Adelaide radar, however, when thunderstorms and severe weather events from the east of Mannum occur (which is rarely). BoM noted this impact is somewhat mitigated by the monitoring available from Mt Gambier and Rainbow radars. The most impacted service is expected to be rainfall estimation which feeds into flood forecasting. To mitigate this impact, BoM recommend the installation of rain gauges and automatic weather stations to the East and West of the Varied Project, to compensate for predicted lost data. Tilt Renewables is continuing to liaise with BoM to confirm the appropriate mitigation strategies including suitable locations for installing rain gauges and weather stations. Tilt Renewables will ensure that the required strategies are implemented to reduce any risk to BoM's assets.

4.5 Landscape and Visual Impact Assessment (LVIA)

Wax Design was engaged to prepare a landscape character and probable visual effect assessment (refer to Appendix L).

The aim of the report was to evaluate the existing landscape character and the degree of visual change that would result from the Varied Project compared to the Approved Project.

Zone of Theoretical Visual Influence (ZTVI) mapping was produced which uses digital modelling to understand how many individual turbines would be visible from any location around the wind farm. The ZTVI assessment indicated a reduction in visual effects in areas in the north, south and west from the Varied Project compared with the Approved Project due to the reduced number of turbines. Similarly, the intensity and clustering of visible wind turbines from the Murray Plain landscape geographic area was found to be reduced.

Comparative analysis was also undertaken based on the 'GrimKe Matrix', a review of Visual Effect Interpolation Mapping and a comparison of photomontages prepared for the Approved and Varied Project.

This assessment highlighted the reduction in visual effects that the Varied Project is likely to achieve in the locality. The removal of the northern cluster of wind turbines reduces the overall area which will experience a visual change when comparing the Approved Project and Varied Project. Importantly, the impacts on scenic landscape features adjacent to Sanderston and Cambrai as well as the Eden Valley, Marne River and the Barossa Valley Character Preservation District are removed.

It is noted that the proposed wind turbine height of 220 m is likely to increase visual impacts associated with the Varied Project in certain locations. The comparative assessment illustrates that an increase in visual impact is likely to be contained to the local area (up to 5 km away from the Varied Project Area) due to the height of the wind turbines and the reduced ability of the local landforms and vegetation to provide screening. This localised increase in visual impact is offset by a decrease in the visual effect across the sub-regional and regional areas (5-10 km from the Varied Project Area) due to a reduction in the number of wind turbines compared to the Approved Project, and the reduction in the visual complexity of the Varied Project.

In summary, compared to the Approved Project, the Varied Project results in:

- Reduced visibility to the north due to the reduced number of wind turbines, with a particular reduction in visual effects on the northern escarpment around Cambrai and the northern Murray Plains
- Reduced visual effects to the northwest and impacts on the associated heritage planning overlays
- Similar visual impacts to the south, east and west when comparing the Approved and Varied Project

While the Varied Project increases the visual effect in the local area due to the increase in the height of the wind turbines, this is offset by a decrease in the visual effect across the sub-regional and regional areas. Overall, the Varied Project represents a notable reduction of the likely visual effect when compared to the Approved Project.

4.6 Noise Impact Assessment (including construction, traffic, and operational noise)

Sonus was engaged to undertake a noise impact assessment (refer to Appendix M).

The assessment found that predictions for the level of noise that would be generated by the Varied Project will comply with all relevant noise criteria at all nearby sensitive receptors, per the recommended noise limits in the *Wind farms environmental noise guidelines* (Environment Protection Authority South Australia, 2021).

Compared to the Approved Project, the predicted noise levels of the Varied Project have generally decreased, with 76 residences likely to experience a decrease in noise level and a small number of residences likely to experience a noticeable increase in noise level (5 non-associated residences and 2 associated residences). Despite the increase in noise level at those 7 residences, the 2021 noise criteria (see above) will still be achieved at all 83 residences.

4.7 Shadow Flicker and Blade Glint Assessment

GHD was engaged to undertake a shadow flicker and blade glint assessment (refer to Appendix N).

The assessment found six residences with theoretical worst-case shadow flicker in excess of the recommended limits in the *Draft National Wind Farm Development Guidelines for Australia (2010)*.

Tilt Renewables has agreements in place with each of the owners of these receptor sites. Under these agreements, two of the six dwellings (which are located within the Project Area) will be abandoned for the life of the wind farm. Tilt Renewables is seeking the express consent of the owners of the other four dwellings (three of which are associated residences) in respect of the anticipated shadow flicker impact. If consent is not obtained prior to commencement of wind farm operations, curtailment measures will be put in place such that shadow flicker impacts at the relevant dwelling meet the guideline levels set out in the *Draft National Wind Farm Development Guidelines for Australia (2010)*.

The reduction in turbines results in an overall decrease in projected shadow flicker exceedances of the Varied Project compared to the Approved Project.

Blade glint is not expected to be an issue as non-reflective coating will be applied to wind turbine blades.

4.8 Traffic Impact Assessment

Stantec was engaged to undertake a traffic impact assessment (refer to Appendix O). The assessment reviewed the existing conditions relating to traffic volumes, crash data and route restrictions; undertook an updated road link assessment for all state and local roads surrounding the Varied Project Area; and undertook a comparative assessment between Approved Project and the Varied Project.

The road link assessment was prepared to assess anticipated Varied Project impacts on the road network with due consideration of forecast traffic volumes “with” and “without” the Varied Project. The assessment defined the impact assessment area to be ‘all road links where the development traffic exceeds 5% of the base traffic in either direction on the link’s annual average daily traffic (AADT) in the year of opening of each stage’.

The assessment found that only four (4) of the state-controlled roads trigger the >5% impact. Of these four (4) roads, a significant proportion of the additional vehicles generated on these links consist of light vehicle traffic. As such, given the large proportion of light vehicle movements and relatively low existing volumes, these impacts would be considered relatively minor in this instance.

The assessment found that due to low-level peak daily volumes generated on the Council-controlled network, with a maximum increase of 20 vehicles per day observed on Brinkworth Road, the impact on the network is not likely to be considered significant.

The comparative impact assessment found the Varied Project will result in a substantial reduction in both the total one-way trips (70,476 less trips) and peak daily trips (167 less trips) compared to the Approved Project. Such a reduction in the total construction traffic would have the following effects:

- Reduced overall impact on State and Council controlled road networks, particularly in terms of anticipated vehicle movements associated with the Varied Project and the extent of potential pavement degradation
- Lower than anticipated peak daily volumes, resulting in less conflict between project-related vehicle movements and local road users who rely on the local road network

A comparative assessment of projected trip generation between the Approved Project and Varied Project is provided at Table 7.

Table 7 Comparative Assessment of projected total one-way trip generation

Vehicle type	Approved Project	Varied Project	Reduction
Light	105,600	65,154	39%
Heavy	49,293	21,350	57%
Oversize Overmass	2,554	467	82%

A Transport Route Assessment for the Varied Project was undertaken by iCubed Consulting and is attached to the TIA (Appendix O).

The Transport Route Assessment identified that a viable port to site route exists for the Varied Project. WTG component delivery from the Port of Adelaide to site, utilising the Sturt Highway and other associated roads, is considered feasible following some intersection upgrade works to geometrically facilitate Oversize/Overmass (OSOM) vehicle passage. Some variation to the OSOM route from the Approved Project is proposed for the Varied Project, with consideration of the proposed updates to infrastructure including the larger WTG model of the Varied Project, and the appropriate vehicles required for their transport. The OSOM route has been updated based on relevant limits to mass of roads, load limits of bridges and culverts, as well as vehicle swept path assessments for the OSOM vehicles.

5. Procedural Matters

5.1 Assessment approach

5.1.1 The Application

The application is to be assessed as a variation to Development Application 711/072/14. This application has been approved and remains in-force.

5.1.2 Assessment Pathway

The Varied Project Area is wholly within the Rural Zone as defined in the Planning and Design Code (the Code). Further discussion on the Code including zoning and overlays is provided in Section 6.

The Code includes “Wind Farm” in the definition of a “Renewable Energy Facility”. Within the Rural Zone, a Renewable Energy Facility is not given a specific assessment pathway⁶.

Accordingly, the Variation Application defaults to following the Performance Assessed Development pathway as an 'All other Code Assessed Development' where the Project is assessed on its merits against the provisions of the Code.

5.1.3 Relevant Authority

On 3 June 2023, the Minister for Planning called in the variation of the Approved Project under Section 94(2)(g) of the PDI Act. In particular, the Minister noted that this would result in consistency with the current planning regime where all new applications relating to renewable energy facilities such as the Project would be assessed by the State Planning Commission.

Accordingly, the Relevant Authority for the Planning Consent component of the Variation Application is the State Planning Commission.

The Minister’s letter is provided in Appendix A. Pursuant to Section 99(1) of the PDI Act, following grant of Planning Consent, the Building Consent component of the Variation Application will be assessed by either Mid Murray Council or by an Accredited Professional.

Mid Murray Council remain the Relevant Authority for granting of Development Approval per Section 99(3) of the PDI Act.

5.1.4 Referrals

The Variation Application requires referral to several different bodies:

- Gas and Liquid Petroleum Pipelines Overlay: referral to the Chief Executive Officer of the Department responsible for administering the *Petroleum and Geothermal Energy Act 2000*
- Key Outback and Rural Routes Overlay: referral to the Department for Infrastructure and Transport / Commissioner of Highways
- Native Vegetation Overlay: referral to the Native Vegetation Council
- State Heritage Place Overlay: referral to the Minister responsible for the administration of the *Heritage Places Act 1993*

Additionally, because of potential impacts to species identified within the EBS Flora and Fauna Impact Assessment (Appendix I), Tilt Renewables will lodge a referral in accordance with the EPBC Act to determine whether the Varied Project requires assessment and approval under the EPBC Act.

⁶ A Renewable Energy Facility is classified as Restricted Development when located in the Significant Landscape Protection or Character Preservation District Overlays. The Project Area is not located in either overlay.

6. Planning assessment

6.1 Land use definition

Part 7 of the Code sets out land use definitions. The Code defines the use of land for a renewable energy facility as:

... land and/or water used to generate electricity from a renewable source such as wind, solar, tidal, hydropower, biomass and/or geothermal.

This use may also include:

- (a) any associated facility for the storage and/or transmission of the generated electricity;
- (b) any building or structure used in connection with the generation of electricity

The definition of a renewable energy facility also includes the nested term 'Wind farm'. The Code provides a distinct definition for Wind farm:

... land used to generate electricity from wind force with wind turbine generators. This use may also include:

- (a) any associated facility for the storage and/or transmission of the generated electricity;
- (b) any building or structure used in connection with the generation of electricity including a wind turbine, substation, maintenance shed, access road or wind monitoring mast

The use does not include a wind farm principally used to supply and/or store electricity to an existing use of land (e.g., domestic wind generator).

'Renewable energy facility', as the parent term, is the appropriate land use definition for the Varied Project.

6.2 Code assessment

The Code includes a set of policies, rules and classifications which may be applied in various parts of the State for the purposes of development assessment. The Code sets out policies governing development across South Australia, divided between a series of Zones, Subzones, Overlays and General Development Policies, which are described as follows:

- 'Zones' - Zones are the primary organising spatial layer in the Code. Zones provide guidance on what can happen in an area by setting out the policies and rules for certain classes of development
- 'Subzones' - Policy in a subzone may vary or build upon policy in the 'parent' zone. Policies (Assessment Provisions) in subzones apply to unique variations in the character of a particular part of a zone
- 'Overlays' - Overlays are the primary mechanism to spatially express State Planning Policies as they pick up location specific planning issues of state interest. Overlays can span multiple zones and subzones and more than one overlay can apply to the same area. Overlay policies take precedence over other Code policies
- 'General development policies' - While zones outline what can occur in an area, general development policies broadly relate to how a development should occur

The hierarchy for these policies is set out in Part 1 of the Code as follows:

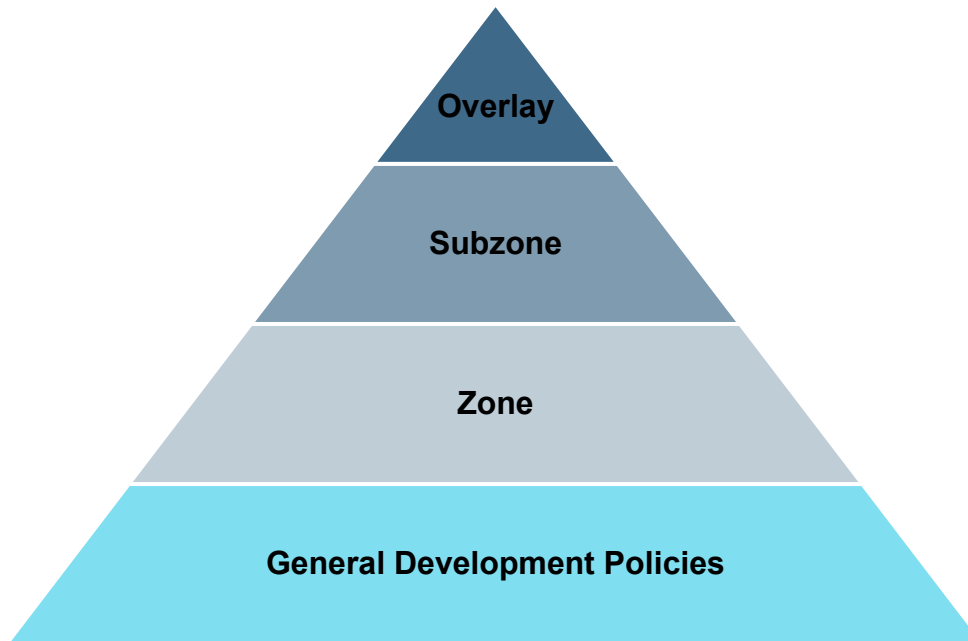


Figure 5 Hierarchy of Policies – Part 1, Planning and Design Code

The Varied Project Area is located entirely within the Rural Zone, and not within any sub-zones. The Varied Project Area is subject to the following Overlays:

- Dwelling Excision
- Gas and Liquid Petroleum Pipelines
- Hazards (Bushfire – Medium Risk)
- Hazards (Flooding – Evidence Required)
- Heritage Adjacency
- Key Outback and Rural Routes
- Limited Land Division
- Murray-Darling Basin
- Native Vegetation
- Prescribed Water Resources Area
- River Murray Tributaries Protection Area
- State Heritage Place
- Water Resources

Within the Rural Zone, a Renewable Energy Facility is assessed as Code Assessed – Performance Assessed unless sited within an Overlay that triggers an assessment as Restricted Development (either the Significant Landscape Protection or Character Preservation District Overlay). As the Varied Project Area is not located within either overlay, the correct assessment pathway is Code Assessed – Performance Assessed.

An assessment of the Varied Project against the relevant policies of the Code is addressed in the following sections.

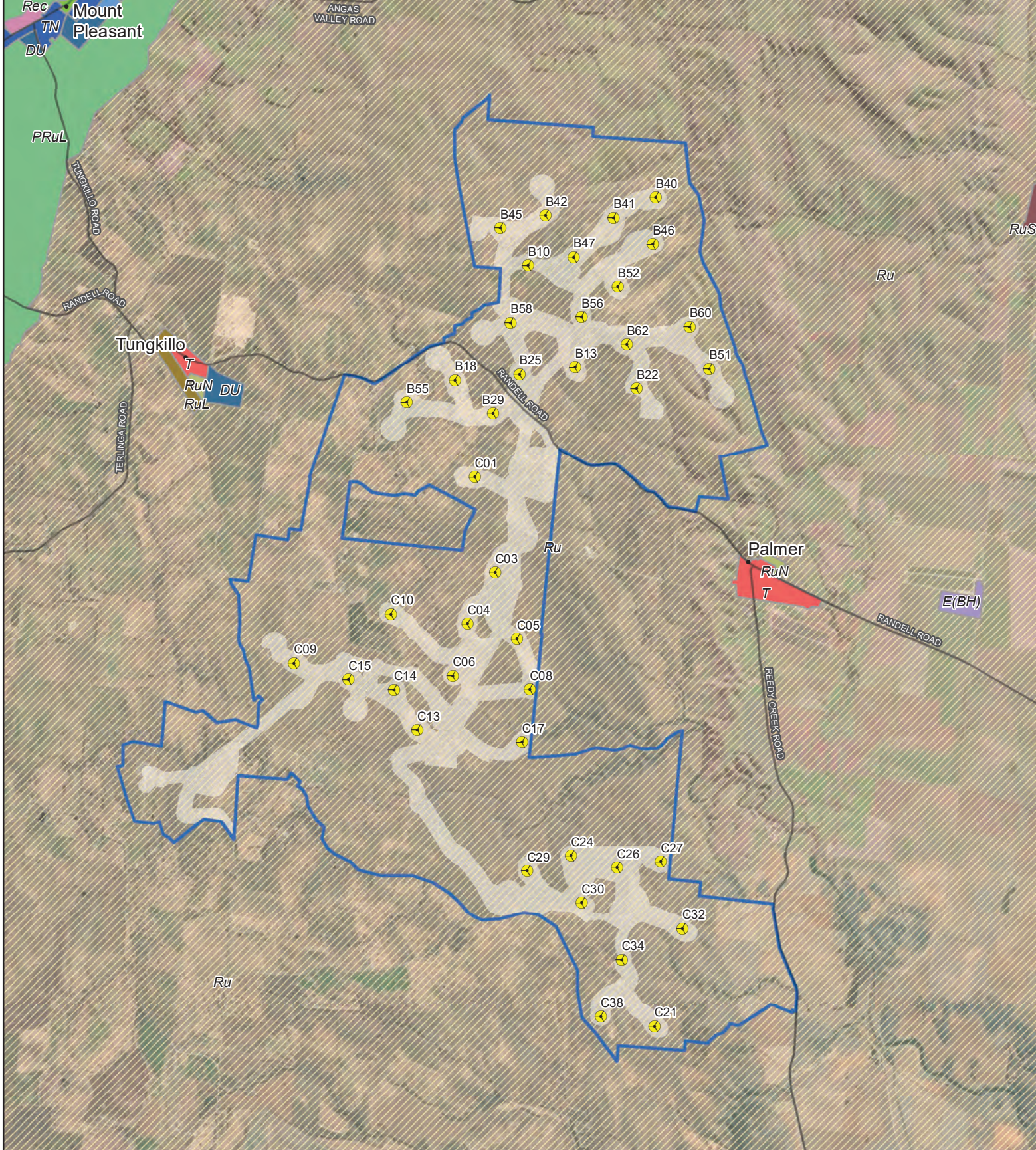
6.3 Zone

6.3.1 Rural Zone

The Rural Zone seeks to support uses such as primary production, forestry, and renewable energy generation. The zone also seeks to encourage diversification of existing businesses that contribute to a value-adding economy, such as industry, warehousing, tourist development and accommodation, and the sale and consumption of primary produce. The entire Project Area is subject to the Rural Zone (Figure 6).

Table 8 Response to Performance Outcomes of the Rural Zone

Desired Outcome		
DO 1	A zone supporting the economic prosperity of South Australia primarily through the production, processing, storage and distribution of primary produce, forestry and the generation of energy from renewable sources.	
Performance Outcome	Deemed-to-Satisfy Criteria / Designated Performance Feature	Response
PO 1.1 The productive value of rural land for a range of primary production activities and associated value adding, processing, warehousing and distribution is supported, protected and maintained.	DTS/DPF 1.1 Development comprises one or more of the following: ...(s) Renewable energy facility	The Varied Project comprises a renewable energy facility, a land use which is deemed as appropriate in the Rural Zone.
PO 9.1 Renewable energy facilities and ancillary development minimises significant fragmentation or displacement of existing primary production.	DTS/DPF 9.1 None are applicable	The Varied Project area consists of land with minimal primary production value, characterised by rocky outcrops and hills. The land is generally not suitable for cropping or related activities. As a result, where primary production is present, this is in the form of grazing. The Varied Project has been designed to allow grazing to continue to occur on parts of the allotments not occupied by WTGs or associated infrastructure, and will not result in significant fragmentation or displacement of primary production.



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Legend Varied Project Area Indicative WTG Location Micrositing Area - WTGs and Other Infrastructure State Roads		Planning Zones Community Facilities, CF Deferred Urban, DU Employment (Bulk Handling), E(BH) Productive Rural Landscape, PRuL Recreation, Rec Rural Living, RuL Rural Neighbourhood, RuN Rural Settlement, RuS Rural, Ru Township Main Street, TMS Township Neighbourhood, TN Township, T		Date: 19/02/2024 Version: E GDA2020 MGA Zone 54 1:75,000	
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Note 1. Design for discussion purposes only and subject to further revision

Palmer Wind Farm
 Figure 6. Varied Project - Planning Zones



6.4 Overlays

As identified in section 6.2, 13 overlays apply to the Varied Project Area. Of these 13 overlays, two are considered not applicable, the Dwelling Excision Overlay as no new allotments or residential development is proposed and the Limited Land Division Overlay, as no land division is proposed.

An assessment of the Varied Project against the relevant policies of the remaining 11 overlays follows in the following sections.

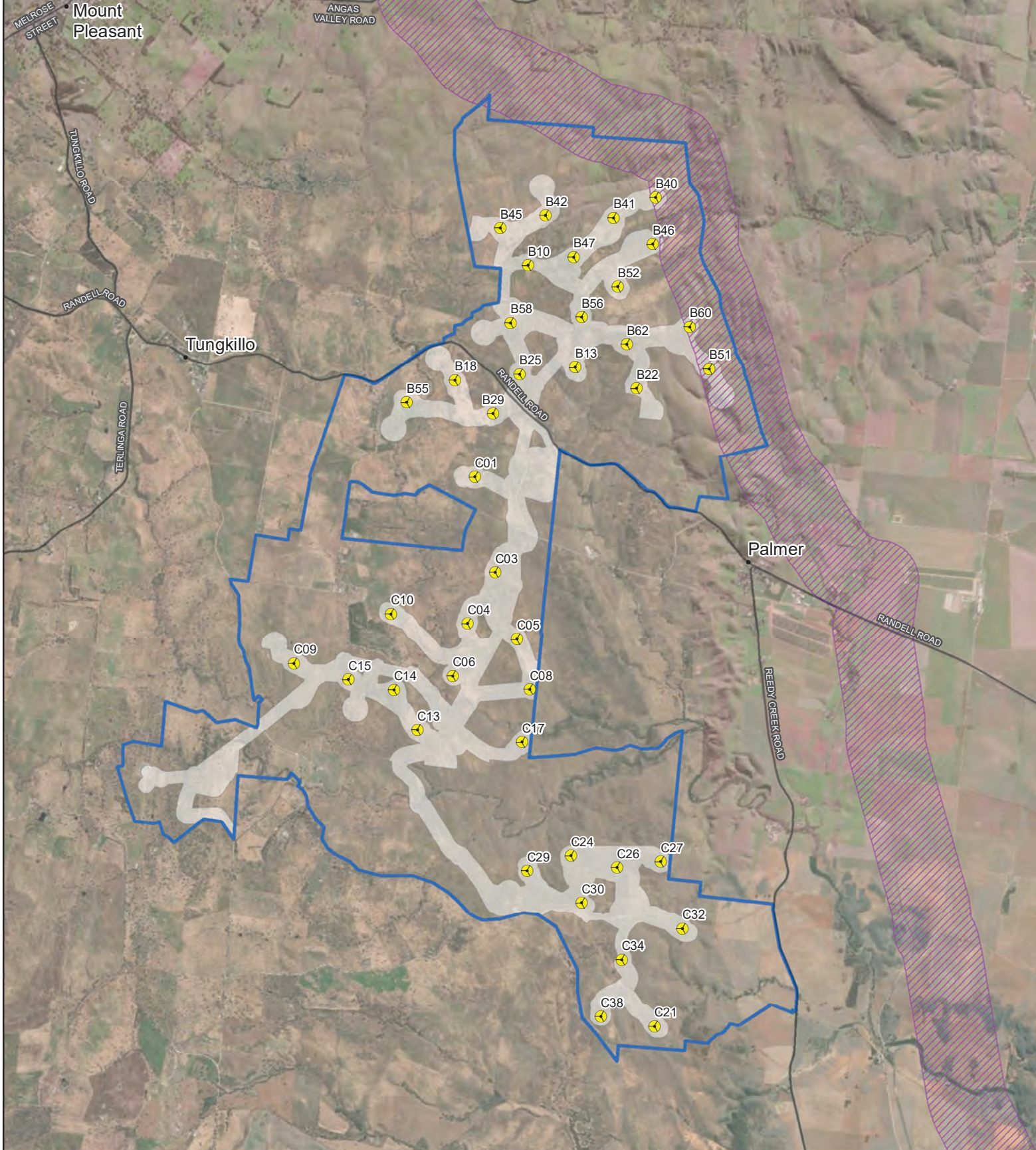
6.4.1 Gas and Liquid Petroleum Pipelines Overlay

The Gas and Liquid Petroleum Pipelines Overlay applies to the northwestern part of the Varied Project Area where the SEA Gas Pipeline System traverses the Varied Project Area (Figure 7). This overlay has one Desired Outcome and three Performance Outcomes, which are addressed in Table 9.

Table 9 Response to Performance Outcomes for the Gas and Liquid Petroleum Pipelines Overlay

Desired Outcome		
Performance Outcome	Deemed-to-Satisfy Criteria / Designated Performance Feature	Response
DO 1	Management of risk to public safety, the environment and security of energy supply from the encroachment of development on strategic gas and liquid petroleum pipelines.	
PO 1.1 Community exposure to a potential hazard from the failure of a gas or liquid petroleum pipeline is mitigated by locating development that may accommodate or result in large congregations of people, buildings for housing and / or caring for vulnerable people and community facilities outside areas that pose an unacceptable risk to protect life.	<p>DTS/DPF 1.1 Development satisfies one of the following:</p> <p>(a) It does not comprise:</p> <ul style="list-style-type: none"> – Child care facility – Caravan and tourist park – Educational facility – Buildings comprising 3 or more building levels – Land division creating allotments under 1ha for residential purposes (except where the existing allotment is less than 1ha) – Prison – Residential park – Retirement facility – Student accommodation – Supported accommodation – Shop or shops with a gross leasable floor area of 1000m² or greater – Tourist accommodation – Stadium <p>(b) A class of development referred to in part (a), or any combination thereof, which will occur in accordance with an agreement under section 123 of the Planning, Development and Infrastructure Act, 2016.</p>	The Project is classed as a renewable energy facility, which satisfies this criterion as it is not within the list at (a).
PO 1.2 Emergency service and major community health related facilities are located outside areas where a gas or liquid petroleum pipeline failure may disrupt ongoing operations to maintain the response capacity in the event of an emergency.	<p>DTS/DPF 1.2 Development does not comprise any of the following:</p> <p>(a) emergency services facility (b) hospital.</p>	The Project does not comprise of an emergency services facility or hospital.

Desired Outcome		
<p>PO 1.3 Development involving the manufacture, collection, handling or bulk storage of flammable, explosive, or otherwise hazardous materials is located and designed to avoid escalating the potential for and effects of a gas or liquid petroleum pipeline failure.</p>	<p>DTS/DPF 1.3 Development satisfies one of the following:</p> <p>(a) It does not comprise:</p> <ul style="list-style-type: none"> – General industry – Special industry – Landfill – Renewable energy facility – Electricity substation – Fuel depot – Retail fuel outlet – Store – Warehouse – Waste treatment facility <p>(b) A class of development referred to in part (a), or any combination thereof, which will occur in accordance with an agreement under section 123 of the Planning, Development and Infrastructure Act, 2016.</p>	<p>The Project does not satisfy criterion PO 1.3. Four turbines (B34, B40, B51, B60) are proposed to be constructed near the western edge of this overlay, in addition to access tracks and other associated infrastructure. The Varied Project infrastructure does not cross the SEA Gas Pipeline or associated easement, with the nearest WTG proposed approximately 440m from the pipeline.</p> <p>Tilt Renewables consulted directly with SEA Gas in relation to the Varied Project and the four turbines proposed to be located within the overlay, meeting with SEA Gas on 22/01/2024. Tilt Renewables will continue to consult with SEA Gas on manageable risks raised in relation to proximity of the Project infrastructure in the vicinity of the high pressure gas pipeline.</p> <p>Due to not satisfying this criterion, the Project requires referral to the Chief Executive of the Department responsible for administering the <i>Petroleum and Geothermal Energy Act 2000</i>.</p>



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Legend

- Varied Project Area
- Indicative WTG Location
- Micrositing Area - WTGs and Other Infrastructure
- State Roads
- Gas and Liquid Petroleum Pipelines Overlay

Note 1. Design for discussion purposes only and subject to further revision

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Palmer Wind Farm

Figure 7. Varied Project - Gas and Liquid Petroleum Pipelines Overlay



6.4.2 Hazards (Bushfire – Medium Risk) Overlay

The Hazards (Bushfire – Medium Risk) Overlay applies to the entire Varied Project Area (Figure 8). This overlay has two Desired Outcomes and four applicable Performance Outcomes which are responded to in Table 10. Performance Outcomes PO 3.1 – 3.3 (Habitable Buildings), PO 4.1 – 4.4 (Land Division), and PO 5.1 and 5.2 are not included in the table as no habitable buildings, roads, or land division is proposed.

Table 10 Response to Performance Outcomes for the Hazards (Bushfire – Medium Risk) Overlay

Desired Outcome		
DO 1	Development, including land division responds to the medium level of bushfire risk and potential for ember attack and radiant heat by siting and designing buildings in a manner that mitigates the threat and impact of bushfires on life and property taking into account the increased frequency and intensity of bushfires as a result of climate change.	
DO 2	To facilitate access for emergency service vehicles to aid the protection of lives and assets from bushfire danger.	
Performance Outcome	Deemed-to-Satisfy Criteria / Designated Performance Feature	Response
Siting		
PO 1.1 Buildings and structures are located away from areas that pose an unacceptable bushfire risk as a result of vegetation cover and type, and terrain.	DTS/DPF 1.1 None are applicable.	Separation from vegetation has been provided where possible, noting that the Varied Project Area is located within primarily cleared agricultural land / poorer quality grassland areas (refer to Section 2.1). A detailed emergency management plan will be prepared for both the construction and operational phases to address (amongst other emergencies) bushfire risk.
Built Form		
PO 2.1 Buildings and structures are designed and configured to reduce the impact of bushfire through using designs that reduce the potential for trapping burning debris against or underneath the building or structure, or between the ground and building floor level in the case of transportable buildings and buildings on stilts.	DTS/DPF 2.1 None are applicable.	WTGs are an aerodynamic structure designed to allow maximum air flow. Due to the height of the wind turbine hubs and contained nature of the structures, there is low potential for the proposed structures to trap burning debris.
PO 2.2 Extensions to buildings, outbuildings and other ancillary structures are sited and constructed using materials to minimise the threat of fire spread to residential and tourist accommodation (including boarding houses, hostels, dormitory style accommodation, student accommodation and Workers' accommodation) in the event of bushfire.	DTS/DPF 2.2 Outbuildings and other ancillary structures are sited no closer than 6m from the habitable building.	Fire suppression systems will be included where required throughout infrastructure proposed as part of the Varied Project, to minimise impact to habitable buildings such as offices in the event of fire. A detailed emergency management plan will be prepared for both the construction and operational phases to address (amongst other emergencies) bushfire risk.

Desired Outcome

Vehicle Access - Roads, Driveways and Fire Tracks

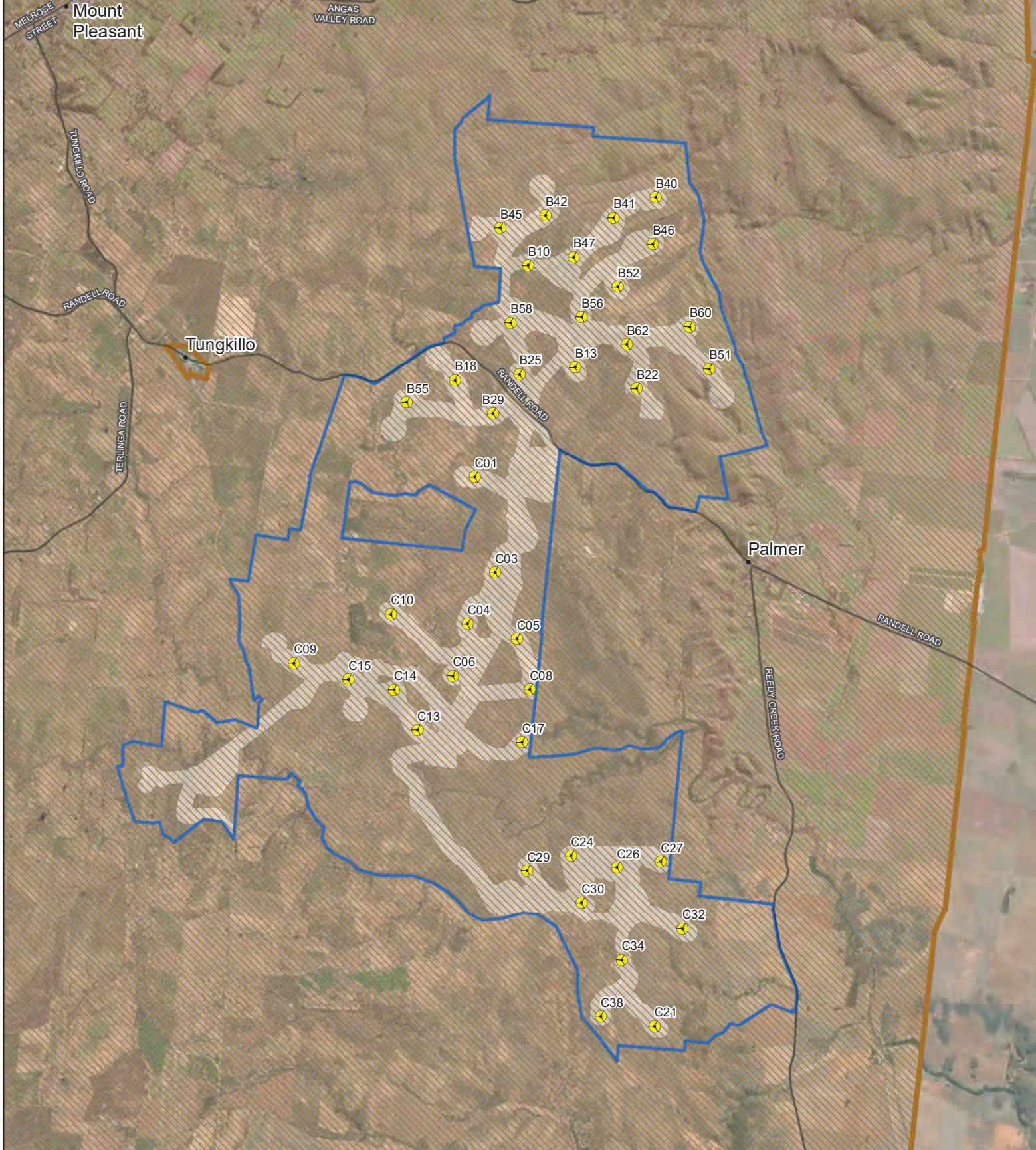
PO 5.3

Development does not rely on fire tracks as means of evacuation or access for fire-fighting purposes unless there are no safe alternatives available.

None are applicable.

Entry and egress to the site is primarily proposed via Randell Road as well as other minor council controlled roads to facilitate construction of the overhead transmission line (refer to Appendix O) and the internal road network is designed to accommodate heavy vehicles and the orderly movement of vehicles.

The development of access tracks as part of the Varied Project will facilitate greater access for fire-fighting capability across the Varied Project Area, with these areas currently having generally limited access for this purpose.



Document Path: G:\GIS\Project Data\Development\SA\Palmer\Maps\Working\PMWF_600_WV_Hazards (Bushfire)_AAP_20240219.mxd

Legend

- Varied Project Area
- Indicative WTG Location
- Micrositing Area - WTGs and Other Infrastructure
- State Roads
- Hazards (Bushfire - Medium Risk) Overlay

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Figure 8. Varied Project - Hazards (Bushfire - Medium Risk) Overlay

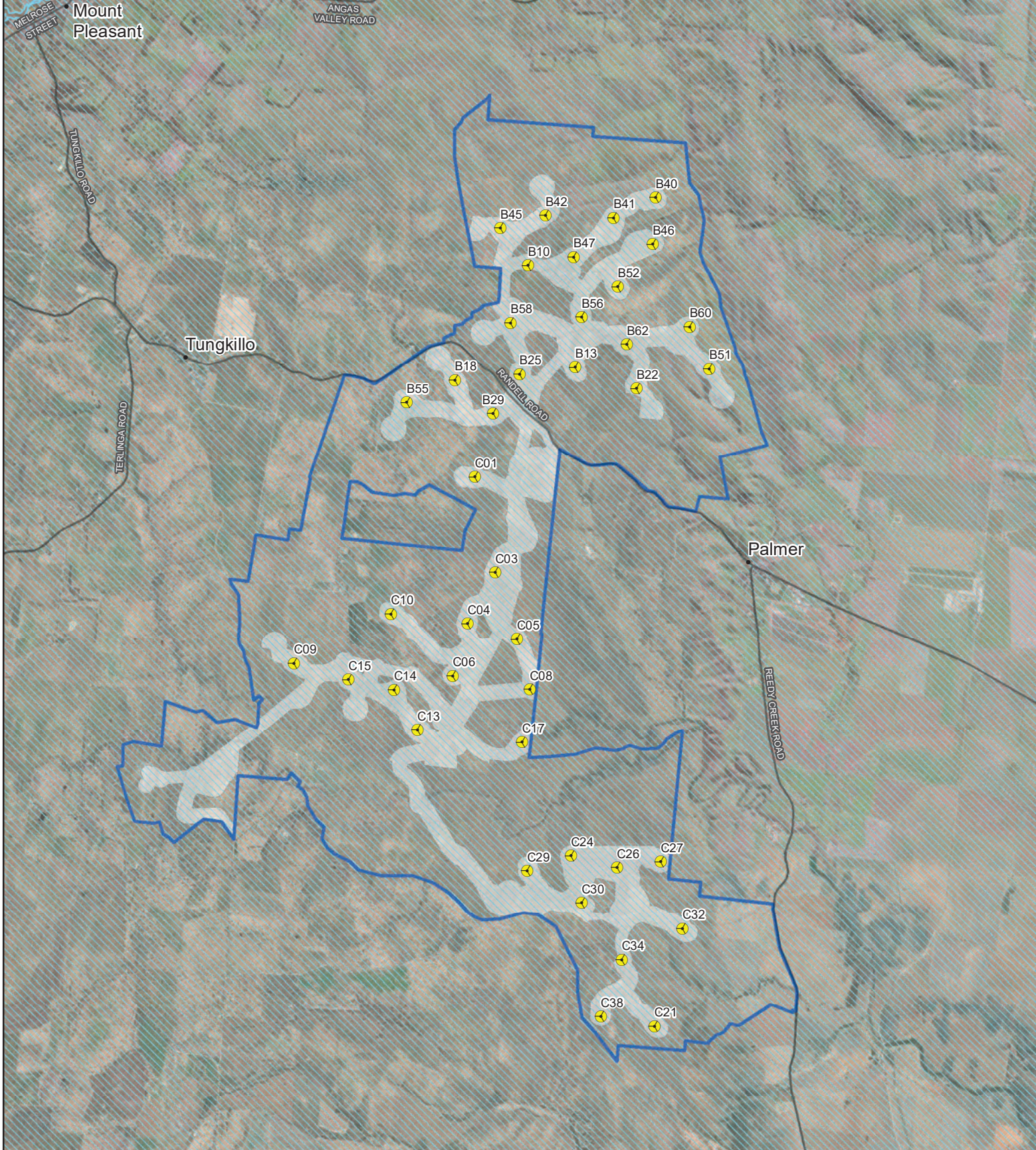


6.4.3 Hazards (Flooding – Evidence Required) Overlay

The Hazards (Flooding – Evidence Required) Overlay applies to the entire Varied Project Area (Figure 9). Risks from stormwater inundation and flooding will be considered when siting WTGs and during the detailed design phase, to mitigate potential impact on people, property, infrastructure and the environment. A response to the Performance Outcomes of this overlay is provided in Table 11.

Table 11 Response to Performance Outcomes of the Hazards (Flooding – Evidence Required) Overlay

Desired Outcome		
Performance Outcome	Deemed-to-Satisfy Criteria / Designated Performance Feature	Response
DO 1	Development adopts a precautionary approach to mitigate potential impacts on people, property, infrastructure and the environment from potential flood risk through the appropriate siting and design of development.	
PO 1.1 Development is sited, designed and constructed to minimise the risk of entry of potential floodwaters where the entry of flood waters is likely to result in undue damage to or compromise ongoing activities within buildings.	DTS/DPF 1.1 Habitable buildings, commercial and industrial buildings, and buildings used for animal keeping incorporate a finished floor level at least 300mm above: (a) the highest point of top of kerb of the primary street or (b) the highest point of natural ground level at the primary street boundary where there is no kerb	A preliminary surface water modelling assessment was prepared by iCubed Consulting Pty Ltd in 2023 to assist in the site planning for the Varied Project. The preliminary results were used to inform any relocation of wind turbines, substations and access tracks and incorporated into the design of the Varied Project. Wind turbines and substation infrastructure are not proposed in identified drainage lines and risks from potential flooding and stormwater inundation will continue to be addressed during the detailed design stage. The siting of WTGs maintains natural hydrological systems and is not expected to negatively impact upon the quantity, quality, depth, or directional flow of surface water and groundwater. No habitable buildings are proposed.
PO 2.1 Buildings and structures used either partly or wholly to contain or store hazardous materials are designed to prevent spills or leaks leaving the confines of the building.	DTS/DPF 2.1 Development does not involve the storage of hazardous materials.	Hazardous materials will be stored in the O&M facilities and the substations. Storage areas will be designed to prevent spills or leaks leaving the confines of the building.



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Legend

- Varied Project Area
- Hazards (Flooding - Evidence Required) Overlay
- Indicative WTG Location
- Micrositing Area - WTGs and Other Infrastructure
- State Roads

Note 1. Design for discussion purposes only and subject to further revision

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Figure 9. Varied Project - Hazards (Flooding - Evidence Required) Overlay



6.4.4 Heritage Adjacency Overlay

Three occurrences of the Heritage Adjacency Overlay appear throughout the Varied Project Area (Figure 10). The location of these overlays relate to five heritage places detailed in Table 12. A response to the Performance Outcomes of the Heritage Adjacency Overlay is provided in Table 13.

Table 12 Relevant State and Local Heritage Places

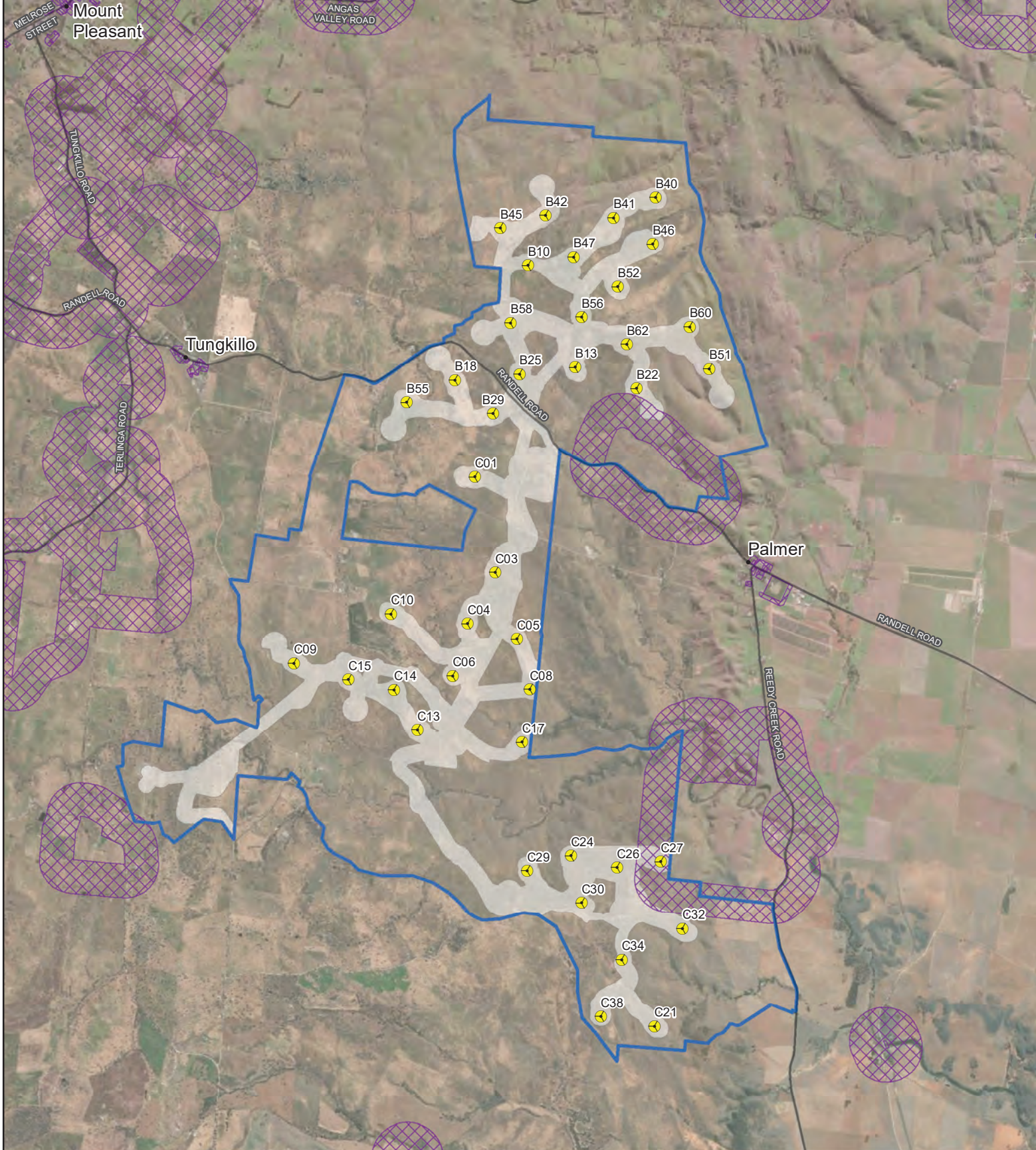
Area	Place	Heritage Class	Heritage Number
A	Granite Boulders Area Geological Site	State Heritage	16315
B	Dwelling (Hillydale)	Local Heritage	27490
	Former Reedy Creek Road Bridge	Local Heritage	27491
	Kitticoola Mine	State Heritage	16299
C	Farmhouse	Local Heritage	27523

Four of the five heritage places are located outside the Varied Project Area.

The Varied Project Area is adjacent to, and partially within, the curtilage of the Granite Boulders Area Geological Site, however no Project infrastructure is proposed to be constructed within the Granite Boulders Area Geological Site. This heritage place has a frontage to the northern side of Randell Road. The State Heritage Overlay surrounds Granite Boulders Geological Site place which will not be materially affected by the Varied Project. For further discussion of the State Heritage Overlay including discussion of the Heritage Impact Assessment prepared for the Heritage Place, refer to section 6.4.10.

Table 13 Response to Performance Outcomes of the Heritage Adjacency Overlay

Desired Outcome		
Performance Outcome	Deemed-to-Satisfy Criteria / Designated Performance Feature	Response
DO 1	Development adjacent to State and Local Heritage Places maintains the heritage and cultural values of those Places.	
PO 1.1 Development adjacent to a State or Local Heritage Place does not dominate, encroach on or unduly impact on the setting of the Place.	None are applicable.	IHC conducted an archaeological inspection in 2023 and did not identify any new historic heritage/archaeological sites of significance within the Varied Project Area.
PO 2.1 Land division adjacent to a State or Local Heritage Place creates allotments that are of a size and dimension that enables the siting and setbacks of new buildings from allotment boundaries so that they do not dominate, encroach or unduly impact on the setting of the Place.	None are applicable.	No land division is proposed.



Document Path: G:\GIS\Project Data\Development\SA\Palmer\Maps Working\PMWF_E20_WV_Heritage Agency_A4P_20240219.mxd

Legend

- Varied Project Area
- Heritage Adjacency Overlay
- Indicative WTG Location
- Micrositing Area - WTGs and Other Infrastructure
- State Roads

Note 1. Design for discussion purposes only and subject to further revision

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Figure 10. Varied Project - Heritage Adjacency Overlay



6.4.5 Key Outback and Rural Routes Overlay

The Key Outback and Rural Routes Overlay is present over all allotments which are adjacent to, or within 25 m of an intersection with a State Maintained Road (Figure 11). Randell Road is a designated State Maintained Road and all proposed access routes to the Varied Project Area extend from Randell Road.

Reedy Creek Road, which extends south from the town of Palmer, is also designated as a State Maintained Road and is subject to the Key Outback and Rural Routes Overlay. However, no access points to the Varied Project Area are proposed from this road.

Key Deemed-to-Satisfy (DTS) criteria which would trigger referral of the Varied Project include:

- A single access point servicing the development site
- On a road with a speed limit of 80 km/h or greater (the Randell Road speed limit is 100 km/h), vehicles can enter and exit the site using left turn only movements

Referral to the Commissioner of Highways is likely for any development within this overlay that does not meet all the DTS criteria, and which proposes any of the following:

- Creation of a new access or junction
- Alterations to an existing access or public road junction (except where deemed to be minor in the opinion of the relevant authority)
- Development that changes the nature of vehicular movements or increase the number or frequency of movements through an existing access (except where deemed to be minor in the opinion of the relevant authority)

A response to the relevant Performance Outcomes and DTS/DPF criteria of the Key Outback and Rural Routes Overlay is provided at Table 14.

Table 14 Response to the Performance Outcomes of the Key Outback and Rural Routes Overlay

Desired Outcome		
DO 1.1	Safe and efficient movement of vehicle and freight traffic on Key Outback and Rural Routes.	
DO 1.2	Provision of safe and efficient vehicular access to and from Key Outback and Rural Routes.	
Performance Outcome	Deemed-to-Satisfy Criteria / Designated Performance Feature	Response
PO 1.1 Access is designed to allow safe entry and exit to and from a site to meet the needs of development and minimise traffic flow interference associated with access movements along adjacent State maintained roads.	DTS/DPF 1.1 An access point satisfies (a), (b) or (c): ... (c) where the development will result in 7 or more dwellings, or is a non-residential land use: a. it will not result in more than one access point servicing the development site b. where on a road with a speed limit of 80 km/h or greater vehicles can enter and exit the site using left turn only movements c. vehicles can enter and exit the site in a forward direction d. vehicles can cross the property boundary at an angle between 70 degrees and 90 degrees e. it will have a width of between 6m and 7m (measured at the site boundary), where the	The Varied Project will result in the upgrade of two access points off Randell Road. The geometry and detailed design of the access points, road upgrades and intersections will be undertaken in consultation with DIT as required by the existing ERDC Orders and will be documented in a Construction Traffic Management Plan and an Operational Traffic Management Plan. Public road access will require road upgrades to a width of 6 m and a 1 m shoulder either side of each access point where needed. Localised widening in excess of 6 m may be required to support transport and construction activity such as passing bays.

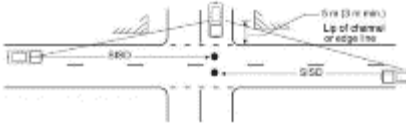
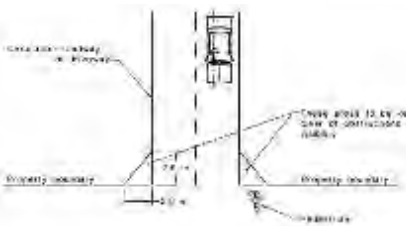
Desired Outcome		
	<p>development is expected to accommodate vehicles with a length of 6.4m or less</p> <p>f. it will have a width of between 6m and 9m (measured at the site boundary), where the development is expected to accommodate vehicles with a length from 6.4m to 8.8m</p> <p>g. it will have a width of between 9m and 12m (measured at the site boundary), where the development is expected to accommodate vehicles with a length from 8.8m to 12.5m</p> <p>h. it provides for simultaneous two-way vehicle movements at the access:</p> <p style="padding-left: 20px;">A. with entry and exit movements for vehicles with a length up to 5.2m vehicles being fully within the kerbside lane of the road</p> <p style="padding-left: 40px;">and</p> <p style="padding-left: 20px;">B. with entry movements of 8.8m vehicles (where relevant) being fully within the kerbside lane of the road and the exit movements of 8.8m vehicles do not cross the centreline of the road.</p>	
Access – On Site Queuing		
<p>PO 2.1</p> <p>Sufficient accessible on-site queuing adjacent to access points is provided to meet the needs of development so that all vehicle queues can be contained fully within the boundaries of the development site to minimise interruption of the functional performance of the road and maintain safe vehicle movements.</p>	<p>DTS/DPF 2.1 are not relevant.</p>	<p>PO 2.1 will be addressed by the preparation of a Construction Traffic Management Plan and an Operational Traffic Management Plan at the detailed design stage.</p>
Access - Location (Spacing) - Existing Access Points		
<p>PO 3.1</p> <p>Existing access points designed to accommodate the type and volume of traffic likely to be generated by development.</p>	<p>DTS/DPF 3.1 are not relevant.</p>	<p>No use of existing access points is proposed.</p>

Desired Outcome

Access - Location (Spacing) - New Access Points

<p>PO 4.1 New access points are spaced apart from any existing access point or public road junction to manage impediments to traffic flow and maintain safe and efficient operating conditions on the road.</p>	<p>DTS/DPF 4.1 (c) where DTS/DPF 4.1 part (a) and (b) do not apply and access from an alternative local road at least 25m from the State Maintained Road is not available, and the access is not located on a Controlled Access Road, the new access is separated in accordance with the following:</p>	<p>The Traffic Impact Assessment (Appendix O) reviewed nominated site access locations for the Varied Project. Each site access along the State Maintained Randell Road was reviewed in accordance with <i>Section 3.3 of Guide to Road Design Part 4A: Unsignalised and Signalised Intersections (Austroads 2017)</i>. The recommendations from the assessment will be incorporated within a Construction Traffic Management Plan and an Operational Traffic Management Plan at the detailed design stage.</p>
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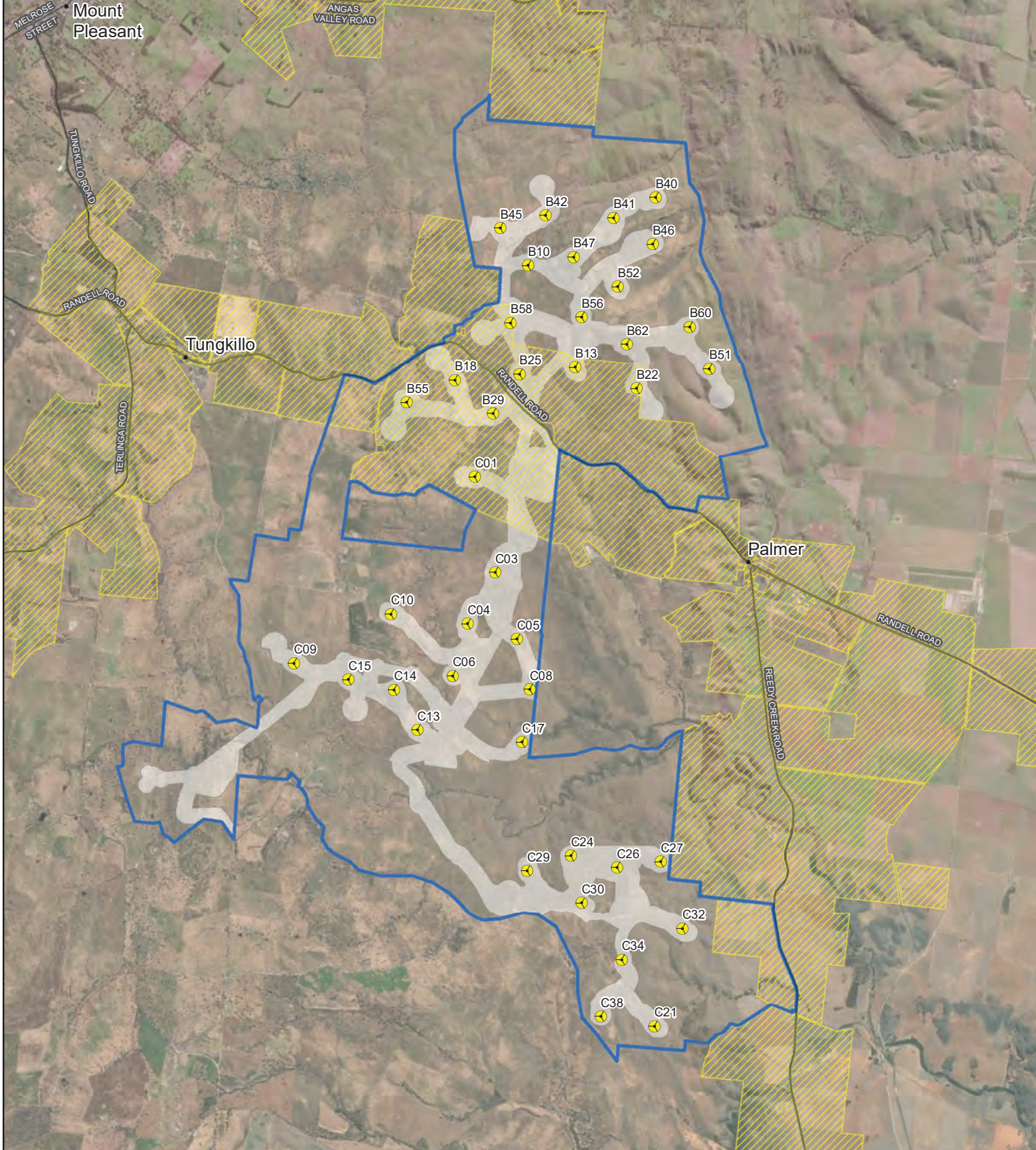
Access - Location (Sight Lines)

<p>PO 5.1 Access points are located and designed to accommodate sight lines that enable drivers and pedestrians to navigate potential conflict points with roads in a controlled and safe manner.</p>	<p>DTS/DPF 5.1 (b) drivers approaching or exiting an access point have an unobstructed line of sight in accordance with the following (measured at a height of 1.1m above the surface of the road):</p> <table border="1"> <thead> <tr> <th>Speed Limit</th> <th>Access Point serving 1-6 dwellings</th> <th>Access point serving all other development</th> </tr> </thead> <tbody> <tr> <td>40 km/h or less</td> <td>47m</td> <td>73m</td> </tr> <tr> <td>50 km/h</td> <td>63m</td> <td>97m</td> </tr> <tr> <td>60 km/h</td> <td>81m</td> <td>123m</td> </tr> <tr> <td>70 km/h</td> <td>100m</td> <td>151m</td> </tr> <tr> <td>80 km/h</td> <td>121m</td> <td>181m</td> </tr> <tr> <td>90 km/h</td> <td>144m</td> <td>220m</td> </tr> <tr> <td>100 km/h</td> <td>169m</td> <td>262m</td> </tr> <tr> <td>110 km/h</td> <td>195m</td> <td>300m</td> </tr> </tbody> </table>  <p>and</p> <p>i. pedestrian sightlines in accordance with the following diagram:</p> 	Speed Limit	Access Point serving 1-6 dwellings	Access point serving all other development	40 km/h or less	47m	73m	50 km/h	63m	97m	60 km/h	81m	123m	70 km/h	100m	151m	80 km/h	121m	181m	90 km/h	144m	220m	100 km/h	169m	262m	110 km/h	195m	300m	<p>An assessment of sightlines is provided in Section 8.2 of the Traffic Impact Assessment (Appendix O). The diagram within DTS/DPF 5.1 describes a generic standard that applies to access points of all types.</p> <p>Access locations for the Project have been identified in consultation with DIT. Control measures would be required to minimise traffic conflicts.</p> <p>These would be contained within a Construction Traffic Management Plan and an Operational Traffic Management Plan prepared at the detailed design stage.</p>
Speed Limit	Access Point serving 1-6 dwellings	Access point serving all other development																											
40 km/h or less	47m	73m																											
50 km/h	63m	97m																											
60 km/h	81m	123m																											
70 km/h	100m	151m																											
80 km/h	121m	181m																											
90 km/h	144m	220m																											
100 km/h	169m	262m																											
110 km/h	195m	300m																											

Access - Mud and Debris

<p>PO 6.1 Access points constructed to minimise mud or other debris being carried or transferred onto the road to ensure safe road operating conditions.</p>	<p>DTS/DPF 6.1 Where the road has an unsealed shoulder and the road is not kerbed, the access way is sealed from the edge of the seal on the road for a minimum of 10m or to the property boundary (whichever is closer).</p>	<p>PO 6.1 and DTS/DPF 6.1 will be addressed at the detailed design stage, in consultation with DIT and consistent with DIT standards.</p>
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Desired Outcome		
Access - Stormwater		
<p>PO 7.1 Access points are designed to minimise negative impact on roadside drainage of water.</p>	<p>DTS/DPF 7.1 Development does not:</p> <ul style="list-style-type: none"> (a) decrease the capacity of an existing drainage point (b) restrict or prevent the flow of stormwater to an existing drainage point system (c) result in access points becoming stormwater flow paths directly onto the road. 	<p>PO 7.1 and DTS/DPF 7.1 will be addressed at the detailed design stage in consultation with DIT and consistent with DIT standards.</p>
Building on Road Reserve		
<p>PO 8.1 Buildings or structures that encroach onto, above or below road reserves designed and sited to minimise impact on safe movements by all road users.</p>	<p>DTS/DPF 8.1 No encroachment of buildings or structures onto, above or below the road reserve.</p>	<p>No buildings or structures are proposed on, above, or below the road reserve.</p>



Document Path: G:\GIS\Project Data\Development\SA\Palmer\Maps\Working\PMWF_632_WV_Key Outback and Rural Routes_AAP_20240219.mxd

Legend

- Varied Project Area
- Key Outback and Rural Routes Overlay
- ⚡ Indicative WTG Location
- Micrositing Area - WTGs and Other Infrastructure
- State Roads

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Palmer Wind Farm
Figure 11. Varied Project - Key Outback and Rural Routes Overlay



6.4.6 Murray-Darling Basin Overlay

The entire Varied Project Area is within the Murray-Darling Basin Overlay.

The sole Desired Outcome for this overlay (DO 1) is for sustainable water use in the Murray-Darling Basin area. The Assessment Provisions within this Overlay relate to forms of development that require a Water Licence.

The Variation Application does not propose any development of this type and therefore this overlay is not relevant.

6.4.7 Native Vegetation Overlay

The entire Varied Project Area is within the Native Vegetation Overlay (Figure 12).

As assessment against Performance Outcome 2.1 is not included in the table below as there is no land division proposed.

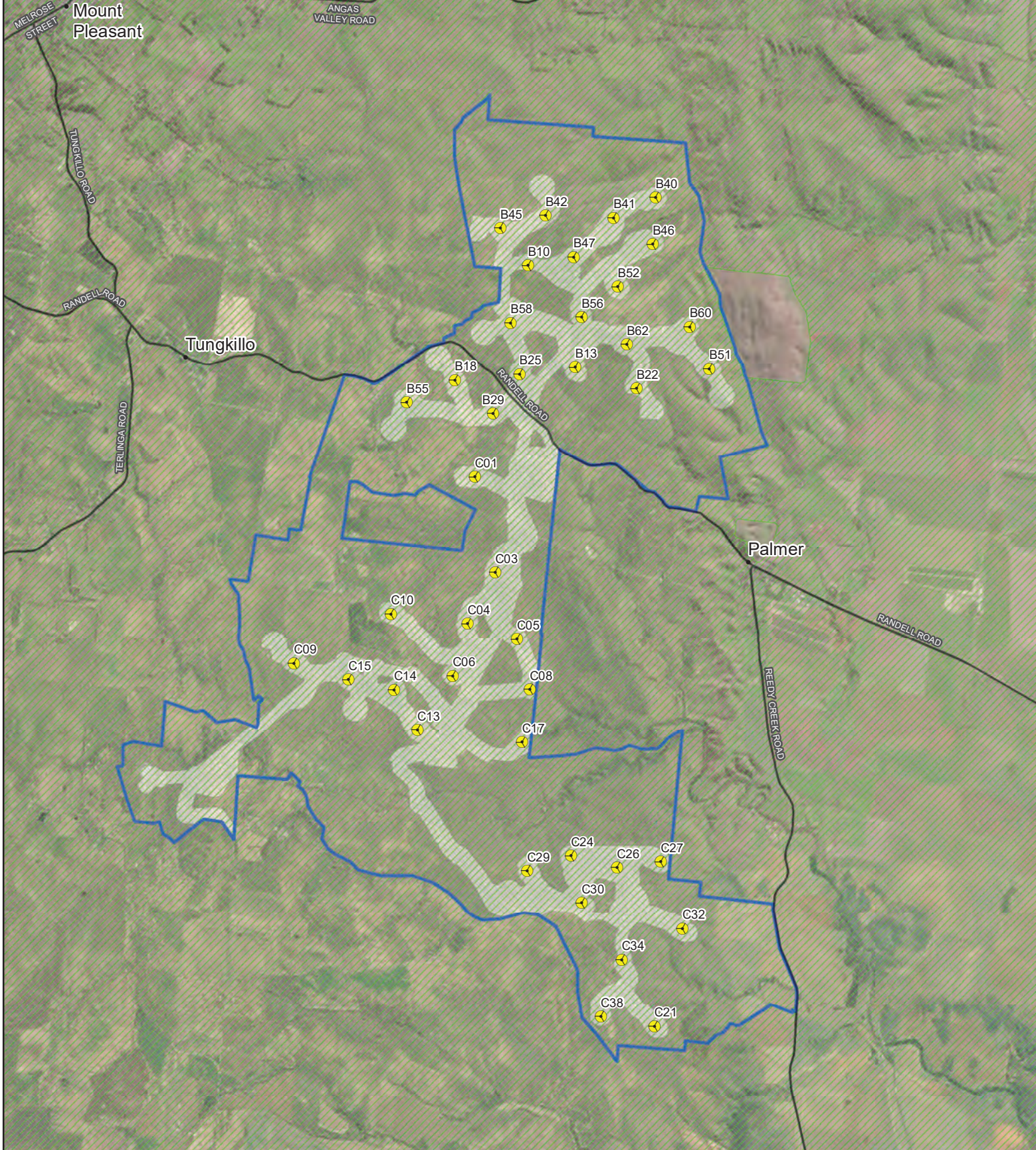
Table 15 Response to Performance Outcomes of the Native Vegetation Overlay

Desired Outcome		
DO 1	Areas of native vegetation are protected, retained and restored in order to sustain biodiversity, threatened species and vegetation communities, fauna habitat, ecosystem services, carbon storage and amenity values.	
Performance Outcome	Deemed-to-Satisfy Criteria / Designated Performance Feature	Response
Environmental Protection		
PO 1.1 Development avoids, or where it cannot be practically avoided, minimises the clearance of native vegetation taking into account the siting of buildings, access points, bushfire protection measures and building maintenance.	DTS/DPF 1.1 An application is accompanied by: <ul style="list-style-type: none"> – A declaration stating that the proposal will not, or would not, involve clearance of native vegetation under the <i>Native Vegetation Act 1991</i>, including any clearance that may occur: <ul style="list-style-type: none"> • In connection with a relevant access point and / or driveway • Within 10m of a building (other than a residential building or tourist accommodation) • Within 20m of a dwelling or addition to an existing dwelling for fire prevention and control • Within 50m of residential or tourist accommodation in connection with a requirement under a relevant overlay to establish an asset protection zone in a bushfire prone area or <ul style="list-style-type: none"> – A report prepared in accordance with Regulation 18(2)(a) of the Native Vegetation Regulations 2017 that establishes that the clearance is categorised as 'Level 1 clearance'. 	The Varied Project proposes clearance of 350.93 ha of native vegetation, which is categorised as Level 4 clearance. The majority of the proposed clearance (301.28 ha) is located in poorer quality grassland areas. The Varied Project is supported by a Native Vegetation Clearance Report prepared by EBS Ecology. This will form the basis of a Native Vegetation Clearance Application to be lodged by Tilt Renewables. The Varied Project design minimises the amount of native vegetation to be cleared and where clearance is required, prioritises the clearance of lower quality native vegetation over high quality remnant vegetation.

Desired Outcome		
<p>PO 1.2</p> <p>Native vegetation clearance in association with development avoids the following:</p> <ul style="list-style-type: none"> – Significant wildlife habitat and movement corridors – Rare, vulnerable or endangered plants species – Native vegetation that is significant because it is located in an area which has been extensively cleared – Native vegetation that is growing in, or in association with, a wetland environment 	<p>None are applicable.</p>	<p>Areas of high value vegetation have been identified in the Ecological Constraints Assessment Appendix I. Works and access will be sited to avoid such areas of vegetation as far as reasonably practicable.</p> <p>Tilt Renewables has received a Clearance Data Report under the <i>Native Vegetation Act 1991</i> to permit the removal of 350.93 ha of native vegetation.</p> <p>Prior to construction, a CEMP will be created and measures will be implemented to minimise, rehabilitate and offset unavoidable loss or impacts to native vegetation.</p>
<p>PO 1.3</p> <p>Intensive animal husbandry, commercial forestry and agricultural activities are sited, set back and designed to minimise impacts on native vegetation, including impacts on native vegetation in an adjacent State Significant Native Vegetation Area, from:</p> <ul style="list-style-type: none"> – In the case of commercial forestry, the spread of fires from a plantation – The spread of pest plants and phytophthora – The spread of non-indigenous plants species – Excessive nutrient loading of the soil or loading arising from surface water runoff – Soil compaction – Chemical spray drift 	<p>DTS/DPF 1.3</p> <p>Development within 500 metres of a boundary of a State Significant Native Vegetation Area does not involve any of the following:</p> <ul style="list-style-type: none"> – Horticulture – Intensive animal husbandry – Dairy – Commercial forestry – Aquaculture 	<p>No horticulture, intensive animal husbandry, commercial forestry, or other agricultural activities are proposed.</p>
<p>PO 1.4</p> <p>Development restores and enhances biodiversity and habitat values through revegetation using locally indigenous plant species.</p>	<p>None are applicable.</p>	<p>Laydown areas and land use for temporary facilities will be revegetated following construction.</p>

Referral

The Ecological Constraints Assessment (Appendix I) concludes that the potential clearance associated with the project would be classified as clearance Level 4. A referral to the Native Vegetation Council is required.



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Legend

- Varied Project Area
- Indicative WTG Location
- Native Vegetation Overlay
- Micrositing Area - WTGs and Other Infrastructure
- State Roads

Note 1. Design for discussion purposes only and subject to further revision

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Figure 12. Varied Project - Native Vegetation Overlay



6.4.8 Prescribed Water Resources Area Overlay

The entire Varied Project Area is within the Prescribed Water Resources Area Overlay.

The sole Desired Outcome for this overlay (DO 1) is that sustainable water use in prescribed water resources areas maintains the health and natural flow paths of surface water, watercourses and wells. The Assessment Provisions within this Overlay relate to forms of development that require a Water Licence, and/or the development of dams or other structures intended to collect or divert surface water.

The development does not require a Water Licence and no dams or other structures intended to collect or divert surface water are proposed. There is no development proposed near existing water courses and the project design and siting will avoid development and works near any ephemeral water courses. No modification of existing watercourses is proposed. The development is unlikely to have significant impacts to either hydrology or run-off and any areas of hardstand or significant ground disturbance will consider suitable drainage controls as part of the detailed project design.

6.4.9 River Murray Tributaries Protection Area Overlay

The entire Varied Project Area is within the River Murray Tributaries Protection Area Overlay.

The sole Desired Outcome for this overlay (DO 1) is for sustainable water use and conservation of riverine environments within the River Murray Tributaries Protection Area. The Assessment Provisions within this Overlay relate to land division, forms of development that require a Water Licence, or forms of development which will collect and/or divert surface water flows through construction/modification of a dam or similar structure.

The Variation Application does not propose any development of this type and this overlay is not relevant.

6.4.10 State Heritage Place Overlay

By virtue of the outer boundaries of the parcels of land forming the Varied Project Area, the Granite Boulders Area Geological Site, which is classified as a State Heritage Place (SHR 13197), is located partially within the Varied Project Area. This place has a frontage to the northern side of Randell Road (Figure 13). No Project infrastructure is proposed to be constructed within the Granite Boulders Area Geological Site.

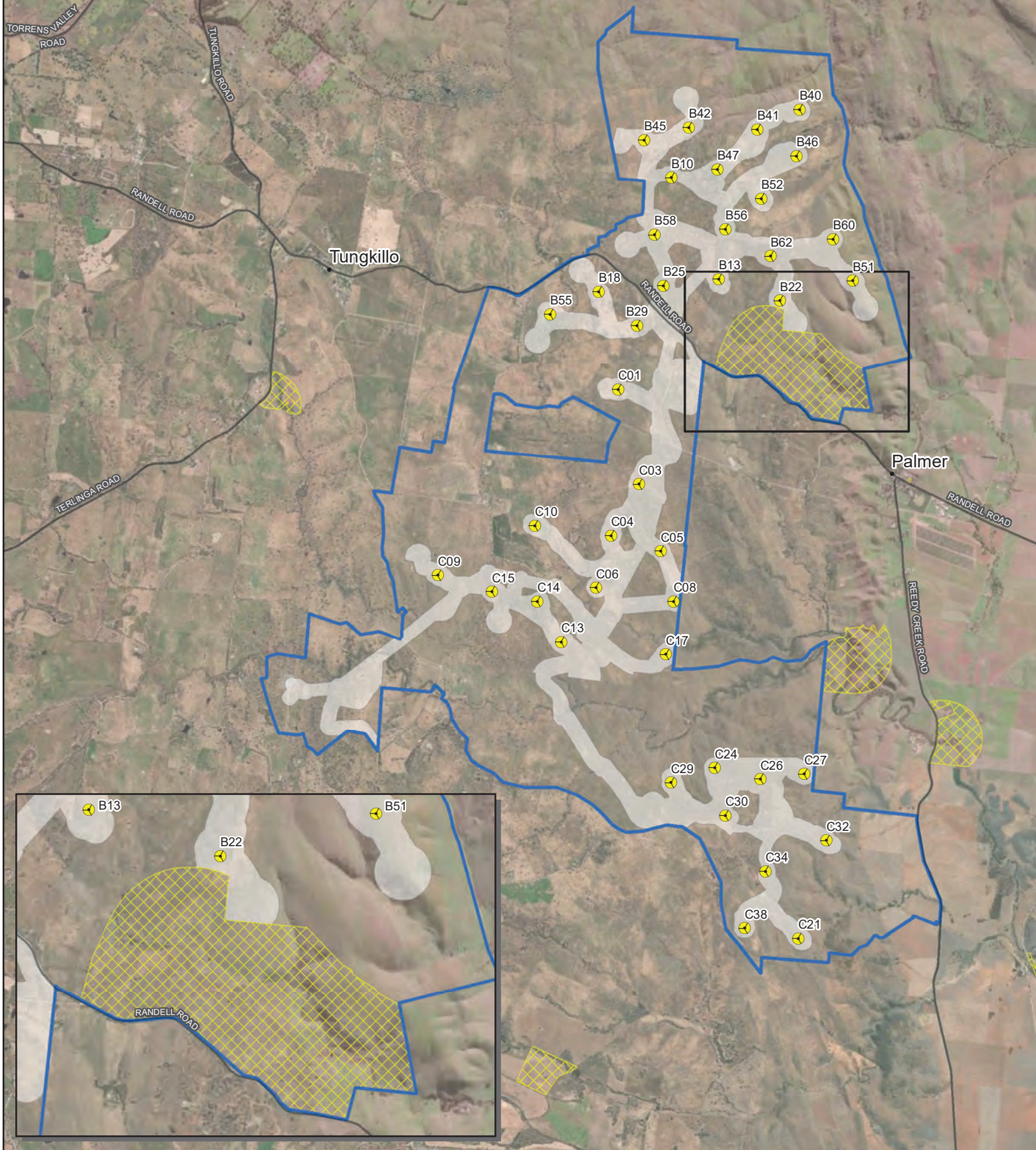
IHC's *Palmer Wind Farm Granite Boulders Geological Site: Heritage Impact Assessment* (January 2024) (Appendix G) notes that:

In 2014, the Development Application for the original Palmer Wind Farm development was referred to the Minister for Sustainability, Environment and Conservation in accordance with the Development Regulations 2008 – as development that directly affects a State heritage place or, in the opinion of the relevant authority, materially affects the context within which the State heritage place is situated. The South Australian State Heritage Unit assessed the proposed development in its impact on the Granite Boulders Area Geological Site and determined the following;

- *The proposed Palmer Wind Farm and ancillary development will not affect the significant fabric of the State Heritage Place, as the works are located a considerable distance away*
- *The setting of the Granite Boulders Area Geological site is considered to be limited by its landscape and allotment boundary. The proposed works, including substation, operations, maintenance, transmission lines and construction facilities, are located on land adjacent to the Geological Site. The nearest turbine is 750 m distance from the heritage place and therefore will not have any adverse impact on the setting of the State heritage place.*

Whilst the Minister's conclusions related to the Approved Project, the same conclusion can reasonably be expected to apply to the proposed Varied Project, as the distance from SHR 13197 to the nearest WTG remains 750 m. IHC's assessment concluded that whilst works would have minor temporary construction impacts (visual) on the cultural values of the site, these impacts would not materially affect the heritage value or significance of the site in the longer term. Increased access to and rehabilitation of the adjacent areas are likely to enhance the importance of the place to the community.

An assessment against the relevant Performance Outcomes of this overlay is provided at Table 16.



Document Path: G:\GIS\Project Data\Development\SA\Palmer\Maps\Working\FMWF_65C_WV_State Heritage Places_AAP_20240219.mxd

Legend

- Varied Project Area
- State Heritage Places Overlay
- ⚡ Indicative WTG Location
- Micrositing Area - WTGs and Other Infrastructure
- State Roads

Note 1. Design for discussion purposes only and subject to further revision

Date: 20/02/2024
Version: D

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Kilometres

GDA2020 MGA Zone 54
1:75,000



Palmer Wind Farm

Figure 13. Varied Project - State Heritage Places Overlay



Table 16 Response to the Performance Outcomes of the State Heritage Place Overlay

Desired Outcome		
DO 1	Development maintains the heritage and cultural values of State Heritage Places through conservation, ongoing use and adaptive reuse consistent with Statements of Significance and other relevant documents prepared and published by the administrative unit of the Public Service that is responsible for assisting a Minister in the administration of the <i>Heritage Places Act 1993</i> .	
Performance Outcome	Deemed-to-Satisfy Criteria / Designated Performance Feature	Response
Built Form		
PO 1.1 The form of new buildings and structures maintains the heritage values of the State Heritage Place.	None are applicable.	There are no proposed modifications or direct impacts to State Heritage ID 13197. The closest WTG is located approximately 100 m from the northern curtilage of the heritage site and 750 m from the item itself. The proposed works would have minor temporary construction impacts (visual) on the cultural values of the State Heritage Place, but these will not materially affect the heritage value or significance of the site in the longer term.
PO 1.2 Massing, scale and siting of development maintains the heritage values of the State Heritage Place.	None are applicable.	
PO 1.3 Design and architectural detailing (including but not limited to roof pitch and form, openings, chimneys and verandahs) maintains the heritage values of the State Heritage Place.	None are applicable.	
PO 1.4 Development is consistent with boundary setbacks and setting.	None are applicable.	
PO 1.5 Materials and colours are either consistent with or complement the heritage values of the State Heritage Place.	None are applicable.	
PO 1.6 New buildings and structures are not placed or erected between the primary and secondary street boundaries and the façade of a State Heritage Place.	None are applicable.	
PO 1.7 Development of a State Heritage Place retains elements contributing to its heritage value.	DTS/DPF 1.7 None are applicable.	

Referral

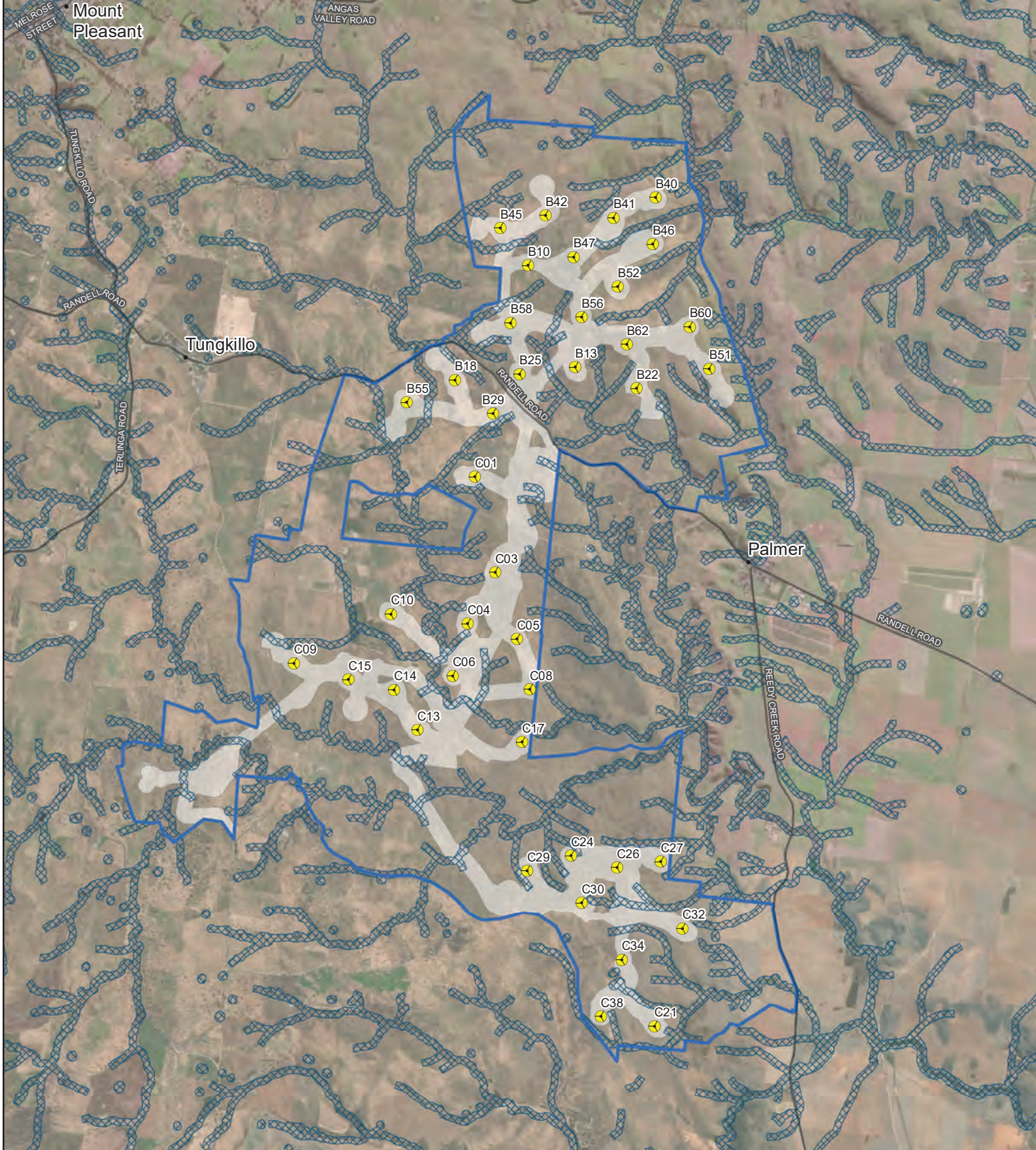
Given that the Varied Project is constituted of structures that are visible from a public street (Randell Road) which abuts the State Heritage Place, and these structures may visually affect the context of the Place, the Varied Project will require referral to the Minister responsible for the administration of the *Heritage Places Act 1993*.

6.4.11 Water Resources Overlay

The Water Resources Overlay traverses much of the Varied Project Area (Figure 14).

The two Desired Outcomes for this overlay are concerned with the protection of surface water quality in light of projected climate change, and the maintenance of natural flow paths of watercourses to assist in the management of stormwater and flood events.

There is no development proposed near existing watercourses and the project design and siting will avoid development and works near any ephemeral watercourses. No modification of existing watercourses is proposed. The development is unlikely to have significant impacts to either hydrology or run-off and any areas of hardstand or significant ground disturbance will consider suitable drainage controls as part of the detailed project design.



Document Path: G:\GIS\Project Data\Development\SA\Palmer\Maps\Working\PMWF_66C_WV_Water Resources_AAP_20240214.mxd

Legend

- Varied Project Area
- Water Resources Overlay
- ↻

 Indicative WTG Location
- Micrositing Area - WTGs and Other Infrastructure
- State Roads

Note 1. Design for discussion purposes only and subject to further revision

Date: 20/02/2024
Version: D

Kilometres

GDA2020 MGA Zone 54
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Palmer Wind Farm

Figure 14. Varied Project - Water Resources Overlay



6.5 General Development Policies

Within the Rural Zone, a wind farm is subject to assessment against all relevant general development policies. Many of the general development policies which would be applicable to the Varied Project are addressed via criteria in the overlays discussed in section 6.4. This section considers the Varied Project in light of the Assessment Provisions of applicable General Development Policies within the Code.

6.5.1 Clearance from Overhead Powerlines

The applicant has provided a declaration to the effect that the proposed development will not be contrary to the regulations prescribed for the purposes of Section 86 of the *Electricity Act 1996*.

6.5.2 Design

The Desired Outcome for this policy seeks to encourage development that is contextually appropriate, durable, inclusive, and sustainable.

Laydown areas will be revegetated following construction, where possible utilising locally indigenous species and/or species suited to climatic conditions, consistent with Design PO 3.2.

Siting of WTGs maintains natural hydrological systems and is not expected to negatively impact upon the quantity, quality, depth, or directional flow of surface water and groundwater, consistent with Design PO 5.1. As identified in Figure 14, no WTG locations or hardstands are proposed within the relevant Water Resources Overlay.

The proposed car parking areas are designed to minimise impact on sensitive receivers through siting and appropriate landscaping, consistent with Design PO 7.2 and 7.6.

Earthworks for the construction of access tracks are anticipated to be minimised, consistent with Design PO 8.1. On sloping land, access tracks have been designed with a gradient not exceeding 25%, in accordance with Design PO 8.2.

6.5.3 Infrastructure and Renewable Energy Facilities

The Desired Outcome for this policy seeks to ensure efficient provision of renewable energy facility and ancillary development in a manner that minimises hazard, is environmentally and culturally sensitive and manages adverse visual impacts on natural and rural landscapes and residential amenity.

The Aviation Impact Assessment concludes that there will not be an adverse impact on air transport safety, in accordance with PO 4.1.

Siting of WTGs is separated as far as practicable from nearby dwellings and tourist accommodation, and is not expected to increase bushfire hazard risk, in accordance with Infrastructure and Renewable Energy Facilities POs 4.2 and 4.3.

Siting of WTGs and other structures such as substations and operations facilities has been informed by the Flora and Fauna Impact Assessment (Appendix I) and Landscape and Visual Impact Assessment (Appendix L), in order to avoid and minimise impacts to native vegetation and visual amenity as much as practicable. The selected layout and design are in accordance with PO 5.1.

In accordance with Renewable energy facilities – PO 7.1, the Varied Project has been designed to be as close as reasonably practicable to existing electricity infrastructure including substations and transmission lines. Final design of transmission lines and connection to a nearby substation will be confirmed at the design stage and is dependent upon the outcome of connection studies undertaken in conjunction with ElectraNet. The relevant design parameters of the electrical infrastructure proposed as part of the Varied Project are summarised in section 3.1.

Laydown areas and land use for temporary facilities will be revegetated following construction, in accordance with Infrastructure and Renewable Energy PO 13.2.

6.5.3.1 Renewable Energy Facilities (Wind Farm)

In addition to those policies outlined in section 6.5.3, the General Development Policies for Infrastructure and Renewable Energy Facilities include several policies specific to Wind Farms (PO 8.1 – PO 8.5). These policies seek to reduce the visual impact of WTGs, minimise the potential for bird and bat strike, and minimise the risk to aircraft operations from both WTGs and met masts.

PO 8.1 specifies setback distances from certain zones and dwellings, which must be met to achieve DTS/DPF 8.1. WTGs must be set back from the Rural Settlement Zone, the Township Zone, the Rural Living Zone and the Rural Neighbourhood Zone by at least 2,000 m with an additional 10 m setback per additional metre over 150 m turbine height (measured from the base of the turbine). Based on the proposed maximum WTG height for the Varied Project, the setback requirement from the relevant zones is 2,700 m.

WTGs must also be setback at least 1,500 m from any non-associated dwellings and tourist accommodation. There are no non-associated dwellings within 1,500 m of any WTGs for the Varied Project, with 16⁷ associated dwellings located within this setback (refer to Appendix C).

The layout of all WTGs meets or exceeds the minimum requirements described above and therefore DTS/DPF 8.1 is satisfied.

The proposed layout of WTGs for the Varied Project has been optimised based on feedback from the Landscape and Visual Impact Assessment (Appendix L) and Bird and Bat Risk Assessment (Appendix K) to reduce visual impact and minimise the potential for bird and bat strike.

The Aviation Impact Assessment (Appendix F) concludes that the Varied Project will post minimal risk to aircraft operations and meets requirements for minimum clearance zones. In accordance with the recommendations of the Aviation Impact Assessment, WTGs and met masts will have appropriate hazard marking and lighting and notifications will be made to the relevant agencies to note the tall structures on aviation charts.

6.5.4 Interface between Land Uses

The Desired Outcome for this policy seeks to ensure development is located and designed to mitigate adverse effects on or from neighbouring and proximate land uses.

The Varied Project Area is located approximately 2.7 km west of the town of Palmer and approximately 2 km east of the town of Tungkillo, where most of the residential uses within proximity of the Varied Project Area are located within the Township Zone. Most of the land surrounding the Varied Project Area and adjacent to these towns is zoned Rural Zone. As this zone seeks to support the development of renewable energy facilities, the Varied Project meets the Interface between Land Uses criteria PO 1.1 and 1.2 for General Land Use Compatibility.

Under normal conditions the WTGs will operate for 24 hours per day. Given the separation distance between the Varied Project and sensitive receivers and the Township Zone, these hours of operation are considered to be appropriate and consistent with PO 2.1.

POs 3.1, 3.2, and 3.4 seek to reduce the impact of overshadowing and shadow flicker on nearby sensitive receptors and dwellings. A Shadow Flicker and Blade Glint Assessment (Appendix N) has been used to inform the siting of WTGs. The assessment found six receptors which, based on a conservative assessment, are expected to receive annual shadow flicker in excess of that recommended by the *Draft National Wind Farm Development Guidelines for Australia (2010)*.

As discussed in Section 4, Tilt Renewables has agreements in place with each of the owners of the dwellings. Under these agreements, two of the six dwellings (which are located within the Project Area) will be abandoned for the life of the Project. Tilt Renewables is seeking the express consent of the owners of the other four dwellings in respect of the anticipated shadow flicker impact. If consent is not obtained prior to commencement of wind farm operations, curtailment measures will be put in place such that shadow flicker impacts at the relevant dwelling meet the guideline levels set out in the *Draft National Wind Farm Development Guidelines for Australia (2010)*.

⁷ It is noted that Tilt Renewables has agreement with two of the 16 dwellings to abandon and not occupy the dwelling for the life of the Project.

PO 4.1 seeks to minimise adverse impact from activities generating noise at sensitive receivers. A Noise Impact Assessment (January 2024, Appendix M) found that compliance with recommended noise limits per the *Wind farms environmental noise guidelines* (Environment Protection Authority South Australia, 2021) were likely to be achieved at all non-associated residences (i.e. all residences without an agreement with Tilt Renewables). DTS/DPF 4.1 is satisfied.

PO 7.1 seeks to minimise negative impacts to adjacent road users or adjacent buildings/land uses that may occur from excess Solar Reflectivity / Glare. The Shadow Flicker and Blade Glint Assessment (Appendix N) notes that per the *Draft National Wind Farm Development Guidelines for Australia (2010)* wind turbine blades must be finished using a low-reflective treatment such that reflective glinting from the blade surface or strobing reflections caused by blade rotation is mitigated. It has become standard practice for wind turbine blade manufacturers to apply such treatment to their blades and there is low risk of excessive/harmful blade glint. DTS/DPF 7.1 is satisfied.

As discussed in Section 3.4, An Electromagnetic Interference (EMI) Assessment (Appendix H) was undertaken to inform siting of the WTGs. The assessment concluded that the proposed turbine locations have been spaced to mitigate the effect of creating a "virtual wall" of turbines. A virtual wall is an electromagnetic barrier between a TV transmitter and households serviced by that transmitter.

As was the case for the Approved Project, television reception at certain dwellings located in the scattering zones may be affected by the Varied Project. This will be mitigated by pre- and post-construction TV signal surveys undertaken to confirm any impacts from the wind farm and implementation of appropriate measures to rectify any confirmed impacts. Any effect on the mobile telephone and broadband internet broadcast from the Varied Project will be minimal.

The Varied Project will have nil to negligible effects on aircraft navigation signals, trigonometric systems, amateur radio systems, earth stations, scientific radio systems, maritime radio systems and Radiodetermination stations. DTS/DPF 8.1 is satisfied.

7. Conditions of Consent and Statement of Commitments

7.1 Current conditions for the Approved Project

The ERDC issued an Order on 7 March 2018, which approved the Project and updated the conditions originally applied to the approval granted by Mid Murray Council. Table 17 sets out the proposed variation to those conditions as sought by this Variation Application. Of the 27 conditions, only 7 are proposed to be varied, largely for administrative reasons (including as a result of removal of Area A, and the updated noise assessment which will likely result in updated conditions from the Environment Protection Authority).

Table 17 Conditions imposed upon the Development Plan Consent by the ERDC and proposed Variation

ERDC condition		Proposed Variation
1	Except where minor amendments may be required by other relevant Acts, or by conditions imposed by this Development Plan Consent, the development shall be established in strict accordance with the Amended Consolidated Particulars of Development.	Replace with the following condition in order to reflect modifications to the Project set out in this Variation Application: <i>1. Except where minor amendments may be required by other relevant Acts, or by conditions imposed by this Development Plan Consent, the development shall be established in strict accordance with the Amended Consolidated Particulars of Development, as modified by the Variation Application dated February 2024.</i>
2	The final layout plan, or layout plans for each stage, and associated details including the final colour selection of the wind turbines and ancillary infrastructure (including the overhead powerlines), shall be submitted to the Council. The Council shall confirm its satisfaction with this additional information prior to the granting of Development Approval or prior to Development Approval for each stage.	No change
3	A driver safety assessment report that identifies appropriate mitigation measures (if any) shall be submitted to the Council. The Council shall confirm its satisfaction with this additional information prior to the granting of Development Approval or, in the case of a staged approval, prior to Development Approval for the first stage.	No change.
4	Within two years of the wind farm becoming non-functional all above ground infrastructure will be decommissioned and removed from the site by the applicant.	No change.

ERDC condition	Proposed Variation
<p>5 In respect of the site of the dwelling and associated buildings (namely, those buildings - excluding tanks, poles and the like - shown on the site plan dated 29/07/15 rev C as 'existing historic stone building retained', 'existing structure', existing structures', 'proposed carport' and 'prop new dwelling') described in Development Approval 711/013/14 (Exhibit 2A4) and located on section 654, Hundred of Jutland (with access via section 79, Hundred of Finniss) certificate of title volume 5604 folio 632 ('the Royal building site'):</p> <p>a) noise levels at the Royal building site must meet the requirements of the Environment Protection Authority's Wind Farms Environmental Noise Guidelines (2009) for a relevant receiver;</p> <p>b) no turbine may be constructed within 1 kilometre of the area of the Royal building site shown as the precise site of the new dwelling approved in Development Approval 711/013/14 (the dwelling envelope); and</p> <p>c) theoretical shadow flicker duration at the dwelling envelope and within 50 metres of the dwelling envelope must be less than 30 hours per year and actual shadow flicker at the dwelling envelope and within 50 metres of the dwelling envelope must not exceed 10 hours per year.</p>	No change.
Condition agreed between Eastern Mount Lofty Ranges Landscape Guardians Inc and Tilt Renewables	
<p>6 The final wind farm layout required by condition 2 of the Development Plan Consent:</p> <p>a) shall show all wedge tailed eagle and peregrine falcon nests which have been either:</p> <ul style="list-style-type: none"> i. recorded by EBS Ecology at the time of preparation of the final layout; or ii. identified by Ian Falkenberg to the proponent and: <ul style="list-style-type: none"> A. verified by EBS Ecology (or other suitably qualified environmental consultant engaged by the proponent); or B. after consideration by EBS Ecology (or other suitably qualified environmental consultant engaged by the proponent), verified by a suitably qualified environmental consultant nominated by the President of the Law Society of South Australia, <p>at the time of preparation of the final layout; and</p> <p>b) shall not show any wind turbine within:</p> <ul style="list-style-type: none"> i. 500 metres of any wedge tailed eagle nest shown on the layout; or ii. 1000 metres of any peregrine falcon nest shown on the layout. 	No change.
Conditions as advised by the Environment Protection Authority (EPA)	
<p>7 Noise levels at the noise sensitive receivers in the vicinity of the Wind Farm development shall meet the requirements of the EPA's Wind Farms Environmental Noise Guidelines (2009). The noise level at the relevant receivers* shall not exceed:</p> <ul style="list-style-type: none"> i. 35dB(A) if receivers are situated in a Rural Living zone, or ii. 40dB(A) for noise sensitive receivers in other zones, or iii. the background noise (LA90, 10) by more than 5dB(A), whichever is the great. <ul style="list-style-type: none"> • A relevant receiver is defined as an occupied dwelling where the owners do not have an agreement with the wind farm developer. The above measured noise levels shall be adjusted in accordance with the Wind Farms Environmental Noise Guidelines (2009) by the inclusion of a penalty for the tonal characteristic where necessary. 	No change.

ERDC condition		Proposed Variation
8	Warranted maximum sound power characteristic for the wind turbine generators installed in accordance with the proposed layout shall not exceed levels in Table 5.1' of the Environmental Noise Assessment report prepared by Sonus Pty Ltd and dated August 2014 unless otherwise agreed to by the Council, having consulted with the Environment Protection Authority. The warranted sound power levels shall be measured and reported in accordance with IEC61400-11, Ed.3.0: Wind turbines - Part 11: Acoustic noise measurements techniques.	The Variation Application is expected to be referred to the Environment Protection Authority (EPA) and it is anticipated that revised conditions will reference the Environmental Noise Assessment undertaken for the Variation Application (Sonus, 2024).
9	Noise emitted by the selected wind turbine generators shall not include tones audible at the noise receivers ($\Delta L_{a,k} > 0$) when tested in accordance with the tonality test procedure defined in IEC 61400-11, Ed.3.0: Wind turbines - Part 11: Acoustic noise measurement techniques. Alternatively, the absence of tones shall be confirmed by results of post-construction acoustic testing performed at locality R40 as shown in the Environmental Noise Assessment report (Sonus Pty Ltd, August 2014). The results of any such post-construction tonality testing shall be submitted to the Council within 3 months of the proposed development commencing operation. The Council shall confirm its satisfaction with any post-construction tonality testing, having consulted with the Environment Protection Authority.	
10	Sound power of each of the two transformers to be installed in the electric substation shall not exceed levels indicated in Table 5.2 of the Environmental Noise Assessment report (Sonus Pty Ltd, August 2014) unless otherwise agreed to by the Council, having consulted with the Environment Protection Authority.	
11	An independent acoustical consultancy (other than the company that prepared the predictive acoustical report) shall monitor noise levels at seven localities at least: R13, R22, R28, R39, R45, R55 and R100 (as shown on the map in the Environmental Noise Assessment report prepared by Sonus Pty Ltd and dated August 2014) or such other localities agreed to by the Council, having consulted with the Environment Protection Authority. Monitoring shall be undertaken with reference to the Environment Protection Authority Wind Farms Environmental Noise Guidelines when all of the noise sources associated with the wind farm are in operating mode. The results of this monitoring shall be submitted to the Council within 3 months of the proposed development commencing operation. The Council shall confirm its satisfaction with the results of the post-construction noise monitoring, having consulted with the Environment Protection Authority.	
12	If post-construction noise monitoring results reveal non-compliance with the noise criteria specified in the EPA's 2009 Wind Farms Environmental Noise Guidelines, the proponent shall implement measures to ensure compliance with such noise criteria.	

ERDC condition		Proposed Variation
Conditions as advised by Department of Planning, Transport and Infrastructure		
13	<p>A Traffic Management Plan for the proposal shall be submitted to the Council. The Council shall confirm its satisfaction with this additional information, having consulted with the Department of Planning, Transport and Infrastructure, prior to the granting of Development Approval or, in the case of a staged approval, prior to Development Approval for the first stage. This plan shall incorporate the following points:</p> <ul style="list-style-type: none"> – The final access route for areas A, B and C; – Details of all road upgrades required to facilitate the development; – Details of delivery times; – Details of proposed road closures and their management; – Details of permits required; – Details of all required road signs and advisory signs; – A route risk assessment for roads intended for transportation of over-dimensional/over mass wind farm components 	Delete reference to Area A (given that Area A is being deleted from the Project Area as part of the Variation Application).
14	The transmission line shall be designed to minimise its impact on the arterial road network. Evidence of how this impact has been minimised via the consideration of alternative options shall be provided to the satisfaction of Council, having consulted with the Department of Planning, Transport and Infrastructure. All power poles adjacent arterial roads shall be constructed in accordance with Austroads Guide to Road Design Part 6: Roadside Design, Safety and Barriers.	No change.
15	All power lines over arterial roads shall provide a minimum vertical clearance of 7.5 metres.	No change.
16	All underground cabling (including boring) on or adjacent arterial roads shall be designed to minimise its impact on the arterial road network. All reinstatement works shall be undertaken to Department of Planning, Transport and Infrastructure standards and requirements at the applicant's cost.	No change.
17	All access points serving the temporary construction facilities (including but not limited to, workers compounds and batching facilities) located on, or requiring access to, arterial roads shall be located to the satisfaction of the Council, having consulted with Department of Planning, Transport and Infrastructure, to ensure road safety is maximised during the construction phase of the project. All temporary access points shall be decommissioned to Department of Planning, Transport and Infrastructure requirements at the applicant's cost.	No change.
18	All road works deemed to facilitate safe access shall be designed and constructed to comply with Austroads Guides and Australian Standards and to the satisfaction of the Council, having consulted with the Department of Planning, Transport and Infrastructure, with all costs (including, but no limited to, design, construction, project management and any changes to road drainage) to be borne by the applicant. Prior to the applicant undertaking any detailed design, the applicant shall contact Department of Planning, Transport and Infrastructure Traffic Operations, A/Project Liaison Engineer, Mrs Christina Canatselis on telephone (08) 8226 8262 or mobile 0401 120 490 (christina.canatselis@sa.gov.au) to discuss any technical issues regarding the required works.	No change.
19	Any modification to road side drainage as a result of a temporary access, or modifying an existing access on an arterial road shall be suitably designed to Department of Planning, Transport and Infrastructure standards in order to maximise road safety on the adjacent arterial road network.	No change.

ERDC condition		Proposed Variation
20	The applicant shall notify the Commissioner of Highways by submitting a "Notification of Works Impacting Department of Planning, Transport and Infrastructure Roads" form at least five (5) working days before construction works begin. This form is available from the following internet address: http://www.sa.gov.au/topics/transport-travel-and-motoring/transport-industry-services/road-construction-and-maintenance/getting-permission-to-carry-out-roadworks	No change.
21	All vehicles shall enter and exit to/from arterial roads in a forward direction.	No change.
22	All car parking facilities shall be designed and constructed in accordance with AS/NZS 2890.1:2004 and 2890.6:2009.	No change.
23	All heavy vehicle manoeuvring areas shall be consistent with AS 2890.2:2002.	No change.
Conditions as required by the Minister for Water and the River Murray		
24	During construction activities the subject land shall be managed in a manner as to prevent erosion and pollution of the subject site and the environment, including keeping the area in a tidy state and ensuring any waste materials are appropriately contained to ensure no pollutants (including excavation or fill material) enter the River Murray system.	No change.
25	Any fill material brought to development sites shall be clean and not contaminated by construction or demolition debris, industrial or chemical matter, or pest plant or pathogenic material.	No change.
26	Any excavation or fill material surplus to the requirements of the development shall be disposed of such that it will not: <ul style="list-style-type: none"> a. be located within the floodplain of any watercourses; b. adversely impact native vegetation; c. impede the natural flow of any surface waters; d. allow sediment to re-enter any water body; e. facilitate the spread of pest plant and pathogenic material. 	No change.
27	Wind turbines shall be positioned such that no portion of the structure, including blades, overhang into adjacent parcels of Crown Land.	No change.

7.2 Statement of Commitments

The Amended Consolidated Particulars of Development that describe the Approved Project contain a Statement of Commitments in respect of the manner in which the Approved Project will be developed and operated.

Some of the Commitments are proposed to be varied to reflect the Varied Project. The Commitments that are proposed to be varied are set out in Table 18 while a full copy of the Statement of Commitments, showing the proposed variations in context, is included at Appendix E.

Table 18 Proposed variations to Statement of Commitments

Topic	Number	Statement of Commitment	Proposed Variation	Justification
4.4 Landscape and Visual Impact Management	7	<i>Turbines will be located within approved ridgeline segments and spaced in an ellipse of no less than three times the rotor diameter by two times the rotor diameter. The ellipse will be oriented into the predominant wind direction.</i>	Turbines will be located within the approved <u>micrositing areas for turbines and other infrastructure</u> . <u>Any micrositing of turbines will ensure compliance with all relevant regulations listed in these commitments including appropriate setbacks from dwellings and compliance with noise and shadow flicker requirements.</u>	Ridgeline segments are no longer relevant to the Varied Project, with a refined micro-siting area for wind farm infrastructure being defined as part of the Variation Application.

Topic	Number	Statement of Commitment	Proposed Variation	Justification
4.5 Flora and Fauna Impact Management	3	<i>Within one year after construction of turbines in a turbine area, the operator will implement a bird monitoring program in respect of the turbine area that provides for annual monitoring, for a minimum of five years, of all nest sites of Wedge-tailed Eagles and Peregrine Falcons recorded in the turbine area in the EBS Ecology Report "Palmer Wind Farm Flora and Fauna Survey" dated 7 August 2014. Monitoring is to be undertaken in accordance with established scientific methods and at a minimum must identify whether each nest is active and whether young have successfully fledged from the nest. The operator will provide a report of the results of the monitoring to the Mid Murray Council each year for a minimum of five years.</i>	Within one year after construction of turbines in a turbine area, the operator will implement a bird monitoring program in respect of the turbine area that provides for annual monitoring, for a minimum of five years, of all nest sites of Wedge-tailed Eagles and Peregrine Falcons recorded in the turbine area in the draft EBS Ecology Report " <u>Variation Application Flora and Fauna Impact Assessment</u> " dated 02 February 2024. Monitoring is to be undertaken in accordance with established scientific methods and at a minimum must identify whether each nest is active and whether young have successfully fledged from the nest. The operator will provide a report of the results of the monitoring to Mid Murray Council each year for a minimum of five years.	Update to commitment is proposed to align with most recent ecological surveys undertaken for the Varied Project.
4.7 Cultural Heritage Impact Management	5	<i>The Aboriginal site discovery procedure provided in the Heritage Assessment report will be followed if Aboriginal sites, objects or remains are discovered during works in the Project Area.</i>	The Aboriginal site discovery procedure provided in the <u>Heritage Assessment Summary</u> will be followed if Aboriginal sites, objects or remains are discovered during works in the Project Area.	Update required to reflect reference to the heritage assessment undertaken for the Varied Project.
4.8 Traffic Impact Management	1	<i>In consultation with the Council, DPTI and any other relevant agency, a Traffic Management Plan (construction and operational) will be developed to manage the overall impacts and disturbance to infrastructure and other road users during the construction and ongoing operation phases of the project, including any special safety considerations for historic traffic hot spot areas and impact mitigation measures for residential dwellings along proposed public access routes.</i>	In consultation with the Council, <u>Department for Infrastructure and Transport</u> and any other relevant agency, a Traffic Management Plan (construction and operational) will be developed to manage the overall impacts and disturbance to infrastructure and other road users during the construction and ongoing operation phases of the project, including any special safety considerations for historic traffic hot spot areas and impact mitigation measures for residential dwellings along proposed public access routes.	Update to reflect the Department's name change.
4.10 Electromagnetic Interference Impact Management	2	<i>Additional consultation with Telstra, SA Water and the Bureau of Meteorology will be undertaken as part of finalising the final layout.</i>	Additional consultation with Telstra, SA Water and the Bureau of Meteorology will be undertaken as part of finalising the final layout. Written confirmation will be obtained from the Bureau of Meteorology ensuring satisfaction with mitigation measures implemented as part of the Varied Project to reduce risk to the Adelaide (Buckland Park) radar.	Update to ensure BoM's feedback on the Varied Project will be addressed.

8. Conclusion

This application seeks to vary the existing Development Plan Consent (DA 711/072/14) for the Palmer Wind Farm located in South Australia.

Due to advancements in technology since 2014 when DA 711/072/14 was lodged, the Variation Application proposes to amend the Approved Project to reduce the number of turbines required while generating a similar volume of clean energy. This variation application seeks:

- An increase in the maximum tip height from 165 m to 220 m
- A reduction in the number of turbines from up to 103 to up to 40
- A reduction in the size of the Project Area
- Changes to the internal wind farm layout resulting from the change in turbine model and Project Area
- An increase in 275 kV overhead transmission line length, including an increase in span length as well as the height of lattice towers from up to 46 m to up to 55 m
- An additional electrical substation, for a total of 2
- A reduction in permanent met masts, from up to 7 to up to 5
- Additional temporary construction compounds and laydown areas

The Varied Project would result in a wind farm that is both more technologically advanced and expected to have lesser impact on the surrounding environment, than the Approved Project.

A detailed assessment of the key impacts of the Varied Project has been undertaken by technical specialists. The assessment focused on the potential change in impacts compared with the Approved Project. The assessment has also taken into consideration the relevant environmental issues identified in the assessments of the Approved Project. The assessments undertaken for the Varied Project found that compared to the currently approved development:

- There would be no increased impact to aviation safety
- The reduction in WTGs would result in an approximately 26% reduction in the total rotor swept area. The revised layout also results in four fewer WTFS in or near woodlands. The combined effect of these two changes reduces the potential risks for birds and bats.
- The impact on cultural heritage and historic heritage matters remains unchanged
- The impact on Electromagnetic Interference remains unchanged
- There is likely to be a reduced impact on fauna
- There would be an increase in the removal of native vegetation, however the majority of the vegetation proposed to be removed is of poor quality and efforts have been made to avoid and minimise impacts to high quality native vegetation as much as practicable
- Due to the significantly reduced Project Area, the overall visual impact to the region would be reduced. However, the larger and taller turbines do represent a modest increase to the visual impact from the surrounding the Varied Project Area
- The predicted noise levels have generally decreased, with 76 residences likely to experience a decrease in noise level and seven residences likely to experience a noticeable increase in noise level (5 non-associated residences and 2 associated residences). Despite the increase in noise level at those seven residences, the relevant noise criteria would still be achieved at all 83 residences.
- The projected shadow flicker exceedance would be diminished
- There would be a significantly reduced impact on traffic including a significant reduction in trip generation, including a greater than 50% reduction in trips of heavy and oversize overmass vehicles

In conclusion, the results of the various impact assessments demonstrate that the overall impact of the Varied Project is similar to or lower than that of the Approved Project. The Project is highly consistent with the Performance Outcomes sought by the Code and displays considerable merit.

The Palmer Wind Farm will provide renewable energy for South Australia and the national grid, along with opportunities for the local region in terms of employment. It is considered that the variation to the Approved Project warrants approval.

9. References

Aviation Projects, 17 January 2024. *Aviation Impact Assessment Second Draft*

EBS Ecology, 25 August 2023. *Bird and Bat Risk Assessment*.

EBS Ecology, 02 February 2024. *Flora and Fauna Impact Assessment – Version 3*

GHD Pty Ltd, 12 February 2024. *Shadow Flicker and Blade Glint Assessment*.

GHD Pty Ltd, 9 February 2024. *Electromagnetic Interference Assessment*.

Independent Heritage Consultants, January 2024. *Heritage Gap Analysis and Archaeological Inspection*.

Independent Heritage Consultants, January 2024. *Heritage Impact Assessment – Granite Boulders Geological Site*.

Sonus Pty Ltd, January 2024. *Noise Impact Assessment*.

Stantec Australia Pty Ltd, 18 January 2024. *Traffic Impact Assessment – Draft Report*.

Wax Design, 23 January 2024. *Landscape Character and Probable Visual Effect Assessment*.

Appendices

Appendix A

Ministerial Call-In Letter

Hon Nick Champion MP



Government
of South Australia

Minister for Trade and
Investment

Minister for Housing and
Urban Development

Minister for Planning

GPO Box 11032
ADELAIDE SA 5001

T: (08) 8235 5580

E: ministerchampion@sa.gov.au

23EXT0142

Mr Anthony Yeates
Executive General Manager, Development
Tilt Renewables

By email: anthony.yeates@tiltrenewables.com

Dear Mr Yeates

Thank you for your recent correspondence regarding a call-in request under section 94 of the *Planning, Development and Infrastructure Act 2016* (the Act) for a proposed variation to the previously approved Palmer Windfarm, near Palmer and Tungkillo, approximately 50 kilometres east of Adelaide.

Section 94(2)(g) of the Act allows a proposed development to be called-in for assessment by the State Planning Commission (the Commission) where the Minister considers that it is otherwise necessary or appropriate for the proper assessment of the proposed development.

I note that this Act has been introduced since the original application for the Palmer Windfarm was approved, and that the Act appoints the Commission as the relevant authority for applications for electricity generating plants over 5MW connected to the state's electricity network. In this instance, due to the nature of the variation, the change in assessment responsibilities between the local and state level for larger scale renewables, and to remove any doubt as to the decision-maker for this variation, I am of the view that a call-in to the Commission is appropriate for the proper assessment of the proposal.

It is the expectation that prior to the formal lodgement of the proposal you will actively participate with the Commission in a pre-lodgement process, which will involve the Mid Murray Council and relevant state agencies. Furthermore, a subsequent development application is to be lodged with the Commission within nine months of the date of this letter, otherwise the support for the call-in under section 94 of the Act will lapse.

The application should be lodged through the Development Application Processing (DAP) system via the PlanSA Portal online at https://plan.sa.gov.au/our_planning_system/plan_sa/development_application_processing_system. This correspondence should be included with your development application when completing the online lodgement process on the DAP system.



OFFICIAL

If you require any further information about the development assessment process, including pre-lodgement requirements, please contact Mr Troy Fountain, Manager – Commission Assessment, Planning and Land Use Services, Department for Trade and Investment on (08) 7133 2366 or via email at troy.fountain@sa.gov.au.

Further, it would be appreciated if you could advise Planning and Land Use Services once you have lodged the application on the DAP system.

Yours sincerely

A handwritten signature in blue ink, appearing to read "Nick Champion", with a stylized flourish at the end.

Hon Nick Champion MP
Minister for Planning

3 June 2023

Appendix B

Approved Project Parcels

Table 19 provides a complete list of land parcels which were included in the Approved Project. The third column indicates whether the land parcel is proposed to be retained for the Varied Project.

Table 19 Comparison of land parcels between Approved Project and Varied Project

Title Reference	Parcel ID	Included in Varied Project?
CT5144/864	D26866 A1	✓
CT5153/319	D20944 A74	✓
CT5297/468	F157755 A30	✓
CT5297/468	F157755 A31	✓
CT5297/468	F157755 A32	✓
CT5297/468	F157755 A33	✓
CT5348/175	F169893 A144	
CT5381/422	F170025 A276	
CT5385/990	H171000 S481	✓
CT5385/990	H171000 S482	✓
CT5404/721	F169891 A142	✓
CT5405/94	F204303 A91	✓
CT5405/94	F204303 A92	✓
CT5405/94	F204303 A93	✓
CT5405/94	F204303 A94	✓
CT5405/94	F204303 Q95	✓
CT5405/94	F204303 Q96	✓
CT5408/141	D47145 A62	✓
CT5409/144	H171000 S214	✓
CT5416/67	D16500 A307	
CT5421/814	F157574 A39	✓
CT5421/813	F157582 A47	✓
CT5421/812	F157583 A48	✓
CT5421/815	H171000 B480	✓
CT5423/857	F22576 A203	
CT5426/871	H171000 S357	
CT5433/293	H171000 S241	✓
CT5433/294	H171000 S242	✓
CT5433/702	H171000 S243	✓
CT5436/853	D16500 A305	
CT5473/924	H171000 S211	✓
CT5479/260	H171000 S72	✓
CT5517/115	H170300 S52	
CT5546/926	F169887 A138	
CT5546/925	F169888 A139	
CT5578/297	H171000 S358	✓
CT5615/892	D3806 A8	

Title Reference	Parcel ID	Included in Varied Project?
CT5651/396	F206935 A95	
CT5657/268	F169896 A147	
CT5689/533	D1648 A5	
CT5702/227	F169894 A145	
CT5732/435	F169873 A124	✓
CT5756/275	F217815 A200	✓
CT5756/276	F217815 A201	✓
CT5756/277	F217815 A202	✓
CT5756/278	F217815 A203	✓
CT5756/279	F217815 A204	✓
CT5756/280	F217815 A205	✓
CR5757/383	H170100 S530	
CR5760/543	H170100 S55	
CR5761/336	H170500 S344	✓
CR5762/33	H171000 S513	✓
CT5833/39	R1430 AE	
CT5844/707	F218333 A17	✓
CT5844/707	F218333 A18	✓
CT5844/707	F218333 A19	✓
CT5844/707	F218333 A20	✓
CT5844/707	F218333 A21	✓
CT5844/707	F218333 A22	✓
CT5854/170	H170500 S2	
CT5854/170	H170500 S322	
CT5854/170	H170500 S330	
CT5854/170	H170500 S390	
CT5854/170	H170500 S391	
CT5854/170	H170500 S392	
CT5854/170	H170500 S393	
CT5854/170	H170500 S394	
CT5854/170	H170500 S395	
CT5854/170	H170500 S396	
CT5854/170	H170500 S397	
CT5854/170	H170500 S655	
CT5861/704	F169981 A232	✓
CT5866/948	R4658 AA	✓
CT5868/563	F170028 Q279	
CR5874/60	F43319 A23	✓
CT5876/758	F169983 A234	✓
CT5895/897	D1648 A9	✓
CT5895/323	F169884 A135	✓

Title Reference	Parcel ID	Included in Varied Project?
CT5897/853	D20944 A75	✓
CT5899/987	F169886 A137	✓
CT5906/60	F43319 A20	✓
CT5906/61	F43319 A21	✓
CT5906/62	F43319 A22	✓
CT5906/64	F43319 A26	✓
CT5906/63	F43319 Q24	✓
CT5906/63	F43319 Q25	✓
CT5958/134	D68586 A36	
CT5989/715	F169892 A143	
CT6031/198	F170020 Q272	
CT6055/389	H171000 S483	✓
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CT6081/943	F157552 A17	✓
CT6087/92	F170029 A280	
CT6088/441	H171000 S488	✓
CT6120/424	D17736 A102	✓
CT6166/390	D110980 A1	
CT6177/544	D111240 A3	
CT6184/936	D113198 A10	✓
CT6206/912	D118280 A5	
CT6206/913	D118280 A6	
CT6217/616	D119394 A20	✓
CT6217/618	D119394 A21	✓
CT6230/76	D120933 A201	✓

Appendix C

**Approved vs Varied Project Layout
Figures**

Appendix D

Development Plans

Appendix E

Statement of Commitments

Appendix F

Aviation Impact Assessment

Appendix G

Cultural Heritage (Aboriginal and Historic) Assessment

Appendix H

**Electromagnetic Interference (EMI)
Assessment**

Appendix I

Flora and Fauna Impact Assessment

Appendix J

Native Vegetation Clearance Report

Appendix K

Bird and Bat Risk Assessment

Appendix L

Landscape and Visual Impact Assessment

Appendix M

Noise Impact Assessment

Appendix N

**Shadow Flicker and Blade Glint
Assessment**

Appendix O

Traffic Impact Assessment

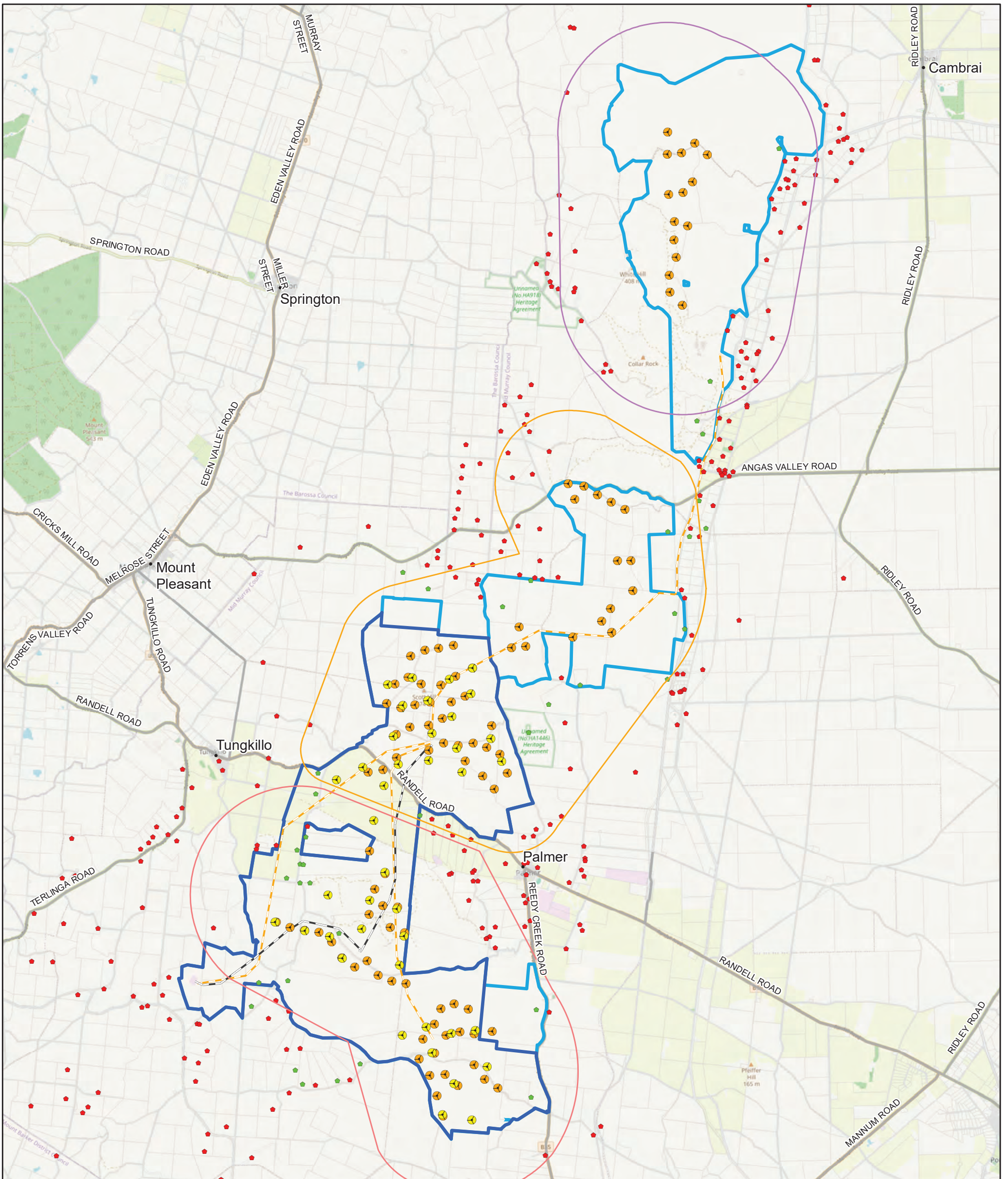


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→ **The Power of Commitment**

Appendix C

**Approved vs Varied Project Layout
Figures**



Legend

- Varied WTG Location
- Approved WTG Location
- Varied Transmission Line
- Approved Transmission Line
- Varied Project Area
- Approved Project Area
- Approved Area A
- Approved Area B
- Approved Area C
- State Roads
- Other Roads
- Residences**
- Associated
- Non-Associated

Note 1. Indicative design for discussion purposes only and subject to further revision

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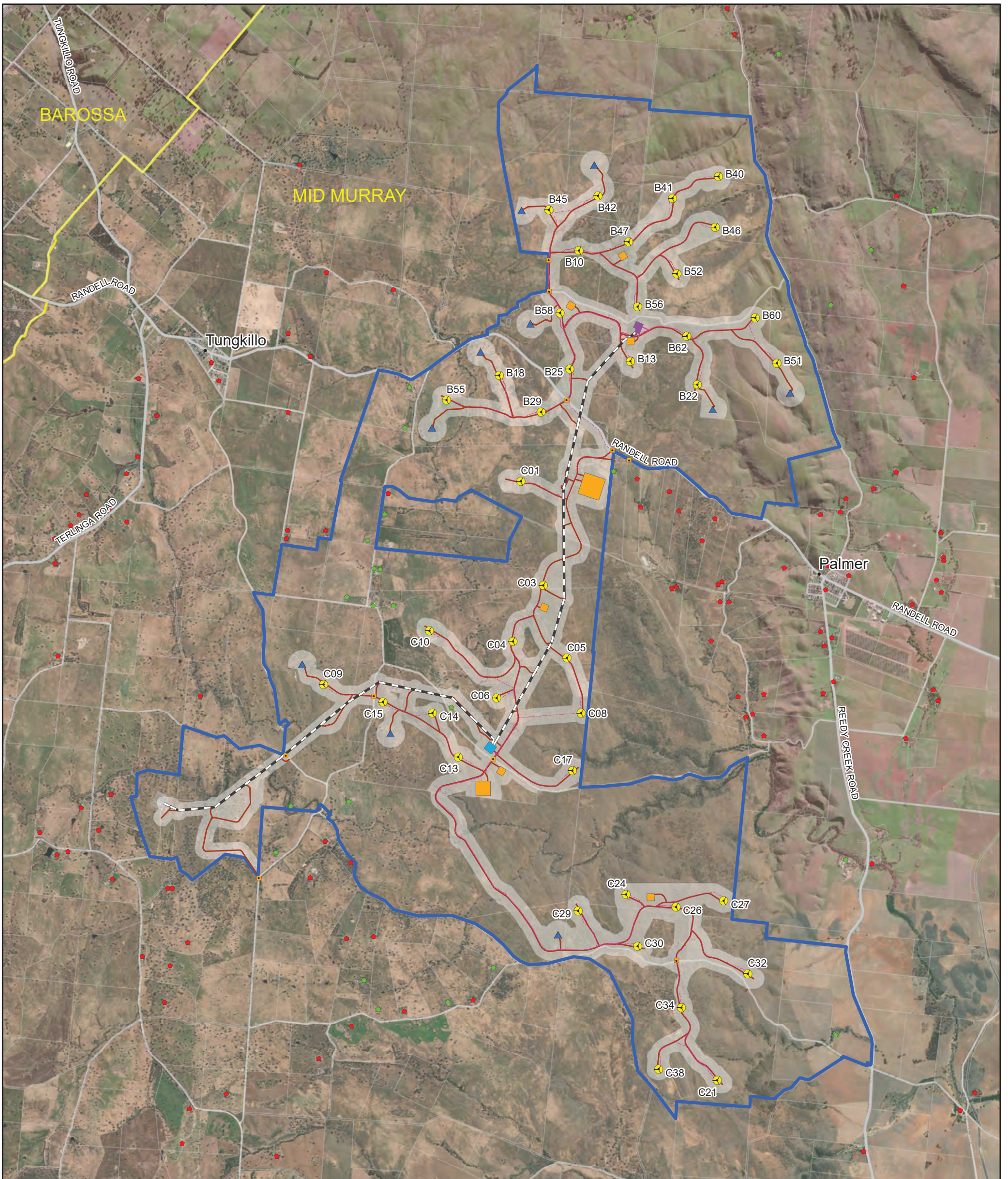


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Palmer Wind Farm

Varied Project Layout compared with Approved Project Layout





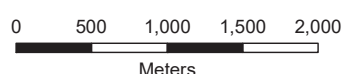
Legend

- Indicative WTG Location
- Indicative Permanent Met Mast Location
- Indicative Site Access Point
- Indicative Access Track
- Indicative Underground Cable
- Indicative 275kV Transmission Line
- Indicative Construction Compound/Batch Plant/Laydown Area
- Indicative Northern Substation/O&M Facility
- Indicative Southern Substation
- Varied Project Area
- Micrositing Area - WTGs and Other Infrastructure
- State Roads
- Other Roads
- Local Government Area
- Residences**
- Associated
- Non-Associated

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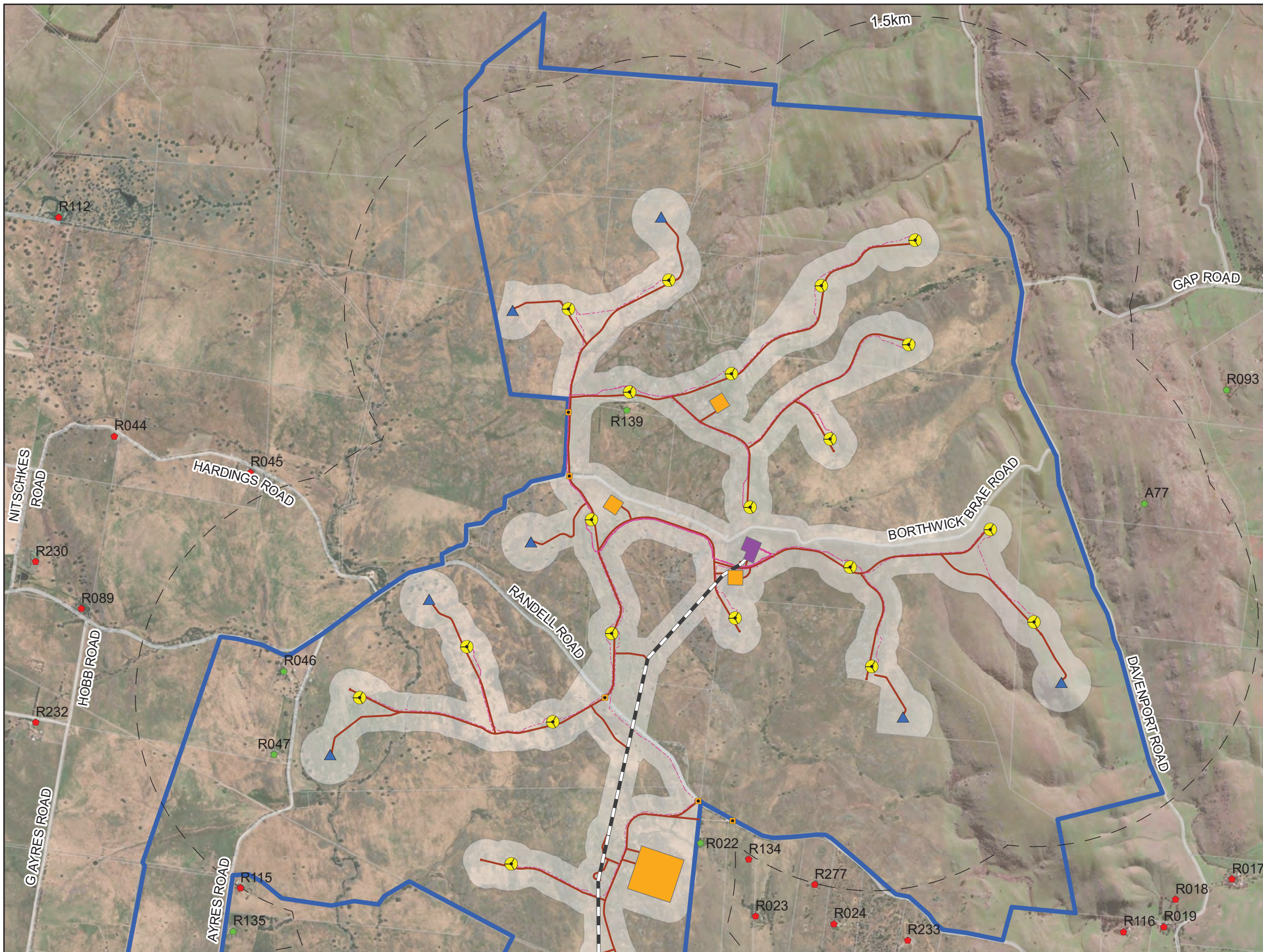


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Palmer Wind Farm

Varied Project





- Varied Project**
- Indicative WTG Location
 - Indicative Permanent Met Mast Location
 - Indicative Site Access Point
 - Distance from WTGs (1.5km Buffer)
 - Indicative 275kV Transmission Line
 - Indicative Underground Cable
 - Indicative Access Track
 - Indicative Construction Compound/Batch Plant/Laydown Area
 - Indicative Northern Substation/O&M Facility
 - Indicative Southern Substation
 - Varied Project Area
 - Micrositing Area - WTGs and Other Infrastructure
 - Public Roads
- Residences**
- Associated
 - Non-Associated

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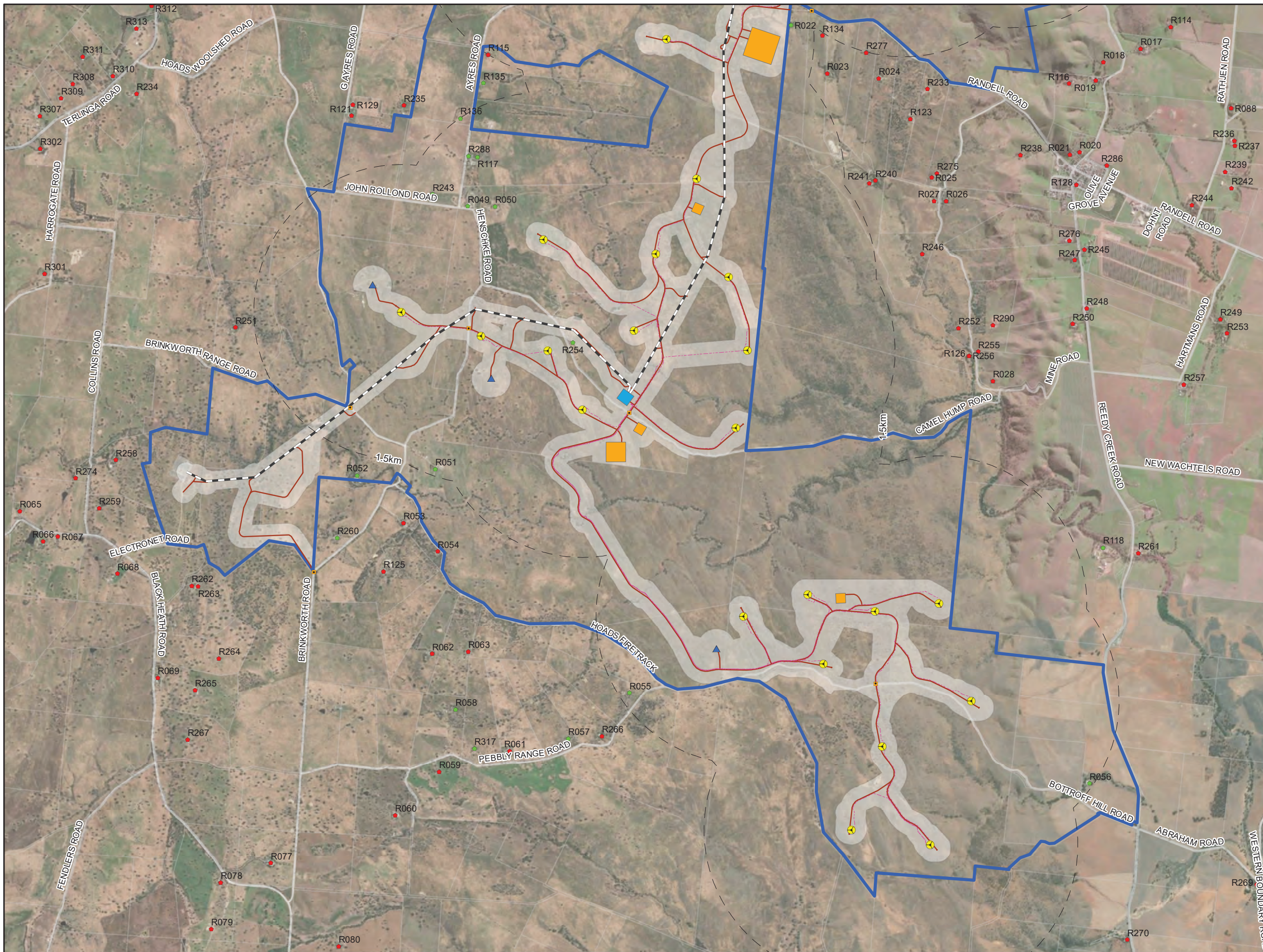
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Palmer Wind Farm

Varied Project Layout - Area B





- Varied Project**
- Indicative WTG Location
 - Indicative Permanent Met Mast Location
 - Indicative Site Access Point
 - Distance from WTGs (1.5km Buffer)
 - Indicative 275kV Transmission Line
 - Indicative Underground Cable
 - Indicative Access Track
 - Indicative Construction Compound/Batch Plant/Laydown Area
 - Indicative Northern Substation/O&M Facility
 - Indicative Southern Substation
 - Varied Project Area
 - Micrositing Area - WTGs and Other Infrastructure
 - Public Road
- Residences**
- Associated
 - Non-Associated

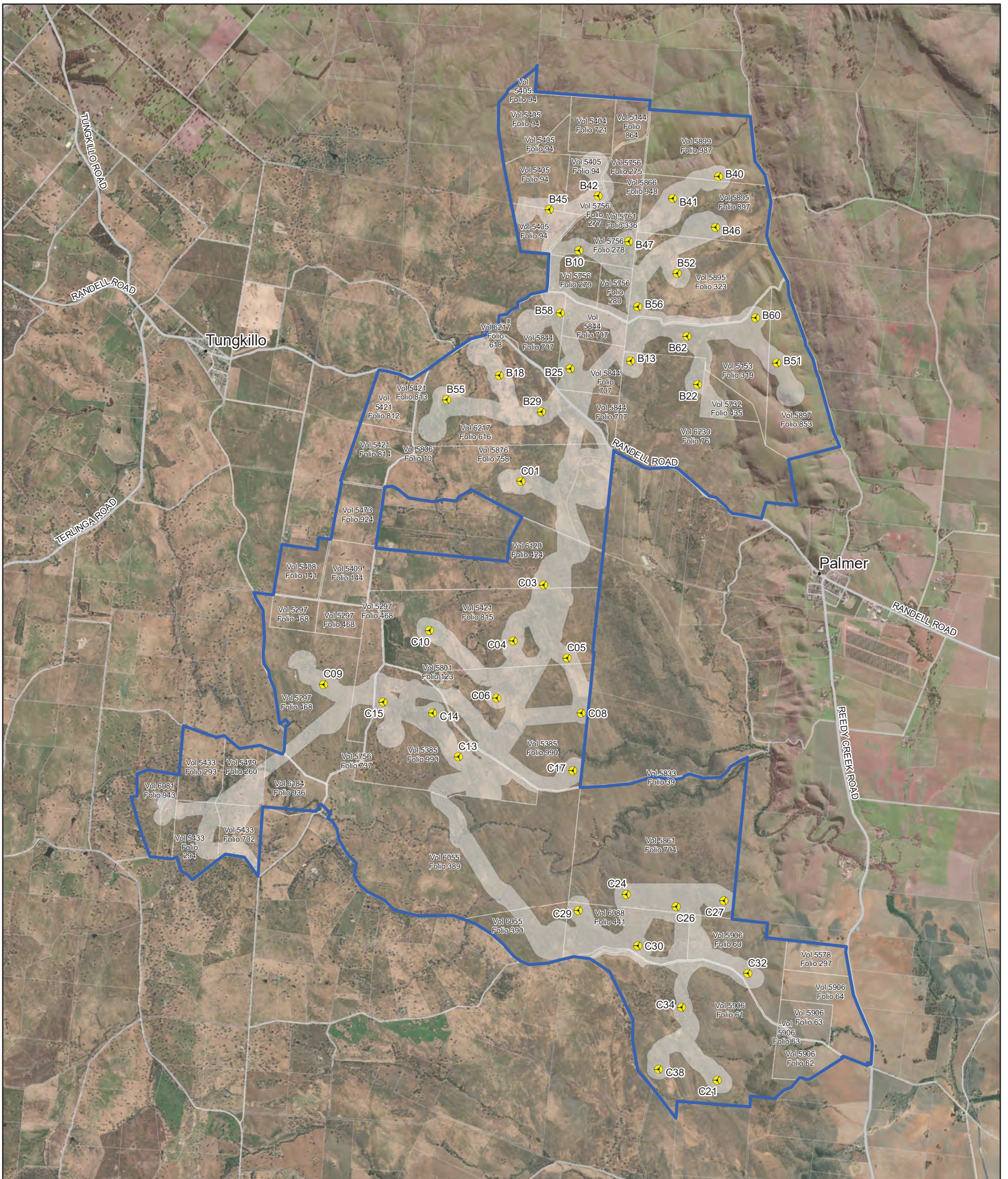
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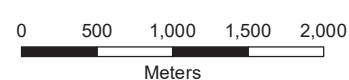


Legend

- Varied Project Area
- Cadastre
- ⚡ Indicative WTG Location
- Micrositing Area - WTGs and Other Infrastructure
- State Roads
- Other Roads



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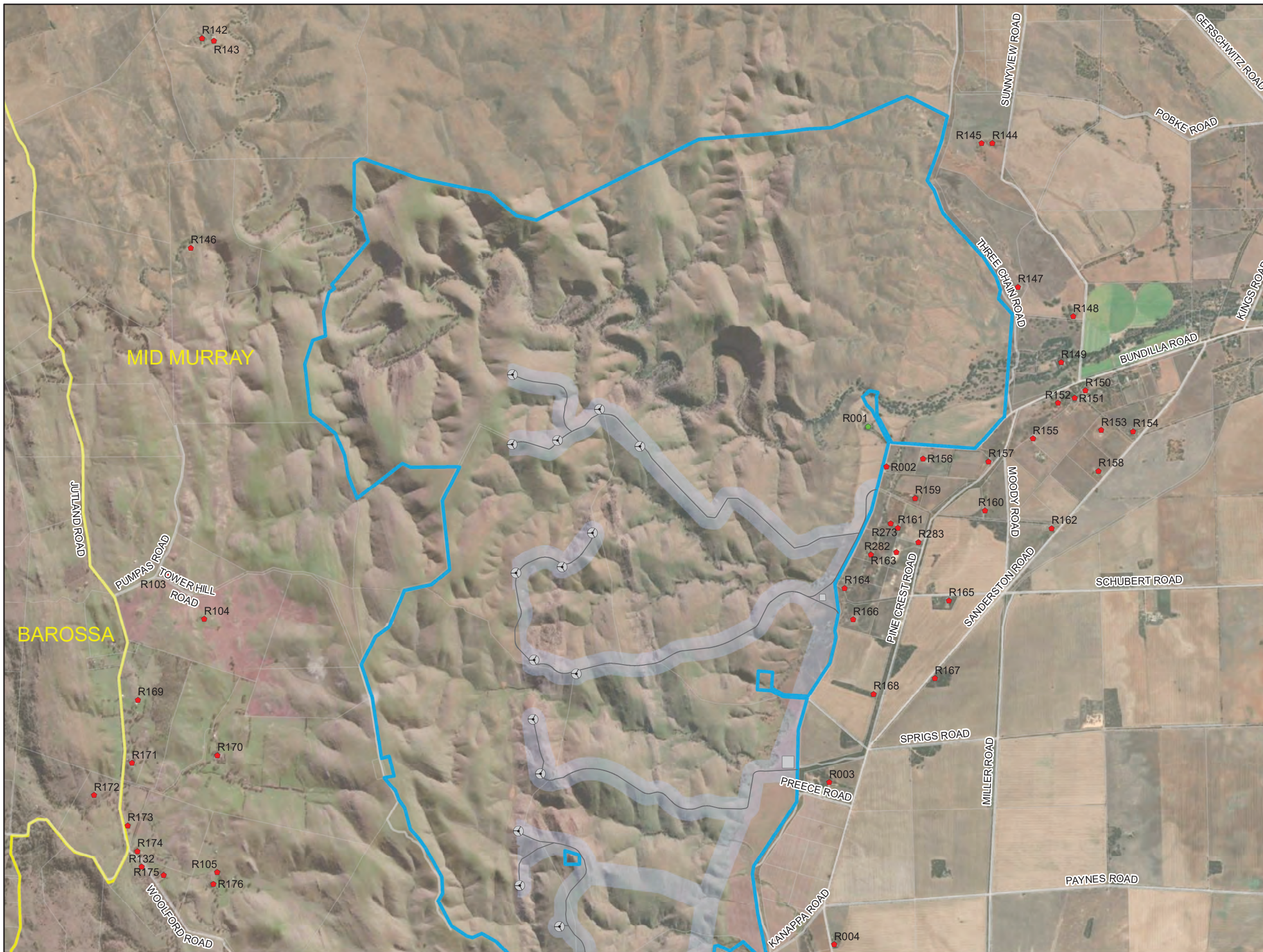
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Palmer Wind Farm

Varied Project - Land Parcels within the Project Area





- Varied Project**
- Indicative WTG Location
 - Indicative Permanent Met Mast Location
 - Indicative Site Access Point
 - Distance from WTGs (1.5km Buffer)
 - Indicative Construction Compound/Batch Plant/Laydown Area
 - Indicative Northern Substation/O&M Facility
 - Indicative Southern Substation
 - Indicative 275kV Transmission Line
 - Indicative Underground Cable
 - Indicative Access Track
 - Varied Project Area
 - Micrositing Area - WTGs and Other Infrastructure
- Approved Project**
- Approved WTG Location
 - Approved Substation Location
 - Approved Construction Compound/Batch Plant/Laydown Area
 - Approved Access Track
 - Approved 275kV Transmission Line
 - Approved Project Area
 - Approved Micrositing Area - Turbines
 - Approved Micrositing Area - Other Infrastructure
- Existing Infrastructure**
- Public Road
 - Local Government Area
- Residences**
- Associated
 - Non-Associated

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- Varied Project**
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 - Indicative Permanent Met Mast Location
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 - Indicative Access Track
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 - Approved Access Track
 - Approved 275kV Transmission Line
 - Approved Project Area
 - Approved Micrositing Area - Turbines
 - Approved Micrositing Area - Other Infrastructure
- Existing Infrastructure**
- Public Road
 - Local Government Area
- Residences**
- Associated
 - Non-Associated

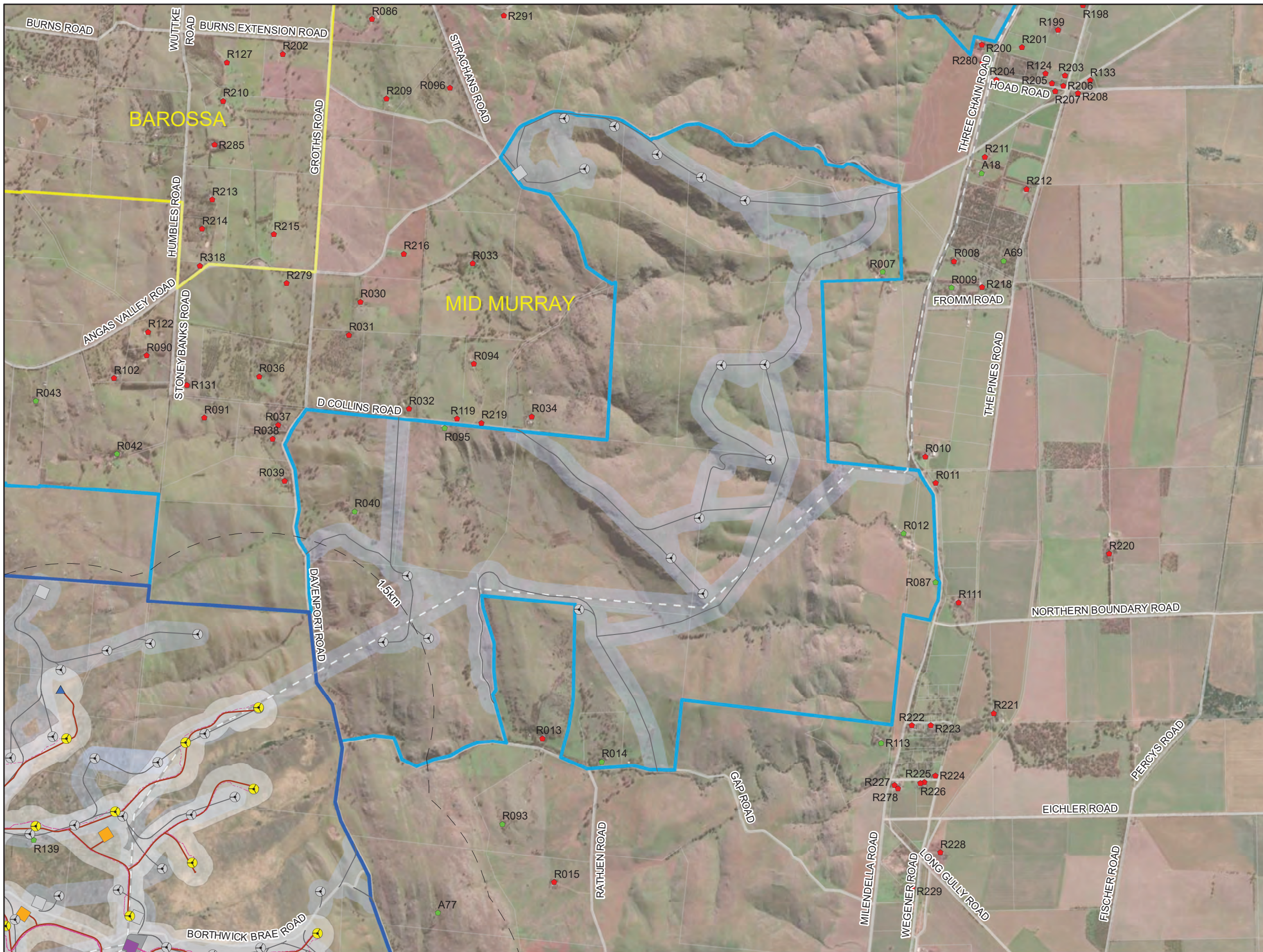
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- Varied Project**
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 - Varied Project Area
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 - Approved 275kV Transmission Line
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 - Approved Micrositing Area - Turbines
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- Existing Infrastructure**
- Public Road
 - Local Government Area
- Residences**
- Associated
 - Non-Associated

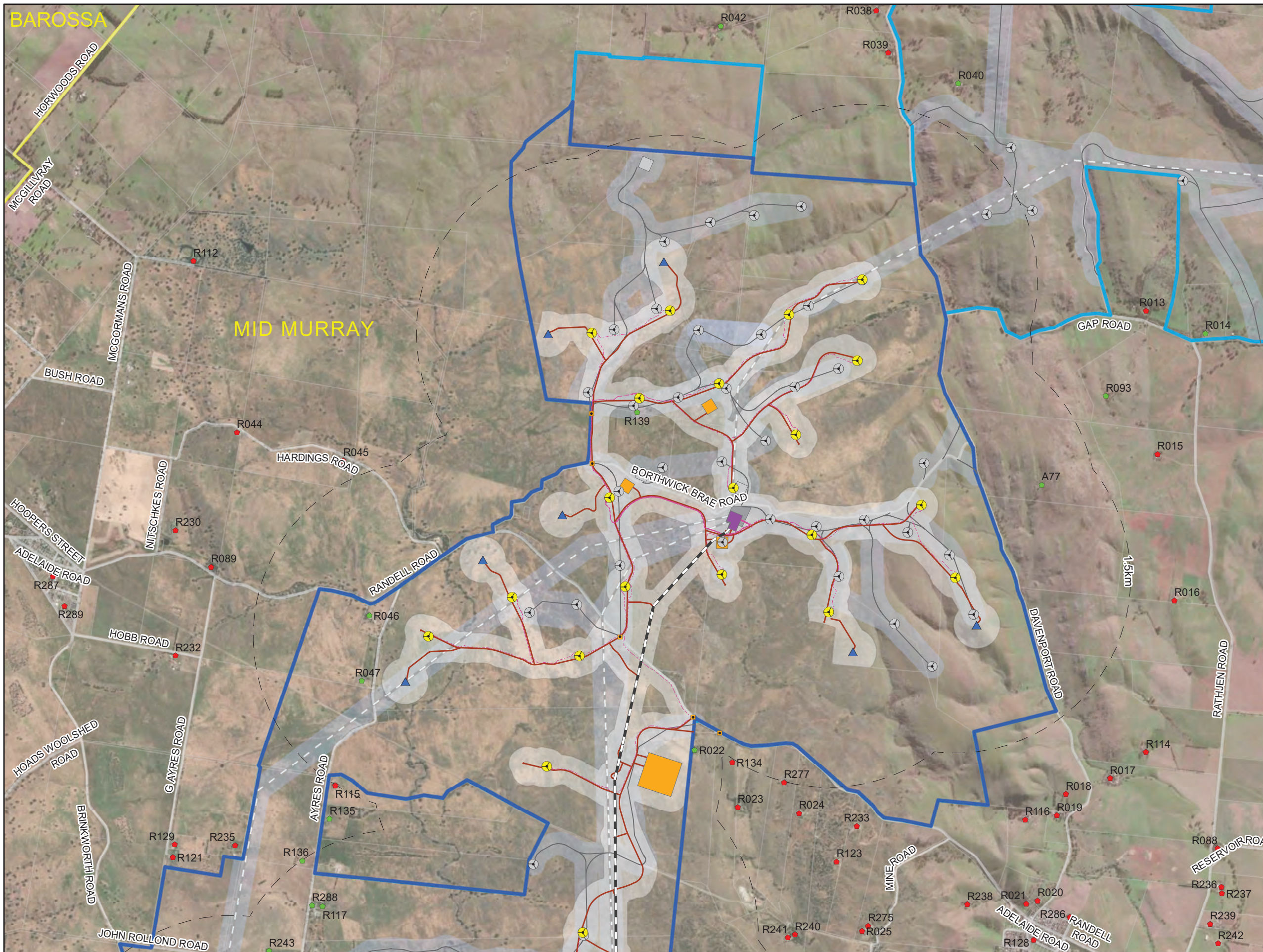
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- Varied Project**
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 - Approved Micrositing Area - Other Infrastructure
- Existing Infrastructure**
- Public Road
 - Local Government Area
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 - Non-Associated

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- Existing Infrastructure**
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- Residences**
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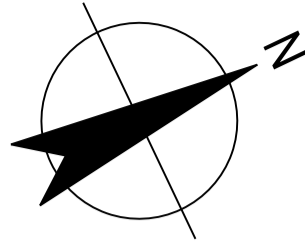
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Appendix D

Development Plans

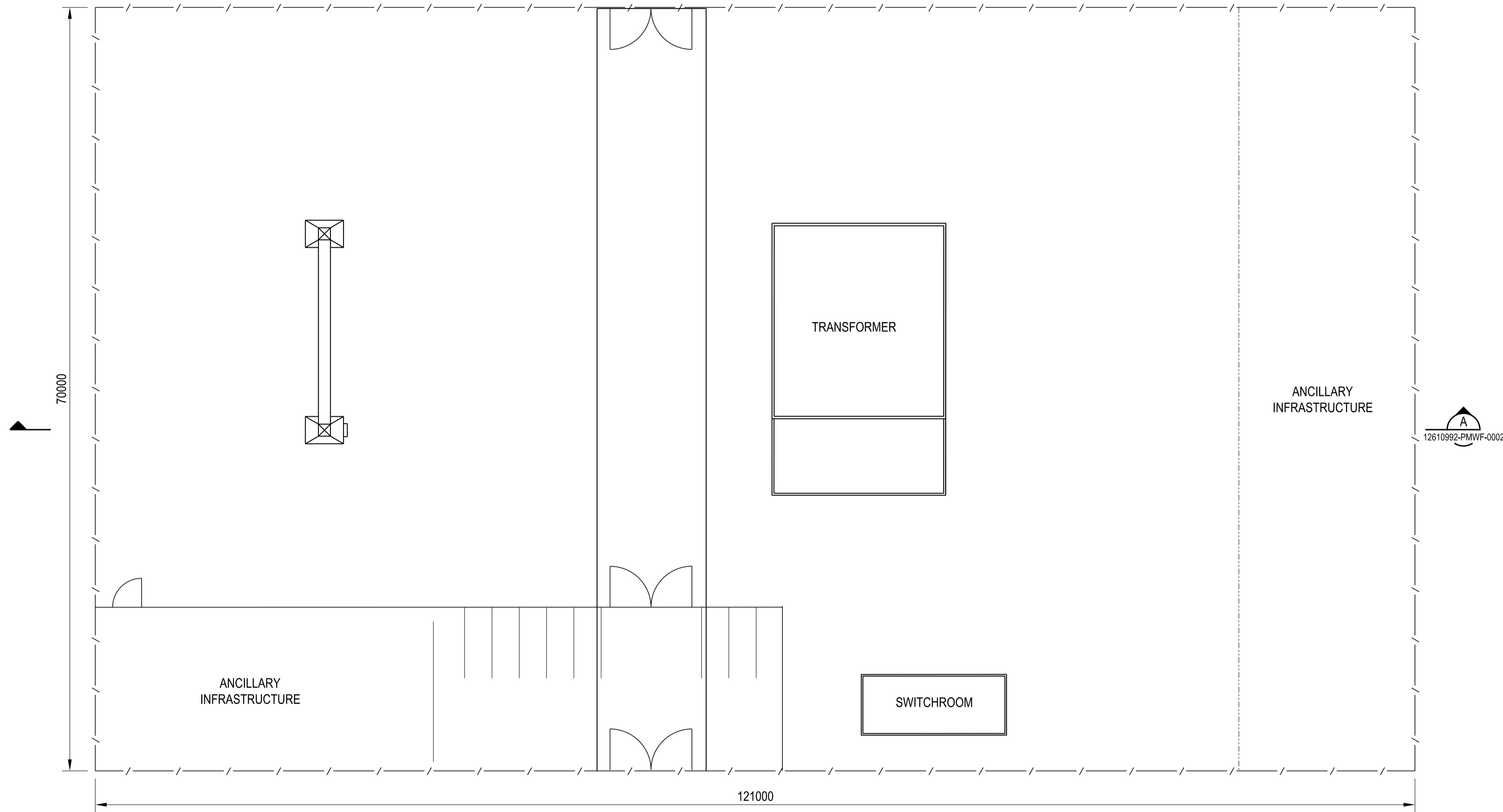


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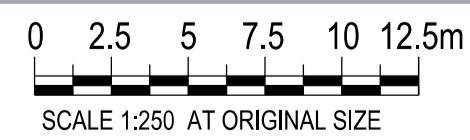
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NORTH SUBSTATION - PLAN

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NOT FOR CONSTRUCTION



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Author	T. DELA CRUZ	Drafting Check	S. ZAMAR
Designer	B. GILBERT	Design Check	G. MARSHALL

Plot Date: - Plotted by: - File Name: C:\12d\SW\data\12610992-PMWF-0001.dgn



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Project No.
12610992

Client	TILT RENEWABLES
Project	PALMER WIND FARM DEVELOPMENT PROJECT
Status	FOR INFORMATION

Drawing Title	PALMER WIND FARM 275/33kV SUBSTATION NORTH SUBSTATION GENERAL ARRANGEMENT - PLAN
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Drawing No.
12610992-PMWF-0001

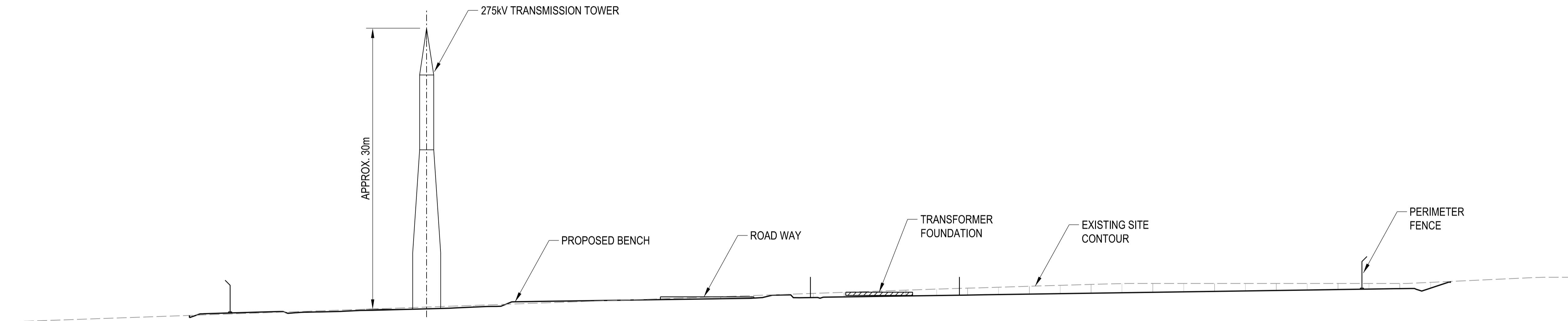
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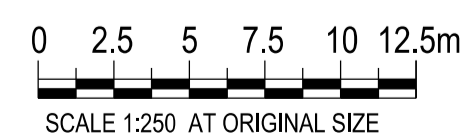
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12610992-PMWF-0001 - NORTH SUBSTATION GA - PLAN



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Rev	Description	Checked	Approved	Date
A	FOR INFORMATION	GM	BG	06/02/24
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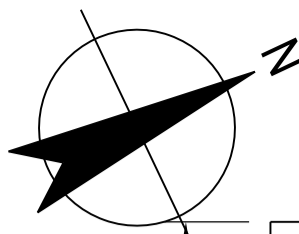


Project No.
12610992

Client	TILT RENEWABLES
Project	PALMER WIND FARM DEVELOPMENT PROJECT
Status	FOR INFORMATION

Drawing Title	PALMER WIND FARM 275/33kV SUBSTATION NORTH SUBSTATION GENERAL ARRANGEMENT - ELEVATION
Drawing No.	12610992-PMWF-0002

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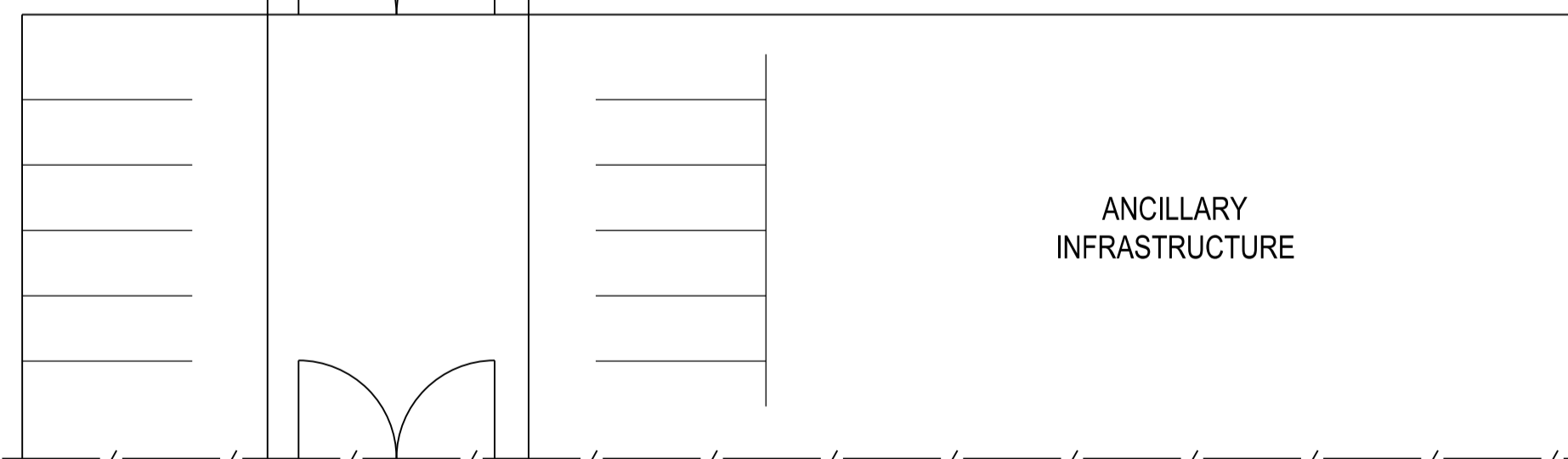
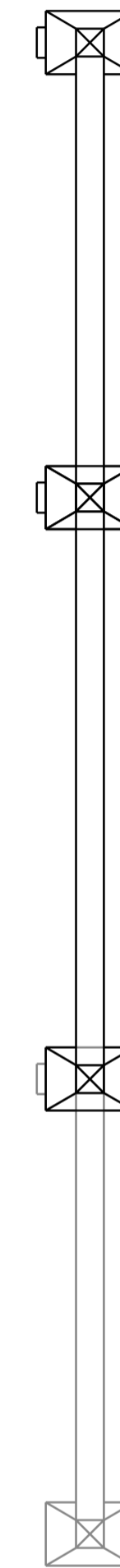
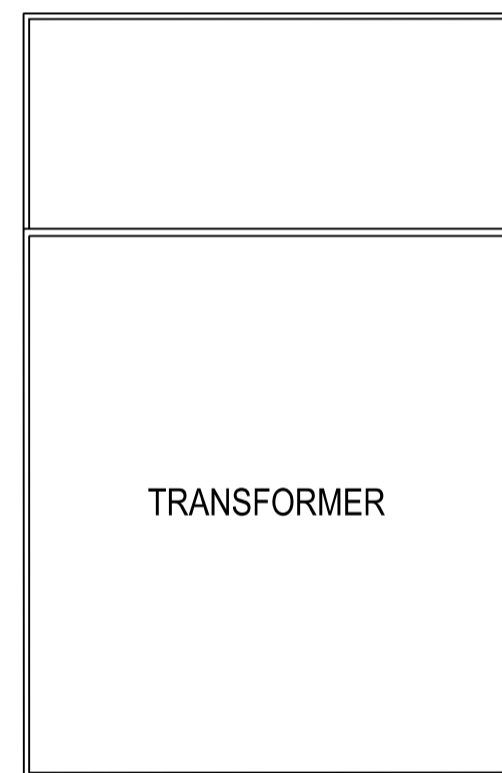
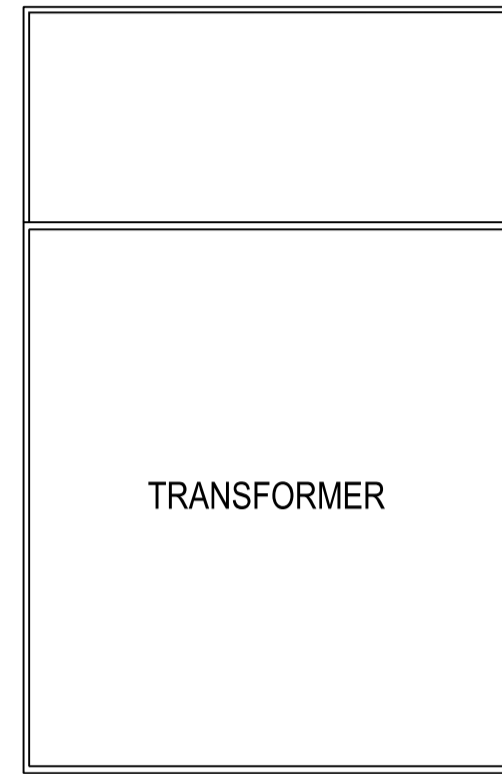
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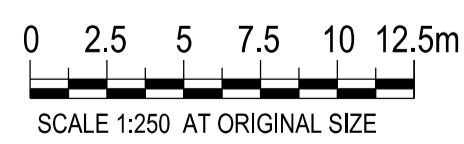
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151000

SOUTH SUBSTATION - PLAN

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Client TILT RENEWABLES

Project PALMER WIND FARM DEVELOPMENT
PROJECT

Status FOR INFORMATION

Drawing Title PALMER WIND FARM
275/33kV SUBSTATION
SOUTH SUBSTATION
GENERAL ARRANGEMENT - PLAN

Drawing No.
12610992-PMWF-0003

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Designer	B. GILBERT	Design Check	G. MARSHALL	

Plot Date: - Plotted by: - File Name: C:\12d\SW\data\p-00-12d-001\33-12610992 - Palmer Wind Farm - Development Plans_2949\CADD\Drawings\12610992-PMWF-0003.dgn

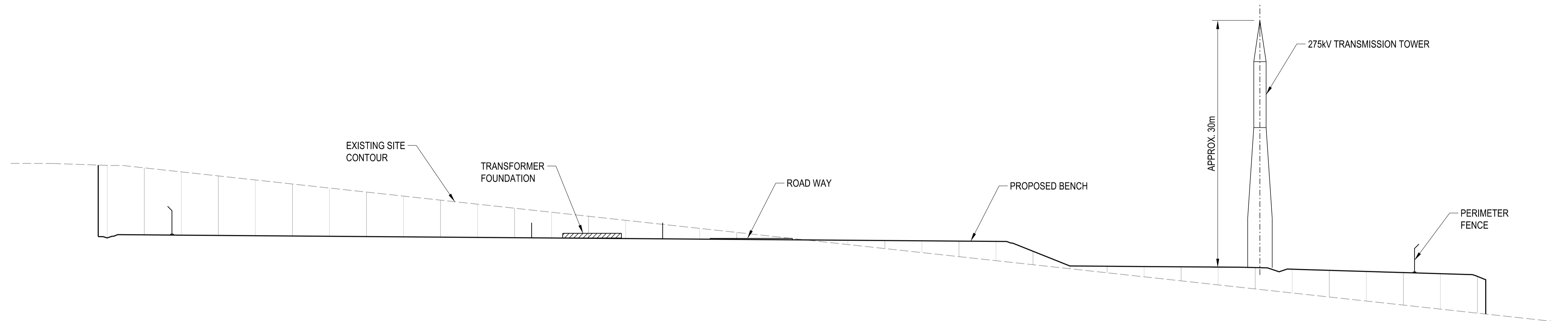
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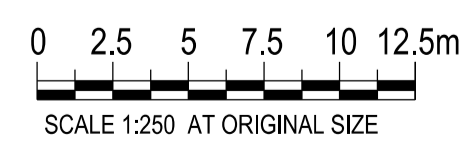
12610992-PMWF-0003 - SOUTH SUBSTATION GA - PLAN



A SECTION
12610992-PMWF-0003 SCALE 1 : 250

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Status	FOR INFORMATION

Drawing Title	PALMER WIND FARM 275/33kV SUBSTATION SOUTH SUBSTATION GENERAL ARRANGEMENT - ELEVATION
Drawing No.	12610992-PMWF-0004
Rev	A

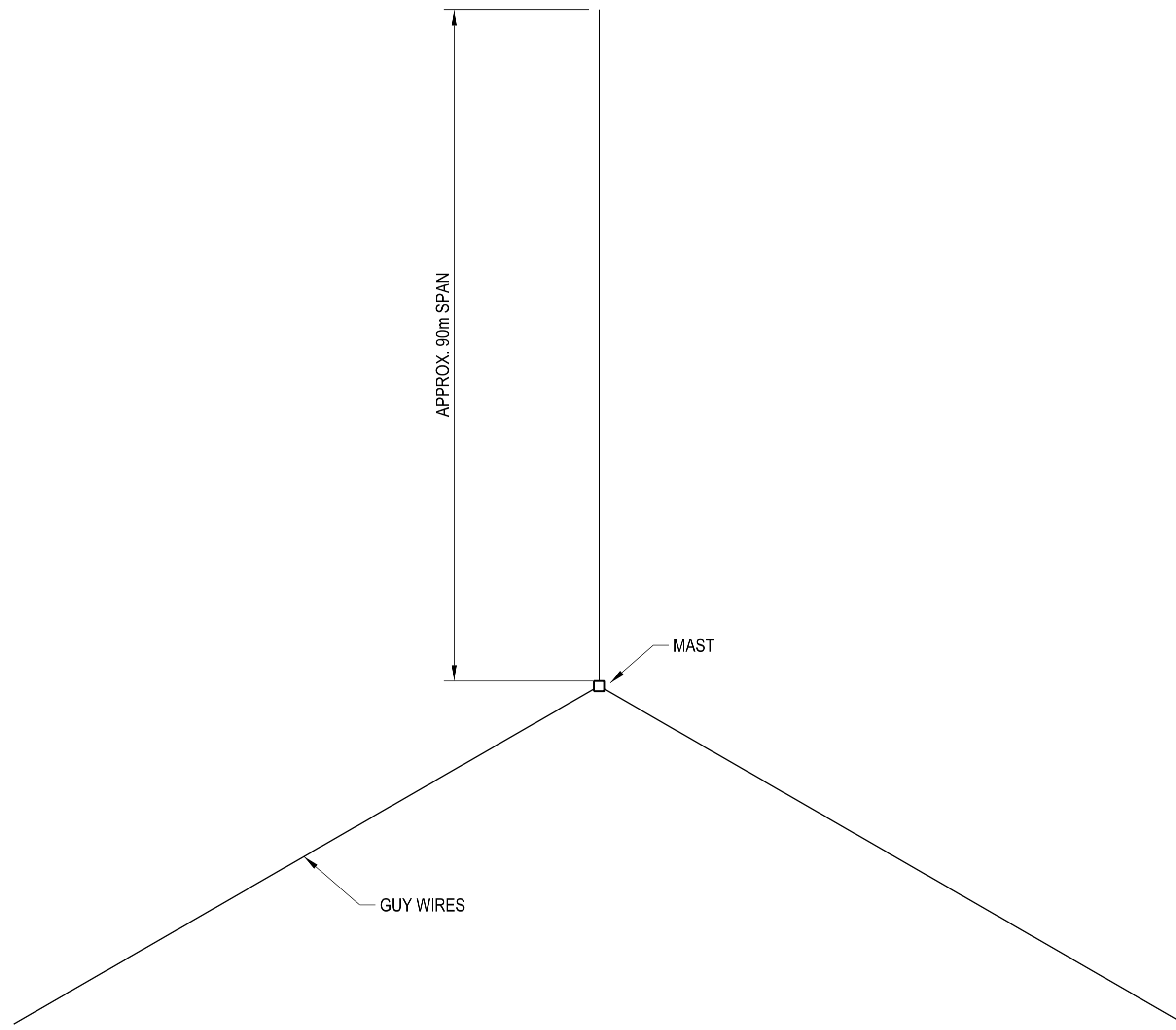
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12610992-PMWF-0006 - GUYED LATTICE MAST GA - TYPICAL ELEVATION



METEOROLOGICAL MAST - PLAN
SCALE 1:500

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Drawing Title	PALMER WIND FARM METEOROLOGICAL MAST TYPICAL FOOTPRINT
Drawing No.	12610992-PMWF-0005

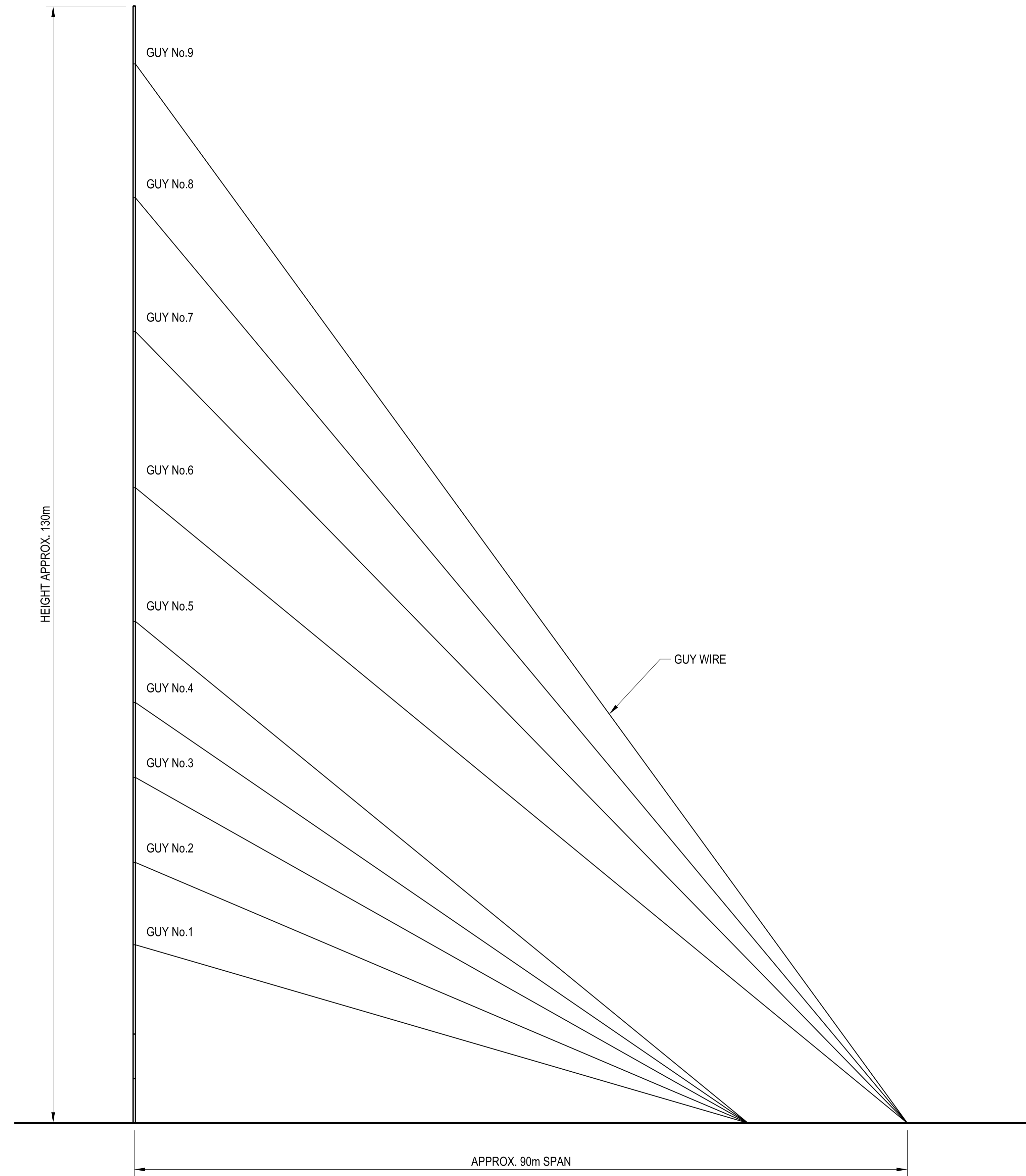
Size
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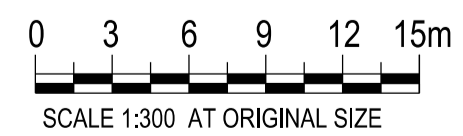
12610992-PMWF-0005 - GUYED LATTICE MAST GA - PLAN



METEOROLOGICAL MAST - TYPICAL ELEVATION
SCALE 1:300

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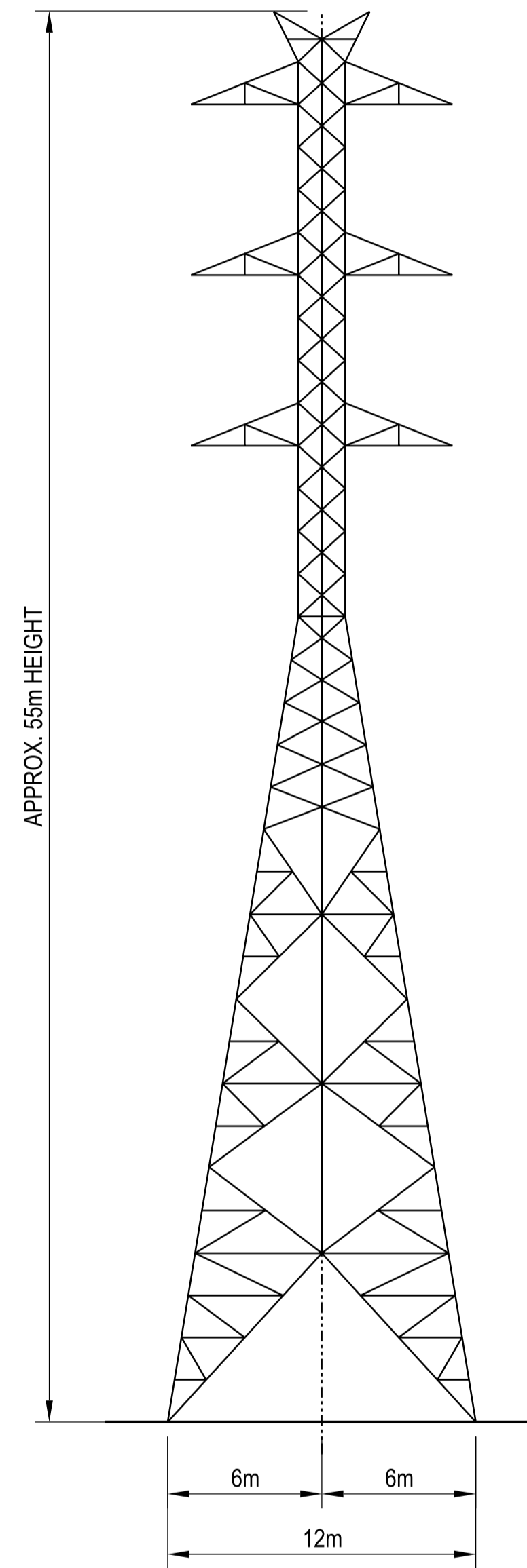
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Drawing No.	12610992-PMWF-0006
Rev	A

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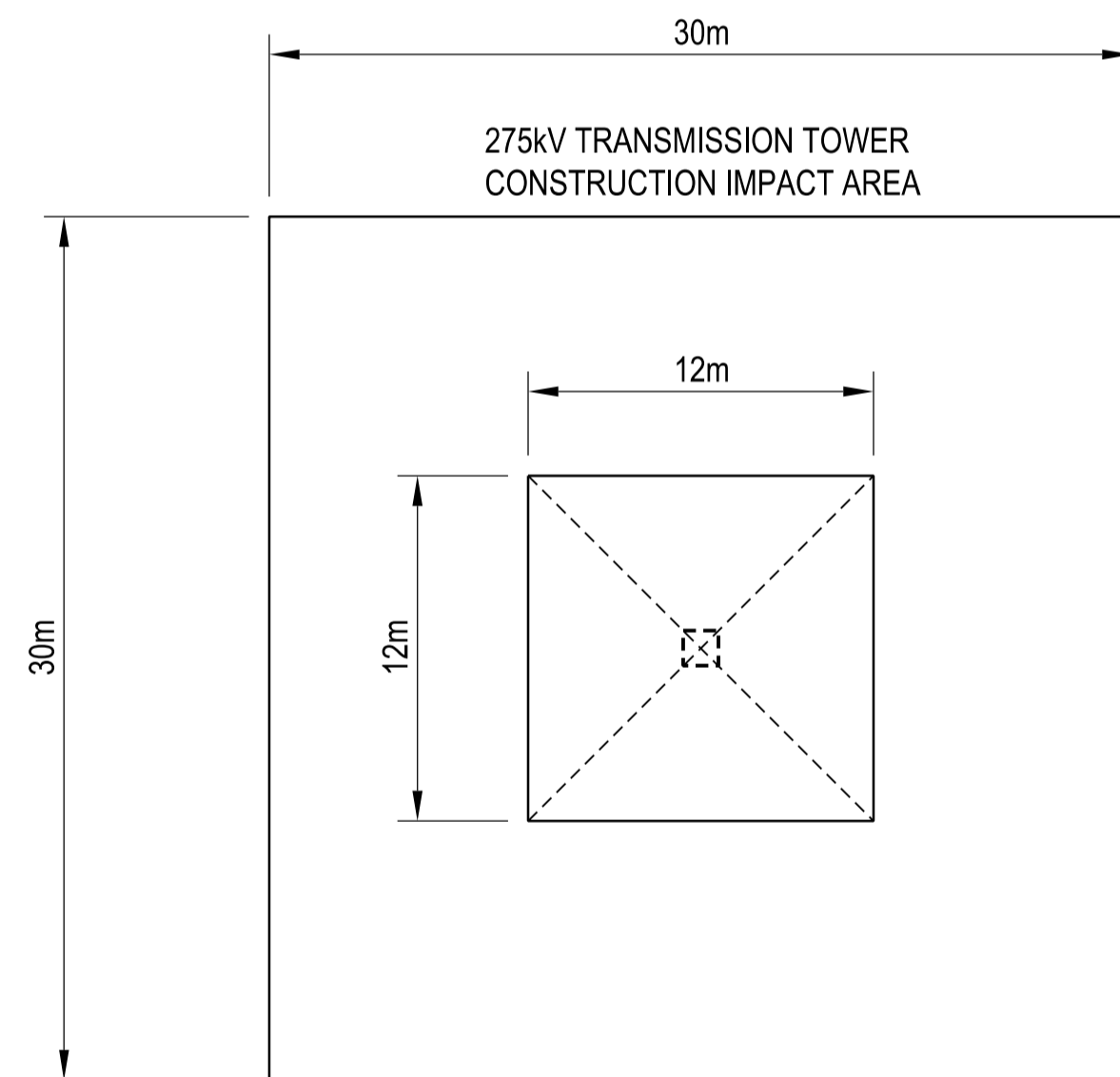
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- 12610992-PMWF-0001 - NORTH SUBSTATION GA - ELEVATION
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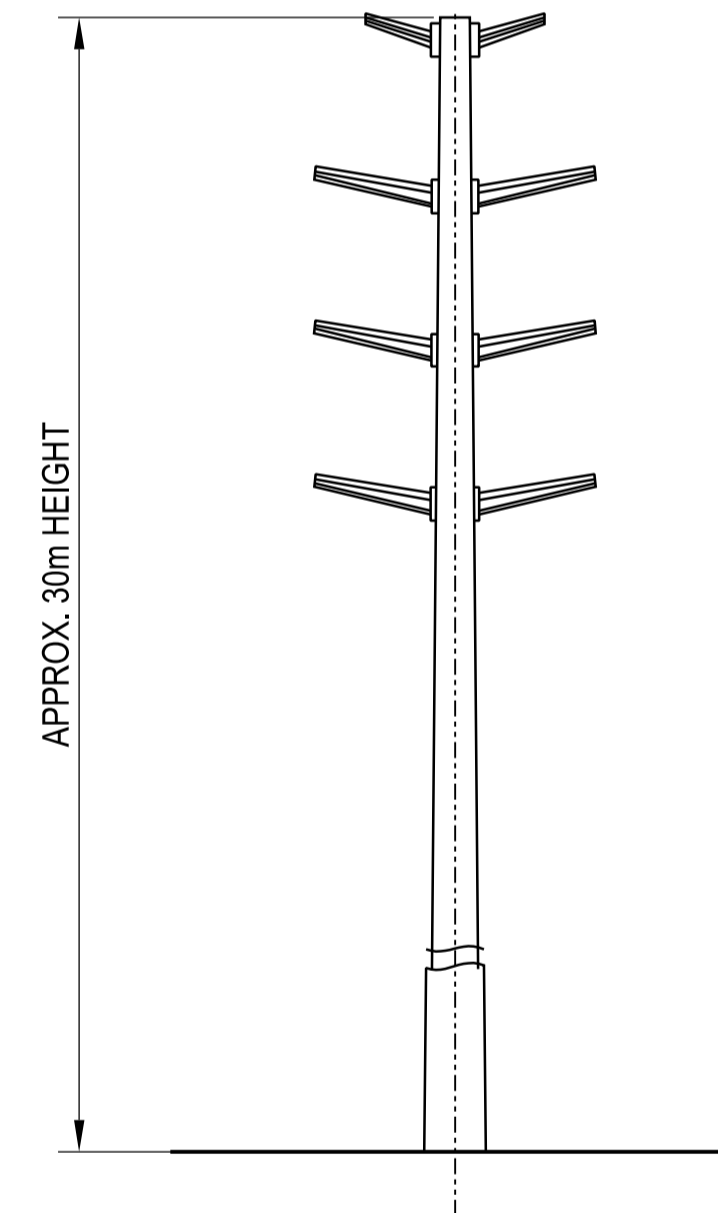
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SCALE 1:200
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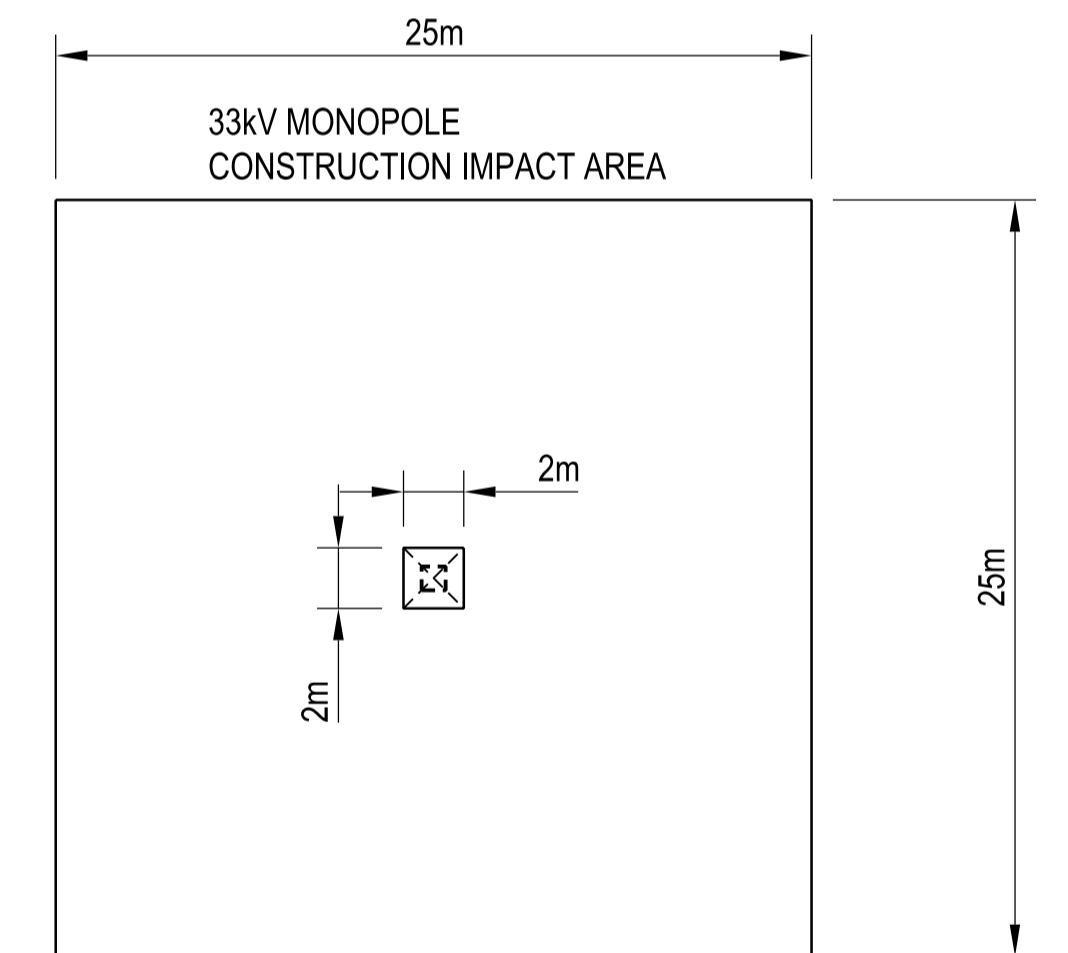
CONSTRUCTION IMPACT AREA AND BASE

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33kV MONOPOLE - ELEVATION

SCALE 1:200

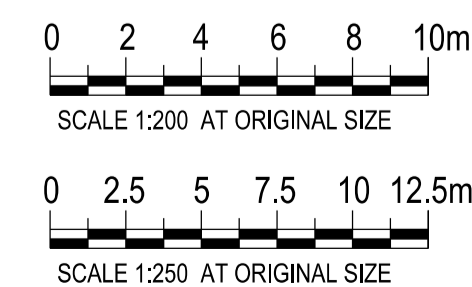


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Status	FOR INFORMATION

Drawing Title
PALMER WIND FARM
HV OVERHEAD LINES - TYPICAL
TYPICAL ELEVATION
TOWER AND MONOPOLE

Drawing No.
12610992-PMWF-0007

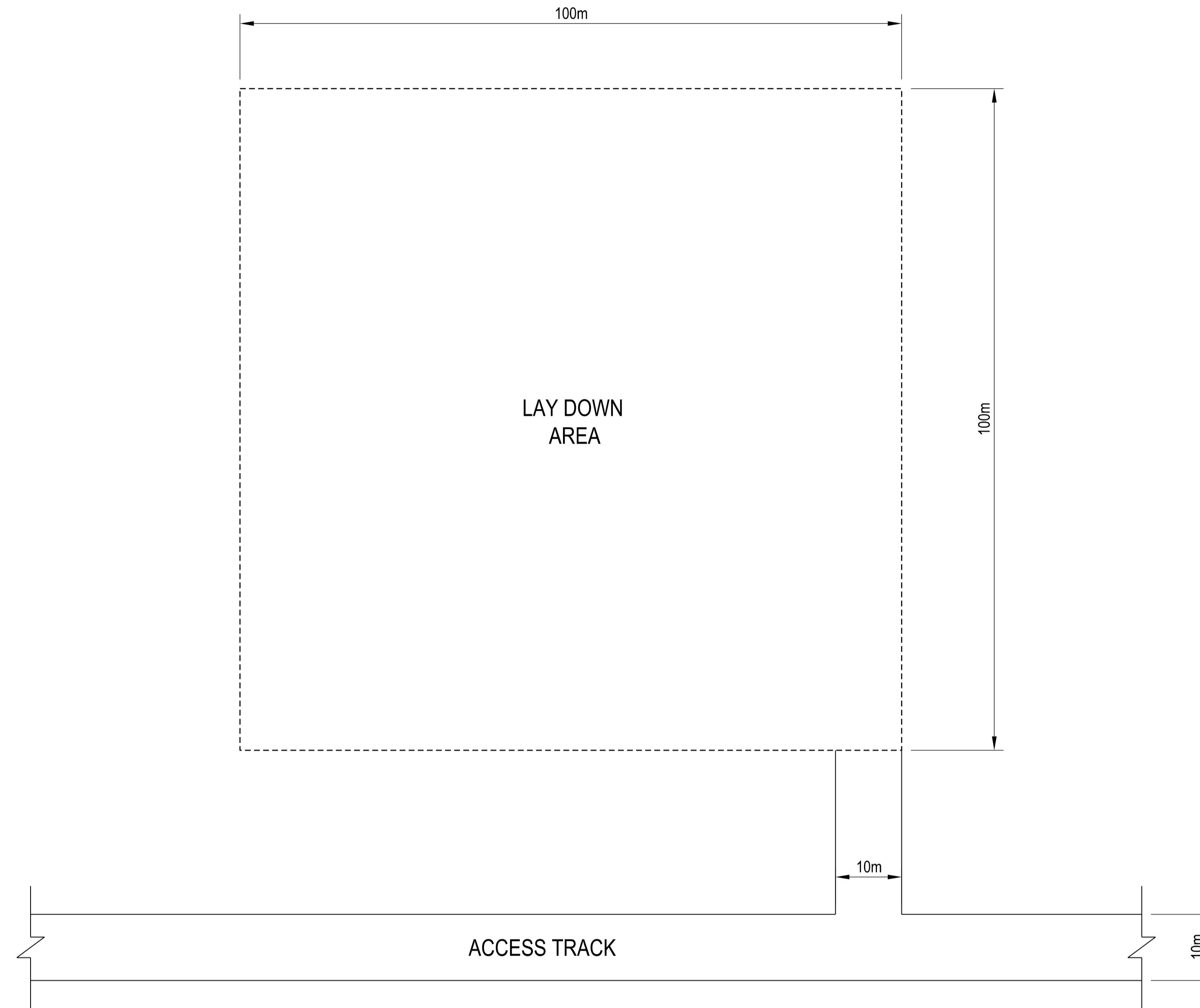
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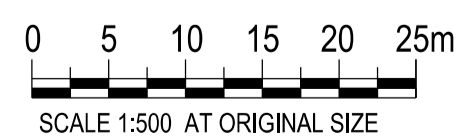
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- 12610992-PMWF-0001 - NORTH SUBSTATION GA - ELEVATION
- 12610992-PMWF-0003 - SOUTH SUBSTATION GA - ELEVATION



LAY DOWN AREA - PLAN
SCALE 1:500

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Client **TILT RENEWABLES**

Project **PALMER WIND FARM DEVELOPMENT PROJECT**

Status **FOR INFORMATION**

Project No.
12610992

Drawing Title **PALMER WIND FARM
HARDSTAND LAYDOWN AREA
GENERAL ARRANGEMENT - TYPICAL**

Drawing No.
12610992-PMWF-0008

Size
A1

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Author T. DELA CRUZ Drafting Check S. ZAMAR
Designer B. GILBERT Design Check G. MARSHALL

Appendix E

Statement of Commitments

Table E.1 Statement of Commitments including proposed Variations.

Topic	Number	Sub-number	Statement of Commitment	Varied commitment (where relevant)
4.1 Final Layout Plan	1		A final layout plan associated with any stage of the project will be prepared and submitted to the Mid Murray Council prior to construction of that stage.	
	2		Additional documentation and evidence will be provided if necessary in order to demonstrate that any minor variations incorporated into the final layout plans comply with relevant criteria (e.g. relating to noise, vegetation, cultural heritage).	
	3		The final layout plan will ensure that no blade overhang occurs on Crown Land.	
	4		In respect of the dwelling described in Development Approval 711/013/14 located at Section 654, (with access via Section 79), Milendella Road, Sanderston, Hundred of Jutland, Certificate of Title 5604 / 632, the final layout of the wind farm will ensure that:	
		a)	Noise levels at the dwelling will meet the requirements of the EPA's Wind Farms Environmental Noise Guidelines (2009) for a relevant receiver;	
		b)	No turbine is constructed within 1 kilometre of the dwelling; and	
		c)	Theoretical shadow flicker duration at the dwelling and within 50 metres of the dwelling will be less than 30 hours per year and actual shadow flicker at the dwelling and within 50 metres of the dwelling will not exceed 10 hours per year.	
4.2 Management Plans	1		Two management plans will be prepared prior to construction of any stage:	
			A Construction Environmental Management Plan (CEMP) which will address all the issues relevant to the construction phase of the stage. A draft CEMP is provided in Appendix B of Volume 1 of the application documents (August 2014).	
			An Operational Management Plan (OMP) that addresses the issues relevant to the operation, maintenance and decommissioning of the wind farm. An indicative example of an OMP for a wind farm is provided in Appendix C of Volume 1 of the application documents (August 2014).	
	2		The CEMP and OMP will cover the following matters relevant to their respective stages;	

Topic	Number	Sub-number	Statement of Commitment	Varied commitment (where relevant)
			Community Consultative Plan; <ul style="list-style-type: none"> - Compounds and ancillary facilities management; - Construction noise and vibration; - Operational noise management; - Traffic management; - Soil and water quality management (including erosion control); - Air quality and dust management; - Aboriginal and European heritage management; - Soil contamination, hazardous material and waste management; - Hazard and risk management. - Site rehabilitation; - Bird and bat management; - Weed and pest management; - Biosecurity management plan; - Health and Safety; - Fire and bushfire risk management; - Telecommunication and Digital TV interference; and - Decommissioning 	
4.3 Temporary Construction Facilities	1		Rehabilitation will be in accordance with the requirements set out in the CEMP.	
	2		All temporary construction sites will be cleared and rehabilitated within 12 months of the completion of construction.	
	3		All batching plants will be removed and their sites rehabilitated within 12 months of the completion of construction.	
	4		All batching plants will be operated in accordance with the COEMP.	
4.4 Landscape and Visual Impact Management	1		The final wind farm layout will not locate any wind turbine generator within 1 km of a non-involved landholder dwelling existing at 28 February 2014.	
	2		Once a micro-siting process has been undertaken for the 275kV transmission pylons, the Second Respondent will consult with residents of dwellings located within 1km of these lines regarding the extent of visual impact and whether landscape planting could assist with screening where relevant.	
	3		The extent of cut and fill requirements for access roads will be minimized by following natural contours and tops of ridgelines where practicable.	
	4		As far as possible road materials will be sourced locally to blend with existing landscape.	

Topic	Number	Sub-number	Statement of Commitment	Varied commitment (where relevant)
	5		Vegetation screening will be established and maintained around the permanent Substation and Operations & Maintenance Compound.	
	6		Advertising, signs or logos will not be mounted on turbine structures, except those required for safety purposes.	
	7		Turbines will be located within approved ridgeline segments and spaced in an ellipse of no less than three times the rotor diameter by two times the rotor diameter. The ellipse will be oriented into the predominant wind direction.	<i>Turbines will be located within the approved micro-siting areas for turbines and other infrastructure. Any micro-siting of turbines will ensure compliance with all relevant regulations listed in these commitments including appropriate setbacks from dwellings and compliance with noise and shadow flicker requirements.</i>
	8		Any external safety lighting provided for the operational phases will be designed to avoid or minimise light overspill, will be motion activated, and timed unless required for OH&S and maintenance work.	
4.5 Flora and Fauna Impact Management	1		A weed and pest management plan and Site rehabilitation plan will be prepared and provided to the Mid Murray Council for approval prior to construction.	
	2		Where construction activities are planned within 500 m and 1000 m of known Wedgetailed Eagle and Peregrine Falcon nests respectively, nest checks will be employed during their peak breeding seasons to determine their breeding status and if necessary buffers put in place or specific management strategies implemented to minimise any potential impact on the breeding success of these birds.	

Topic	Number	Sub-number	Statement of Commitment	Varied commitment (where relevant)
	3		<p>Within one year after construction of turbines in a turbine area, the operator will implement a bird monitoring program in respect of the turbine area that provides for annual monitoring, for a minimum of five years, of all nest sites of Wedge-tailed Eagles and Peregrine Falcons recorded in the turbine area in the EBS Ecology Report "Palmer Wind Farm Flora and Fauna Survey" dated 7 August 2014. Monitoring is to be undertaken in accordance with established scientific methods and at a minimum must identify whether each nest is active and whether young have successfully fledged from the nest. The operator will provide a report of the results of the monitoring to the Mid Murray Council each year for a minimum of five years.</p>	<p><i>Within one year after construction of turbines in a turbine area, the operator will implement a bird monitoring program in respect of the turbine area that provides for annual monitoring, for a minimum of five years, of all nest sites of Wedge-tailed Eagles and Peregrine Falcons recorded in the turbine area in the EBS Ecology Report "Flora and Fauna Impact Assessment" dated XX February 2024. Monitoring is to be undertaken in accordance with established scientific methods and at a minimum must identify whether each nest is active and whether young have successfully fledged from the nest. The operator will provide a report of the results of the monitoring to the Mid Murray Council each year for a minimum of five years.</i></p>
	4		<p>Following construction of turbines in a turbine area, the operator will maintain a register of bird mortalities in respect of the turbine area for a minimum period of 5 years. The register will record the location of any bird carcasses that are found by the operator's employees or contractors within the turbine area that are reasonably attributable to birdstrike, the date that the carcass is found, and identification of the species of the bird to the extent that the operator can make an identification using reasonable endeavours.</p> <p>The operator will provide a copy of the register to the Mid Murray Council each year for a minimum of five years.</p>	
	5		<p>A 1000 m buffer will be maintained around all recorded Peregrine Falcon nests for all wind turbine generators.</p>	
	6		<p>A 500 m buffer will be maintained around all recorded Wedge-tailed Eagle nests for all wind turbine generators.</p>	
	7		<p>Existing access tracks will be used where possible to minimise additional disturbance.</p>	

Topic	Number	Sub-number	Statement of Commitment	Varied commitment (where relevant)
	8		Clearance of significant native vegetation will be minimised as an objective of the detailed layout planning stage and the micro-siting stage, where complete avoidance is not possible.	
	9		Additional detailed micro-siting in Area C will be undertaken at the detailed layout design stage to incorporate, where practical, alternative access routes in order to minimise impact on Peppermint Box trees.	
	10		Consultation and collaboration with horse riding clubs and/or enthusiasts will be carried out prior to construction to accommodate current agreements with host landowners for riding activities, including consideration of the existing trails or assistance towards alternative routes as required. This will be subject to standard site health and safety considerations.	
	11		Horse familiarisation events will be considered to assist with overcoming any short term concerns for horses and to assist with the familiarisation of horses with the sound and movements of turbines, subject to standard site health and safety considerations.	
	12		Where possible, options for an equivalent on-ground SEB in the local area will be given a priority over a financial contribution to the NVC, provided that the option has the full agreement of the landowners and the NVC.	
	13		The Pygmy Blue-tongue Lizard Recovery Team will be consulted prior to construction regarding any information received from members of the public or landowners regarding the locations of Pygmy Blue-tongue Lizard nests within the Project Site.	
4.6 Noise Impact Management	1		A final noise assessment will be undertaken in respect of the final wind farm layout, using the turbine model selected, to ensure that the wind farm noise level complies with the requirements of the South Australian Environment Protection Authority's Wind Farms Environmental Noise Guidelines.	
	2		Confirmation of commercial arrangements with involved landholders in respect of noise levels at dwellings will be provided to the Mid Murray Council prior to construction commencement.	
	3		Final turbine selection and layout will comply with the World Health Organisation Guidelines for Community Noise requiring a maximum of 45 dB(A) or background plus 5 dB(A) (whichever is higher) for all involved residential receivers who have entered into a commercial agreement with the Second Respondent in accordance with the SA EPA Wind Farms Environmental Noise Guidelines.	
	4		A final Construction, Vibration and Operational Noise Management Plan will be prepared and submitted to the EPA prior to construction as part of the CEMP.	

Topic	Number	Sub-number	Statement of Commitment	Varied commitment (where relevant)
	5		An Operational Noise Management Plan will be prepared and submitted to the EPA prior to operation as part of the OMP.	
	6		The noise management plans will include requirements for the operator to:	
		.	Develop and implement an operational noise compliance testing program in accordance with the SA EPA Wind Farms Environmental Noise Guidelines;	
		.	Develop a complaints response procedure in relation to any noise complaints as a result of the operation of the wind farm;	
		.	Locate fixed noise sources such as crushing plant at the maximum practical distance from the nearest dwellings and where possible use existing landforms to block line of sight between equipment and the dwelling; and	
		.	Implement a community consultation process to ensure adequate community awareness and notice of expected construction noise.	
	7		Construction hours will be limited to Monday to Saturday between 7am and 7pm. Works carried out outside of these hours will only entail:	
		.	works that do not cause noise emissions which exceed the noise limits of the Environment Protection (Noise) Policy at any nearby dwelling not associated with the project;	
		.	the delivery of materials as requested by Police or other authorities for safety reasons;	
		.	emergency work to avoid the loss of lives, property, and/or to prevent environmental harm;	
		.	works with the prior consent of the Environment Protection Authority (EPA) (an example might be occasional concrete pours on hot days).	
4.7 Cultural Heritage Impact Management	1		Where necessary areas of infrastructure in the final layout not covered by previous surveys will be surveyed prior to construction.	
	2		Impact mitigation measures agreed with the traditional owners (MACAI), such as construction monitoring, will be carried out.	
	3		Impacts on or disturbance of any registered or newly identified aboriginal sites will be avoided in accordance with the Aboriginal Heritage Act and agreement with MACAI.	
	4		Potential heritage issues will be managed during the construction phase as agreed with MACAI.	

Topic	Number	Sub-number	Statement of Commitment	Varied commitment (where relevant)
	5		The Aboriginal site discovery procedure provided in the Heritage Assessment report will be followed if Aboriginal sites, objects or remains are discovered during works in the Project Area.	<i>The Aboriginal site discovery procedure provided in the Heritage Assessment Summary will be followed if Aboriginal sites, objects or remains are discovered during works in the Project Area.</i>
	6		Prior to work commencing, construction workers on the project will be given appropriate cultural heritage awareness training in consultation with MACAI.	
	7		All on site workers will remain within the project footprint at all times and will avoid going into nearby gullies and rocky outcrops outside of the project footprint wherever possible as these are likely to contain Aboriginal heritage sites.	
	8		Existing access tracks will be utilised as much as possible and disturbance or development in the gullies between hills will be avoided. Wherever possible, access tracks will keep to the crest or upper slopes of the hills within the Project Area.	
	9		Impacts on the dry stone walls will be avoided where possible. If impacts cannot be avoided, these impacts will be minimised or mitigated in consultation with the Dry Stone Wall Association (e.g. by using damaged areas, minimising the access road width) and these measures will be reflected in a management plan as part of the CEMP.	
4.8 Traffic Impact Management	1		In consultation with the Council, DPTI and any other relevant agency, a Traffic Management Plan (construction and operational) will be developed to manage the overall impacts and disturbance to infrastructure and other road users during the construction and ongoing operation phases of the project, including any special safety considerations for historic traffic hot spot areas and impact mitigation measures for residential dwellings along proposed public access routes.	<i>In consultation with the Council, DIT and any other relevant agency, a Traffic Management Plan (construction and operational) will be developed to manage the overall impacts and disturbance to infrastructure and other road users during the construction and ongoing operation phases of the project, including any special safety considerations for historic traffic hot spot areas and impact mitigation measures for residential dwellings along proposed public access routes.</i>

Topic	Number	Sub-number	Statement of Commitment	Varied commitment (where relevant)
	2		A thorough public notification and complaints process will be implemented to provide for advance notifications of anticipated construction and over dimensional traffic.	
	3		The final layout will be reviewed to take into account driver safety issues and appropriate mitigation measures will be implemented to address site specific issues.	
4.9 Construction, Civil, Geology, Geotechnical, Hydrology Impact Management	1		During construction activities the subject land must be managed in a manner as to prevent erosion and pollution of the subject site and the environment, including keeping the area in a tidy state and ensuring any waste materials are appropriately contained to ensure no pollutants (including excavation or fill material) enter the River Murray system.	
	2		Any fill material brought to development sites must be clean and not contaminated by construction or demolition debris, industrial or chemical matter, or pest plant or pathogenic material.	
	3		Any excavation or fill material surplus to the requirements of the development must be disposed of such that it will not:	
		a)	be located within the floodplain of any watercourses;	
		b)	adversely impact native vegetation;	
		c)	impede the natural flow of any surface waters;	
		d)	allow sediment to re-enter any water body;	
		e)	facilitate the spread of pest plant and pathogenic material.	
4.10 Electromagnet ic Interference Impact Management	1		Interference with the Fixed PTP Microwave radio links will be avoided as a design outcome for the detailed layout design process.	
	2		Additional consultation with Telstra, SA Water and the Bureau of Meteorology will be undertaken as part of finalising the final layout.	<i>Additional consultation with Telstra, SA Water and the Bureau of Meteorology will be undertaken as part of finalising the final layout. Written confirmation will be obtained from the Bureau of Meteorology ensuring satisfaction with mitigation measures implemented as part of the Varied Project to reduce risk to the Adelaide (Buckland Park) radar.</i>
	3		Primarily non-metallic turbine blades will be used on wind turbine generators.	

Topic	Number	Sub-number	Statement of Commitment	Varied commitment (where relevant)
	4		Equipment complying with the Electromagnetic Emission Standard, AS/NZS 61000.6.4:2012 will be used (wherever practical).	
	5		Appropriate mitigation measures will be implemented within 5km of the wind farm where TV signals have been demonstrated to be detrimentally impacted by the presence of the wind farm.	
4.11 Aeronautical, Aviation and Qualitative Risk Assessment and Obstacle Lighting	1		The final layout will seek to avoid impacts with respect to aeronautical and aviation issues in accordance with any reasonable requirement of CASA.	
	2		The following information will be provided to CASA, RAAF and Air Services Australia for their register of tall structures and aeronautical maps:	
		.	Prior to construction commencement - the design locations of all wind turbines and meteorological masts; and	
		.	Within three months of construction completion - the as-built locations of all wind turbines and meteorological masts.	
4.12 Shadow Flicker and Blade Glint Impact Management	1		The surface of WTG blades will have a non-reflective surface.	
	2		The final layout will ensure that the predicted actual estimate for shadow flicker will not exceed 10 hours annual or 30 hours theoretical at any non-host residence.	
	3		Complaints in relation to shadow flicker and blade glint from the wind turbine generators will be investigated to confirm actual impacts and mitigated if required as soon as practicable.	
4.13 Economic Impact Management	1		The ultimate construction and turbine supply contractors will be encouraged to identify and utilize local services and employment where possible – both locally and regionally.	
	2		A register of local expressions of interest for delivery of goods and services will be established, maintained and provided to the construction contractors prior to construction commencement.	
	3		An annual ongoing community benefit scheme will be implemented, post construction, in consultation and collaboration with the local community.	

Topic	Number	Sub-number	Statement of Commitment	Varied commitment (where relevant)
	4		A community and tourist information display for the wind farm will be established, in consultation with the Mid Murray Council, after construction completion and potential for wind farm tourism options will be considered in collaboration with appropriate stakeholders.	
4.14 Fire and Bushfire Management	1		All project components will be designed, constructed and operated to minimise ignition risks.	
	2		Asset protection consistent with relevant CFS design will be provided.	
	3		Necessary emergency management will be provided, including appropriate fire-fighting equipment and water supplies on site to respond to a bushfire	
	4		Regular consultation with the local CFS will be undertaken to ensure familiarity with the project, including the construction timetable and the final location of the entire infrastructure on the site. The operator will comply with any reasonable requests of the local CFS to reduce the risk of bushfire and to enable fast access in emergencies.	
	5		A Bushfire Management Plan will be prepared in consultation with the CFS, as part of the development of the Construction Environment Management Plan and the Operational Management Plan. As a minimum the plans will address hot-work procedures, asset protection zones, safety, communication and site access and response protocols in the event of a fire originating in the wind farm infrastructure. All flammable materials and ignition sources brought onto the site, such as hydrocarbons, will be handled and stored as per manufacturer's instructions.	
	6		Appropriate firefighting equipment will be held on site during the construction phase, and training in its use will be provided to staff as necessary. Fire extinguishers will be stored onsite in the control building and within any substations.	
	7		Appropriate bunding will be installed in the substation with a capacity exceeding the volume of the transformer oil to contain the oil in the event of a major leak or fire. The facilities will be regularly inspected and maintained to ensure leaks do not present a fire hazard, and to ensure the bunded area is clear (including removing any rainwater).	
	8		Turbines will be shut down if the components reach critical temperatures or if directed by the CFS in the case of a wildfire being declared within the wind farm site or immediate vicinity (all hours contact points will be made available to the CFS).	
	9		Overhead power line easements will be periodically inspected to monitor and maintain regrowth of encroaching vegetation	

AVIATION PROJECTS: AVIATION IMPACT ASSESSMENT

PALMER WIND FARM

Prepared for Tilt Renewables Australia Pty Ltd



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TABLE OF CONTENTS

EXECUTIVE SUMMARY	IX
1.1. Introduction	ix
1.2. Project description	ix
1.3. Conclusions	x
1.4. Aviation Impact Statement (AIS)	x
1.5. Obstacle lighting risk assessment	xi
1.6. Effect of Variation to Approved Project	xi
1.7. Consultation	xi
1.8. Summary of key recommendations	xi
2. INTRODUCTION	1
2.1. Situation	1
2.2. Purpose and Scope	1
2.3. Methodology	1
2.4. Aviation Impact Statement (AIS)	2
2.5. Material reviewed	3
3. BACKGROUND	4
3.1. Site overview	4
3.2. Project description	4
3.3. Wind monitoring tower description	8
4. EXTERNAL CONTEXT	9
4.1. South Australian Government – planning context	9
4.2. Aeronautical Impact Assessment – approved Project (2014)	9
4.3. National Airports Safeguarding Framework	10
4.4. Aircraft operations at non-controlled aerodromes	10
4.5. Rules of flight	12
4.6. Instrument Flight Rules (Day or night) (IFR)	13
4.7. Aircraft operator characteristics	13
4.8. Military operations	14
4.9. Aerial application operations	14
4.10. Aerial Application Association of Australia (AAAA)	14
4.11. Local aerial application operators	15
4.12. Aeromedical services – Royal Flying Doctor Service	15
4.13. Aerial firefighting	15
5. INTERNAL CONTEXT	17
5.1. Wind farm description	17
5.2. Wind turbine generator (WTG) description	18
5.3. Grid transmission	19
6. CONSULTATION	21
7. AVIATION IMPACT STATEMENT	25
7.1. Overview	25
7.2. Nearby certified aerodromes	25
7.3. Adelaide airport (YPAD)	26
7.4. Parafield airport	31
7.5. Edinburgh (YPED)	34
7.6. Nearby aircraft landing areas (ALAs)	37

7.7. Air route LSALTs and Grid LSALT	38
7.8. Airspace Protection	41
7.9. Aviation facilities – Communication, Navigation and Surveillance Systems (CNS)	41
7.10. Radar	42
7.11. AIS Summary	42
7.12. ALA analysis summary	43
7.13. Assessment recommendations	44
8. HAZARD LIGHTING AND MARKING	45
9. ACCIDENT STATISTICS	46
9.1. General aviation operations	46
9.2. ATSB occurrence taxonomy	46
9.3. National aviation occurrence statistics 2010-2019	46
9.4. Worldwide accidents involving wind farms	48
10. RISK ASSESSMENT	54
10.1. Risk Identification	54
10.2. Risk Analysis, Evaluation and Treatment	54
11. CONCLUSIONS	65
11.1. Project description	65
11.2. Aviation Impact Statement	65
11.3. ALA analysis summary	66
11.4. Aircraft operator characteristics	66
11.5. Hazard marking and lighting	67
11.6. Summary of risks	68
11.7. Comparison of Approved Project aviation risk assessment	68
12. RECOMMENDATIONS	69
ANNEXURES	71
ANNEXURE 1 – REFERENCES	1
ANNEXURE 2 – DEFINITIONS	1
ANNEXURE 3 – CASA REGULATORY REQUIREMENTS – LIGHTING AND MARKING	1
ANNEXURE 4 – RISK FRAMEWORK	1

LIST OF FIGURES

Figure 1 Project Site Overview.....	4
Figure 2 Project Layout	5
Figure 3 Lateral and vertical separation in the standard aerodrome traffic circuit	11
Figure 4 Aerodrome standard traffic circuit, showing arrival and joining procedures.....	12
Figure 5 Central Project Area	17
Figure 6 Northern Project Area.....	18
Figure 7 Proposed WTG locations and highest elevation WTG (WTG-B47)	19
Figure 8 Grid transmission configuration	20
Figure 9 Project location in relation to certified aerodromes.....	26
Figure 10 YPAD published layout.....	27
Figure 11 YPAD MSA.....	29
Figure 12 varied Project in relation to YPAD MSA	30
Figure 13 YPPF layout.....	32
Figure 14 MSA at Parafield airport.....	33
Figure 15 varied Project in relation to YPPF's MSA	33
Figure 16 YPED published layout.....	35
Figure 17 YPED MSA.....	36
Figure 18 Project in relation to YPED MSA.....	36
Figure 19 ALAs in relation to Project Area.....	38
Figure 20 Low-level air routes and Grid LSALT in relation to the Project site	39
Figure 21 High-level air routes and Grid LSALT in relation to varied Project.....	40
Figure 22 Fatal Accident Rate (per million departures) by Operation Type.....	47

LIST OF TABLES

Table 1 Approved Project and varied Project description	5
Table 2 WTG location and elevation	6
Table 3 Stakeholder consultation details.....	22
Table 4 YPAD aerodrome and procedure charts	28
Table 5 YPAD MSA analysis.....	30
Table 6 YPPF aerodrome and procedure charts.....	32
Table 7 YPPF MSA analysis	34
Table 8 YPED aerodrome and procedure charts	35
Table 9 YPED MSA analysis.....	37
Table 10 LSALT analysis	41
Table 11 Comparison of AIS summary	43
Table 12 Number of fatalities by General Aviation sub-category – 2010 to 2019	47
Table 13 Fatal accidents by GA sub-category – 2010 -2019	48
Table 14 Summary of accidents involving collision with a WTG	50
Table 15 Aircraft collision with wind turbine generator (WTG).....	55
Table 16 Harsh manoeuvring leading to controlled flight into terrain	58
Table 17 Effect of the Project on operating crew	61
Table 18 Effect of obstacle lighting on neighbours	63
Table 19 Comparison of AIS for Approved and Varied Project.....	66
Table 20 Summary of Residual Risks	68

ACRONYMS

AAAA	Aerial Agricultural Association of Australia
AC	Advisory Circular
AGL	above ground level
AHD	Australian Height Datum
AIA	aviation impact assessment
AIP	Aeronautical Information Package
AIS	aviation impact statement
ALA	aircraft landing area
ALARP	as low as reasonably practicable
AMSL	above mean sea level
ARP	Aerodrome Reference Point
AS	Australian Standards
AsA	Airservices Australia
ATSB	Australian Transport Safety Bureau
CASA	Civil Aviation Safety Authority
CASR	Civil Aviation Safety Regulation (1998)
CFIT	controlled flight into terrain
CNS	communications, navigation and surveillance
DAH	Designated Airspace Handbook
ERC-H	en-route chart high
ERC-L	en-route chart low
ERSA	En Route Supplement Australia
GA	general aviation
ICAO	International Civil Aviation Organization
IFR	instrument flight rules
IMC	instrument meteorological conditions
LGA	local government area
LSALT	lowest safe altitude
MOC	minimum obstacle clearance
MOS	Manual of Standards

MSA	minimum sector altitude
NASAG	National Airports Safeguarding Advisory Group
NASF	National Airports Safeguarding Framework
NDB	non-directional (radio) beacon
OLS	obstacle limitation surface
PANS-OPS	Procedures for Air Navigation Services - Aircraft Operations
PSR	primary surveillance radar
RAAF	Royal Australian Air Force
RPT	regular public transport
RSR	route surveillance radar
SSR	secondary surveillance radar
VFR	visual flight rules
VMC	visual meteorological conditions
WMTs	wind monitoring towers
WTGs	wind turbine generators

UNITS OF MEASUREMENT

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

DEFINITIONS

Definitions of key aviation terms are included in **Annexure 2**.

EXECUTIVE SUMMARY

1.1. Introduction

Tilt Renewables Australia Pty Ltd (Tilt Renewables – the Proponent) is proposing to develop the Palmer Wind Farm, located in the northern sector of the Mount Lofty Ranges, near the township of Palmer approximately 45 km east of the Adelaide CBD in South Australia.

The Palmer Wind Farm was originally granted Planning Approval in December 2015. The project was approved on appeal to the Environment, Resources and Development Court in March 2018, subject to additional conditions by consent, with the project approval subsequently upheld in the Supreme Court in November 2019.

Following project approval, Tilt Renewables have undertaken a review of the wind farm configuration and have identified an optimised design including a reduction in the number of wind turbine generators (WTGs), an increase in the maximum blade tip height and associated changes to the internal wind farm infrastructure (the varied Project). These changes will require a variation to the Planning Approval, with Tilt Renewables seeking to lodge the Variation Application with the State Planning Commission on completion of the required technical investigations.

This report, Aviation Impact Assessment (AIA), has been prepared to support the Variation Application by the Proponent for the varied Project.

The AIA has been prepared in response to the Civil Aviation Safety Regulations 1998, associated Manuals of Standards and other guidance material provided by CASA, the National Airports Safeguarding Framework (NASF) Guideline D: *Managing the Risk to aviation safety of wind turbine installations (wind farms)/Wind Monitoring Towers*, and specific requirements as advised by Airservices Australia.

This AIA assesses the potential aviation impacts associated with the varied Project and provides aviation safety advice in respect of relevant requirements of air safety regulations and procedures and informs and documents consultation with relevant aviation agencies. This assessment will consider the potential change in impact of the approved Project compared with the varied Project.

This AIA report includes an Aviation Impact Statement (AIS) and a qualitative risk assessment to determine the need for obstacle lighting and marking.

1.2. Project description

The Palmer Wind Farm varied Project will comprise the following infrastructure relevant to this aviation impact assessment:

- Up to 40 wind turbines across two clusters with a maximum overall height (tip height) of up to 220 m above ground level (AGL)
- The highest proposed wind turbine is WTG-B47, with a maximum tip height of 683.4 m AHD (2242 ft AMSL)
- Associated power storage and transmission infrastructure, including overhead 33kV transmission lines with poles up to 30 m, an overhead 275kV transmission line with 55 m lattice towers, and two permanent substations
- Up to five permanent wind monitoring towers and up to 5 temporary calibration masts at approximately 130 m AGL and at the same height as the constructed WTG height

1.3. Conclusions

Based on a comprehensive analysis and assessment detailed in this report, the following conclusions were made:

Certified airports

1. The Project is located within 30 nm of three certified aerodromes:
 - a. Adelaide Airport
 - b. Parafield Airport
 - c. Edinburgh military aerodrome
2. The Project will not affect any Procedures for Air Navigation Services - Aircraft Operations PANS-OPS surfaces or obstacle limitation surfaces at these certified aerodromes

Aircraft Landing Areas (ALAs)

3. There are no active verified or unverified ALAs located within 3 nm of the Project

Air Routes and Lowest Safe Altitude

4. The Project will not affect any route or grid lowest safe altitude

Aviation Facilities

5. The Project will not penetrate any protection areas associated with aviation facilities.

Radar

6. Due to the distance and intervening terrain between the Project and the primary and secondary radar facilities located at Adelaide airport, it is anticipated there will be no impact to radar facilities. Aerservices Australia may conduct a simple assessment on the potential impact of the Project on the Adelaide airport primary radar facility.

1.4. Aviation Impact Statement (AIS)

7. Based on the Project WTG layout and maximum blade tip height of up to 220 m AGL, the blade tip elevation of the highest WTG will not exceed 683.4 m AHD (2242 ft AMSL) and:
 - a) is located within 30 nm of three certified aerodromes:
 - o Adelaide Airport
 - o Parafield Airport
 - o Edinburgh military aerodrome
 - b) will not affect any terminal instrument flight procedures
 - c) will not penetrate any OLS surfaces
 - d) will not have an impact on nearby designated air routes
 - e) will not have an impact on the grid LSALT
 - f) will not have an impact on operational airspace

- g) is wholly contained within Class G airspace
- h) is outside the clearance zones associated with civil aviation navigation aids and communication facilities
- i) will affect Adelaide's Radar Terrain Clearance Chart (RTCC), with WTGs C21, C26, C27, C32, C34 and C38 infringing the RTCC sector. Airservices Australia has been requested to raise the surface of the RTCC to accommodate the Project.

1.5. Obstacle lighting risk assessment

- 8. Aviation Projects has undertaken a safety risk assessment of the Project and concludes that the proposed WTGs will not require obstacle lighting to maintain an acceptable level of safety to aircraft

1.6. Effect of Variation to Approved Project

- 9. The Varied Project will not result in any increased impact to aviation safety as compared to the Approved Project

1.7. Consultation

- 10. Refer to Section 6 for responses from relevant aviation stakeholders.

1.8. Summary of key recommendations

A summary of the key recommendations of this AIA is set out below.

The full list of recommendations and associated details are provided in Section 12 'Recommendations' at the end of this report.

1. 'As constructed' details of the coordinates and elevations of the WTGs should be provided to Airservices Australia, using the Vertical Obstruction Data form (https://www.airservicesaustralia.com/wp-content/uploads/ATS-FORM-0085_Vertical_Obstruction_Data_Form.pdf) to the following email address: vod@airservicesaustralia.com
2. The Proponent should consider engaging with local aerial agricultural operators and aerial firefighting operators in developing procedures for such aircraft operations in the vicinity of the Project site.
3. Details of the final wind farm layout should be provided to local and regional aircraft operators prior to construction so they can plan their operations accordingly.
4. Overhead transmission lines and/or supporting poles associated with the Project that are located where they could adversely affect aerial application operations should be identified in consultation with local aerial agriculture operators and marked in accordance with NASF Guideline D.

2. INTRODUCTION

2.1. Situation

Tilt Renewables is planning the development of the optimised Palmer Wind Farm (the varied Project) in the Mid-Murray region of South Australia, approximately 45 km east of the city of Adelaide. The varied Project is proposed to consist of up to 40 wind turbine generators (WTGs) with a maximum tip height of up to 220 m above ground level (AGL).

This AIA, in respect of the varied Project, assesses the potential aviation impacts, provides aviation safety advice in respect of relevant requirements of air safety regulations and procedures, and informs and documents consultation with relevant aviation agencies.

This AIA report includes an Aviation Impact Statement (AIS) and a qualitative risk assessment to determine the need for obstacle lighting and other applicable mitigation.

The AIA considers the comparison of the approved Project to the varied Project with respect to aviation impacts.

2.2. Purpose and Scope

The purpose and scope of work is to prepare an AIA for consideration by Airservices Australia, CASA and Department of Defence and support a Variation Application to be submitted to the State Planning Commission under the Planning, Development and Infrastructure Act 2016.

The AIA specifically responds to the following key legislation, approvals, and guidance material:

- Government of South Australia, PlanSA, Planning and Design Code, Version 2023.13
- Civil Aviation Safety Authority, Civil Aviation Safety Regulations 1998 (CASR) and associated material
- NASF Guideline D: Managing the Risk to aviation safety of wind turbine installations (wind farms)/Wind Monitoring Towers
- Development Plan consent for the approved Project
- Other specific requirements as advised by Airservices Australia.

2.3. Methodology

Aviation Projects conducted the task in accordance with the following methodology:

1. Confirm the scope and deliverables with the Proponent (or representative)
2. Review client material
3. Review relevant regulatory requirements and information sources
4. Prepare a draft AIA and supporting technical data
5. Prepare an AIS and a qualitative risk assessment to determine need for obstacle lighting and marking
6. Identify risk mitigation strategies that provide an acceptable alternative to night lighting. The risk assessment was completed following the guidelines in *ISO 31000:2018 Risk Management – Guidelines*

7. Consult with relevant Councils (if required), Part 173 procedure designers (if required) and aerodrome operators of the nearest aerodrome/s to seek endorsement of the proposal to change instrument procedures (if applicable)
8. Consult/engage with stakeholders to negotiate acceptable outcomes (if required)
9. Finalise the AIA report when responses received from stakeholders.

2.4. Aviation Impact Statement (AIS)

The AIS included in this report (see Section 7) includes the following specific requirements as advised by Airservices Australia:

Aerodromes:

- Specify all certified aerodromes that are located within 30 nm (55.56 km) of the project site
- Nominate all instrument approach and landing procedures at these aerodromes
- Review the potential effect of the project operations on the operational airspace of the aerodrome(s)

Air Routes:

- Nominate air routes published in ERC-L & ERC-H which are located near/over the project site and review potential impacts of Project operations on aircraft using those air routes
- Specify two waypoint names located on the routes which are located before and after the obstacles

Airspace:

- Nominate the airspace classification – A, B, C, D, E, G etc where the project site is located

Navigation/Radar:

- Nominate radar navigation systems with coverage overlapping the site.

2.5. Material reviewed

Material provided by the Proponent for preparation of this assessment include:

- Project GIS, 2024-01-16 Data for Consultants (L26H).zip, received by email 25 January 2024
- Project GIS (Constructable Area, WTG locations, OHTL, infrastructure) PMWF_Varied Project_20231023.zip, received by email 23 October 2023
- WTG location and elevation, 231024 PMWF Turbine Coordinates.xlsx, received by email 24 October 2023
- Project documents, PMWF Phase 2 documents.zip, received by email 30 October 2023

3. BACKGROUND

3.1. Site overview

The varied Project is located in the eastern Mount Lofty Ranges, approximately 45 km (24 nm) east of the Adelaide CBD, 15 km (8 nm) west of Mannum, and within 3 km (1.6 nm) of the town of Palmer, to the closest proposed WTG location.

The varied Project is located in the Mid-Murray Council Local Government Area (LGA).

An overview of the varied Project relative to nearby townships and the Adelaide CBD is provided in Figure 1 (source: Tilit, Google Earth).

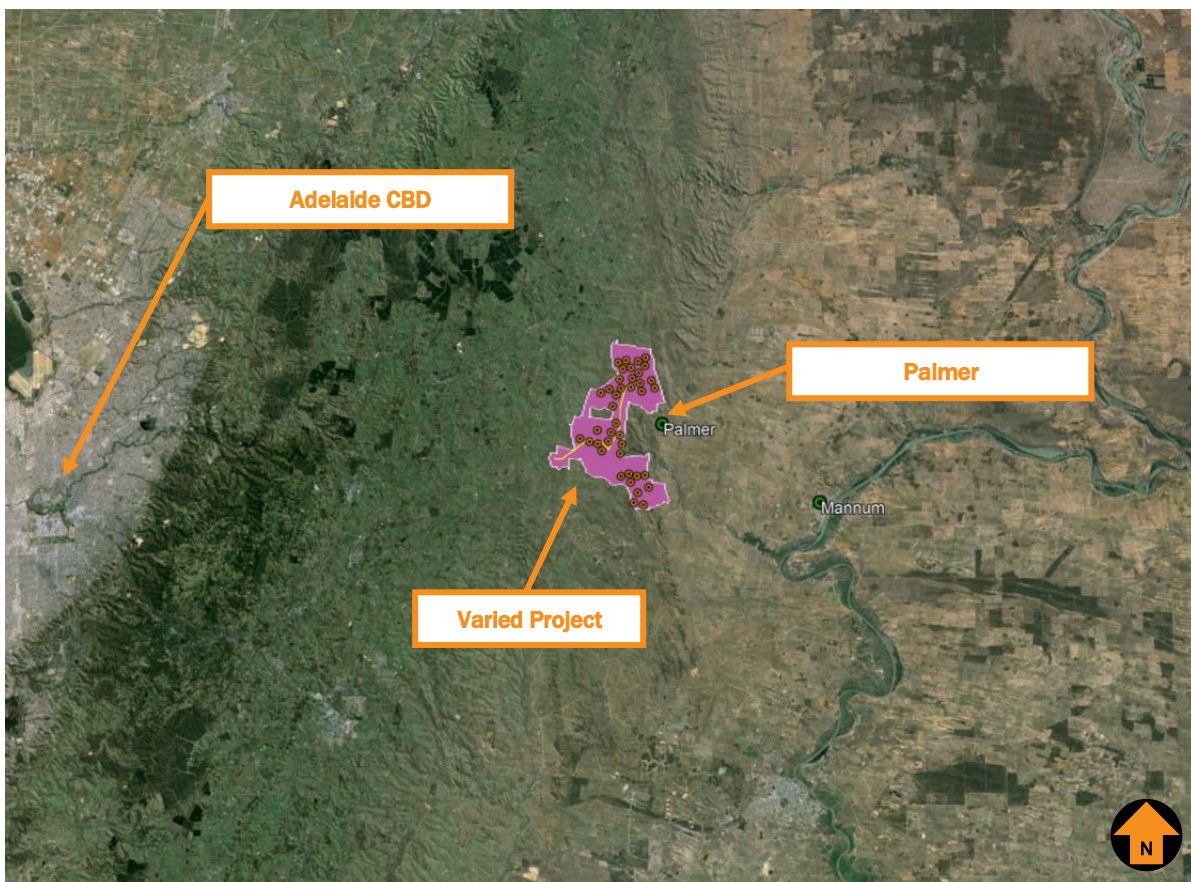


Figure 1 Project Site Overview

3.2. Project description

The varied Palmer Wind Farm is proposed to include the development of wind turbines with a tip height of up to 220 m AGL. The Project also includes 2 permanent substations within the Project boundary, an overhead 275kV transmission line, overhead 33kV transmission lines, up to 5 permanent wind monitoring towers and up to 5 calibration towers at approximately 130 m AGL, along with operation and maintenance facilities and access tracks.

The layout of WTGs and the 275kV overhead transmission line route is shown in Figure 2 (Source, Tilt, Google Earth).

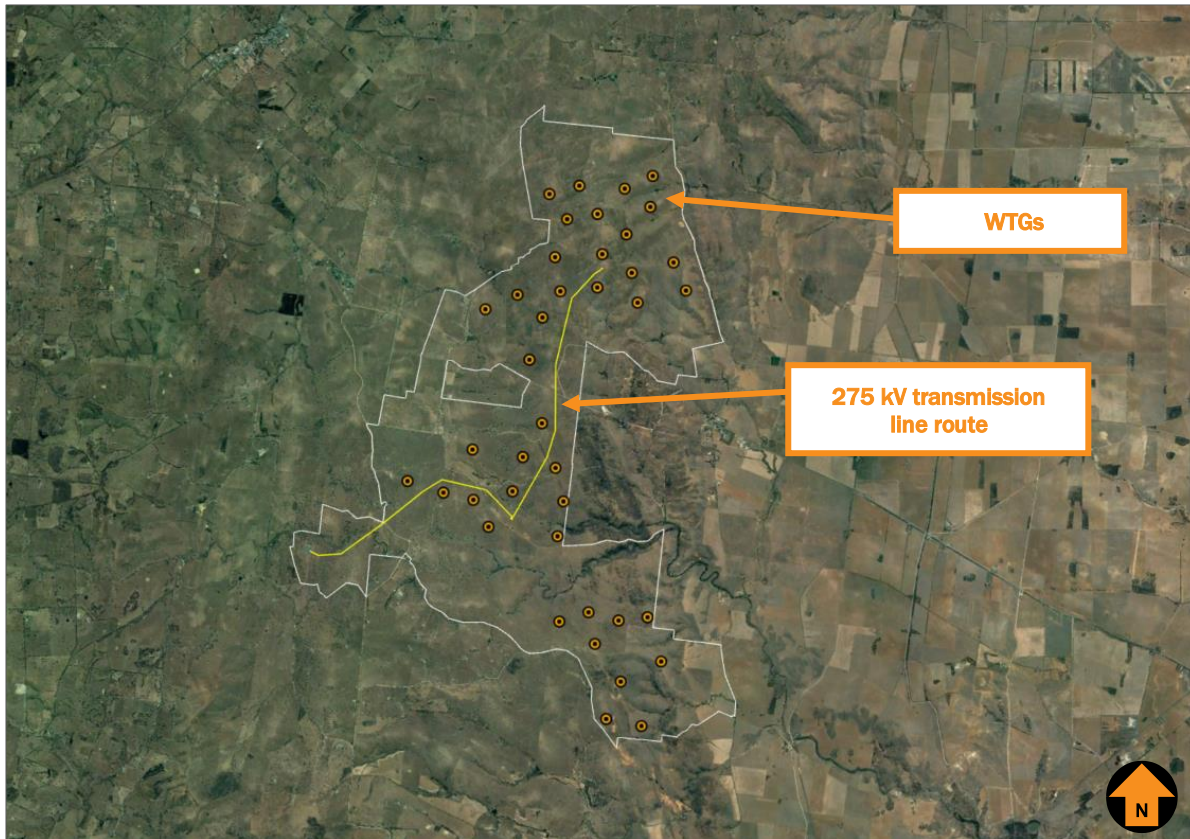


Figure 2 Project Layout

A description of the varied Project compared with the approved Project relevant to this aviation assessment is provided in Table 1 (Source, Tilt Renewables).

Table 1 Approved Project and varied Project description

<i>Element</i>	<i>Approved Project</i>	<i>Varied Project</i>
Number of WTGs	103	Up to 40
Overall Generating Capacity (approximate)	Up to 340MW	Up to 290MW
Maximum height of WTG	165 m tip height	220 m tip height
Overhead 33kV transmission lines	up to 2 circuits (6 conductors) on a single pole line with steel poles of up to 30m in height and spaced approximately 250 – 300 metres apart.	Comprise up to 2 circuits (6 conductors) on a single pole line with steel poles of up to 30m in height and spaced approximately 250 – 300 metres apart.

<i>Element</i>	<i>Approved Project</i>	<i>Varied Project</i>
Overhead 275kV transmission lines	Approximate total length of 10km, comprised of either lattice towers up to 46m high (similar to existing high voltage towers in the area) or steel or spun concrete monopoles and spaced approximately 275 – 375 metres apart	Approximate total length 12km. It will comprise of lattice towers up to 55m high (similar to existing high voltage towers in the area), spaced approximately 300-600 metres apart.
Meteorological masts (wind monitoring towers)	Up to seven permanent masts. These will be approximately 100 m AGL in height and at the same height as the constructed WTG hub height.	Up to five permanent masts Up to five temporary calibration masts These will be approximately 130 m AGL in height and at the same height as the constructed WTG hub height.

Table 2 shows the location(s) and site elevation(s) for each proposed WTG site. Site elevation for each WTG site has been provided by Tilt Renewables. The WTG location responsible for the maximum Project height is highlighted.

The maximum Project height is identified as:

- WTG-B47, with a maximum tip height of 683.4 m AHD (2242 ft AMSL)

By comparison, the Approved Project maximum height was proposed to be 627.8 m AHD (2060 ft AMSL).

Table 2 WTG location and elevation

<i>WTG ID</i>	<i>Easting (m)</i>	<i>Northing (m)</i>	<i>Site elevation (m AHD)</i>	<i>Tip height m AGL</i>	<i>Maximum Height m AHD</i>	<i>Maximum Height (ft AMSL)</i>
B58	328113.6	6145472	410.0	220	630.0	2067
B42	328631.5	6147073	454.1	220	674.1	2212
B45	327960.6	6146882	414.0	220	634.0	2080
B46	330236.1	6146644	376.3	220	596.3	1957
B47	329051.2	6146448	463.4	220	683.4	2242
B40	330278.1	6147338	385.6	220	605.6	1987
B41	329651.6	6147038	393.4	220	613.4	2013
B10	328370.6	6146323	430.6	220	650.6	2135
B62	329845.8	6145151	429.0	220	649.0	2129
B22	329990	6144490	393.5	220	613.5	2013
B13	329075.6	6144812	406.8	220	626.8	2056
B56	329175	6145555	437.4	220	657.4	2157

<i>WTG ID</i>	<i>Easting (m)</i>	<i>Northing (m)</i>	<i>Site elevation (m AHD)</i>	<i>Tip height m AGL</i>	<i>Maximum Height m AHD</i>	<i>Maximum Height (ft AMSL)</i>
B51	331075	6144785	360.3	220	580.3	1904
B52	329710	6146010	425.8	220	645.8	2119
B60	330782.1	6145407	388.4	220	608.4	1996
B55	326562.6	6144283	337.4	220	557.4	1829
C01	327577.6	6143169	351.2	220	571.2	1874
B29	327855.6	6144118	381.9	220	601.9	1975
B25	328248.6	6144708	415.8	220	635.8	2086
B18	327280.6	6144620	362.4	220	582.4	1911
C27	330350.6	6137432	271.6	220	491.6	1613
C30	329173.5	6136816	313.9	220	533.9	1752
C26	329697.2	6137351	302.0	220	522.0	1713
C24	329015.7	6137522	300.8	220	520.8	1709
C21	330259.6	6134979	248.4	220	468.4	1537
C38	329459.2	6135129	285.0	220	505.0	1657
C32	330678.9	6136439	247.5	220	467.5	1534
C34	329771.8	6135976	284.9	220	504.9	1656
C17	328283.3	6139216	280.7	220	500.7	1643
C29	328360.6	6137301	299.8	220	519.8	1705
C05	328209.6	6140753	340.1	220	560.1	1838
C08	328401.6	6140003	318.5	220	538.5	1767
C09	324881.6	6140394	352.3	220	572.3	1878
C13	326722.6	6139400	324.7	220	544.7	1787
C15	325692.6	6140150	329.2	220	549.2	1802
C14	326371.6	6140001	334.2	220	554.2	1818
C04	327469.6	6140983	328.3	220	548.3	1799
C03	327886	6141749	341.3	220	561.3	1842
C06	327247.6	6140207	305.1	220	525.1	1723
C10	326328.6	6141130	318.9	220	538.9	1768
B58	328113.6	6145472	410.0	220	630.0	2067
B42	328631.5	6147073	454.1	220	674.1	2212

3.3. Wind monitoring tower description

The configuration of the wind monitoring towers (WMTs) and meteorological masts proposed for the varied Project has not been specified by the Proponent for this assessment.

The Approved Project was proposed to include up to 7 permanent masts at 100 m AGL. The varied Project is proposed to include up to 5 permanent masts and up to 5 temporary calibration masts at a maximum height of 130 m AGL.

4. EXTERNAL CONTEXT

This chapter explores the federal, state, and local planning context that may impact the Project. Each section will explore and respond to the planning context to identify any conflict between the Project and applicable planning requirements.

4.1. South Australian Government – planning context

Development plan consent was provided in December 2015 for the Palmer wind farm consisting of up to 114 WTGs up to 165 m AGL tip height, and associated infrastructure. 26 development plan consent conditions were originally specified by the Mid-Murray Council, none of which related to aviation.

Following grant of the Development plan consent in December 2015, several challenges appealed the Project's approval, and the Project was updated to address matters raised. This resulted in a 103 WTG layout being approved at the Environment, Resources and Development (ERD) Court in March 2018. The Project was further challenged at the Supreme Court and the Supreme Court upheld the decision of the ERD Court in November 2019, supporting the grant of the original Development Application subject to additional conditions.

Tilt Renewables is seeking to submit a Variation Application for the varied Project. The varied Project will be subject to the South Australian Planning and Design Code, made under the Planning, Development and Infrastructure Act 2016.

The Code divides development into categories based on its classification under the Code as either:

- a) accepted development
- b) deemed-to-satisfy development
- c) restricted development
- d) performance assessed

Relevant to the development of renewable energy facilities is the performance outcome specified in the Infrastructure and Renewable Energy Facilities General Development Policy PO 4.1:

Infrastructure and renewable energy facilities and ancillary development located and operated to not adversely impact maritime or air transport safety, including the operation of ports, airfields and landing strips.

This aviation assessment will examine the impact of the Project on air transport safety. There are no Airport-related overlays applicable to the Project Area.

4.2. Aeronautical Impact Assessment – approved Project (2014)

An aeronautical impact assessment was undertaken by the Ambidji Group Pty Ltd in 2014 for the Approved Project, based on the proposed configuration of 114 WTGs with a maximum height of 165 m AGL, with a maximum project height of 627.8 m AHD (2060 ft AMSL).

Version 7.0 of the aeronautical assessment was reviewed as part of this aviation impact assessment. The following conclusions were made for the approved Project aviation impact assessment:

- The Project did not affect any certified aerodrome's terminal instrument flight procedures or obstacle limitation surface
- The Project did not affect any Lowest Safe Altitude (LSALT)

- The Project did not affect any aviation communication facilities
- The Project did not affect any aviation surveillance (radar) facilities
- The risk assessment shows that the Project will not be of operational significance nor be a hazard to aircraft safety and did not require obstacle lighting.

A summary of the comparison between the Approved and the Varied Project in relation to the conclusions of the aviation impact statement is provided in Section 7 in Table 11.

4.3. National Airports Safeguarding Framework

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

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

NASF Guideline D: *Managing the Risk to Aviation Safety of Wind Turbine Installations (Wind Farms)/Wind Monitoring Towers*, provides guidance to State/Territory and local government decision makers, airport operators and developers of wind farms to jointly address the risk to civil aviation arising from the development, presence, and use of wind farms and WMTs.

The methodology for preparing the risk assessment is contained in the NASF Guideline D Managing the Risk of Wind Turbine Farms as Physical Obstacles to Air Navigation.

The risk assessment will have regard to all potential aviation activities within the vicinity of the Project site including recreation, commercial, civil (including for agricultural purposes) and military operations.

NASF Guideline D strongly encourages consultation with aviation stakeholders in the early stages of wind farm development planning, including with aerodrome owners and operators, regional aircraft operators and CASA and Airservices.

4.4. Aircraft operations at non-controlled aerodromes

Advisory Circulars (ACs) provide advice and guidance from CASA to illustrate a means, but not necessarily the only means, of complying with the Regulations, or to explain certain regulatory requirements. Advisory Circular (AC) 91-10 v1.1 *Operations in the vicinity of non-controlled aerodromes* provides guidance for pilots flying at or in the vicinity of non-controlled aerodromes, with respect to CASR 91.

A conventional circuit pattern and heights are provided in AC 91-10 v1.1. The standard circuit consists of a series of flight paths known as *legs* when departing, arrival or when conducting circuit practice. Illustrations of

the standard aerodrome traffic circuit procedures provided in AC 91-10 v1.1. are shown in Figure 3 and Figure 4.

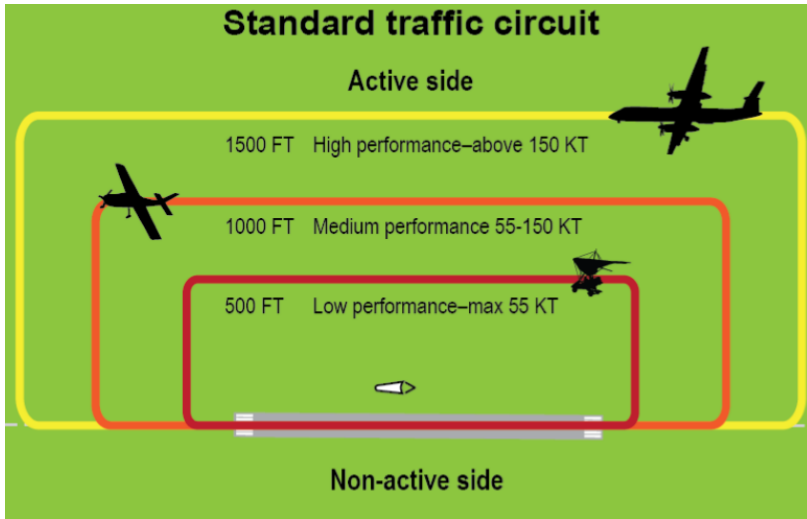


Figure 3 Lateral and vertical separation in the standard aerodrome traffic circuit

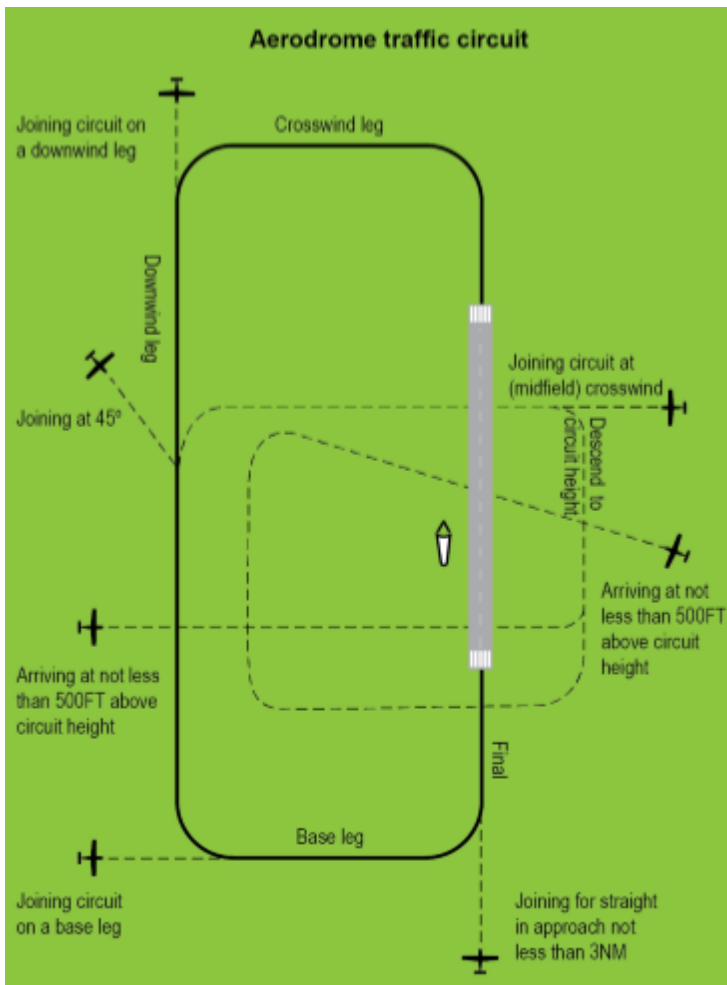


Figure 4 Aerodrome standard traffic circuit, showing arrival and joining procedures

AC 91-10 v1.1, paragraph 7.10 makes reference to a distance of 3 nm (5556 m) that is “normally” well outside the circuit area and where no circuit traffic conflict exists. The paragraph is copied below:

7.10 Departing the circuit area

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

4.5. Rules of flight

4.5.1. Flight under Day Visual Flight Rules (VFR)

According to Aeronautical Information Publication (AIP) the meteorological conditions required for visual flight in the applicable (Class G) airspace at or below 3000 ft AMSL or 1000 ft AGL whichever is the higher are: 5000 m visibility, clear of clouds and in sight of ground or water.

Civil Aviation Safety Regulation (1998) 91.267 (Minimum height rules—other areas) prescribes the minimum height for flight. Generally speaking, and unless otherwise approved, aircraft are restricted to a minimum height of 500 ft AGL above the highest point of the terrain and any object on it within a radius of 300 m in visual flight during the day when not in the vicinity of built-up areas, and 1000 ft AGL over built up areas (within a horizontal radius of 600 m of the point on the ground or water immediately below the aeroplane).

These height restrictions do not apply if through stress of weather or any other unavoidable cause it is essential that a lower height be maintained.

Flight below these height restrictions is also permitted in certain other circumstances.

4.5.2. Night VFR

With respect to flight under the VFR at night, Civil Aviation Safety Regulations (1998) 91.277 requires that the pilot in command of an aircraft flying VFR at night must not fly below the following heights (unless during take-off and landing operations, within 3 nm of an aerodrome, or with an air traffic control clearance):

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

4.6. Instrument Flight Rules (Day or night) (IFR)

According to CASR 91, flight under the instrument flight rules (IFR) requires an aircraft to be operated at a height clear of obstacles that is calculated according to an approved method.

4.7. Aircraft operator characteristics

Aircraft operations in the vicinity of the Project Area are likely to be mostly private and recreational aircraft, flight training and aerial application aircraft including aerial firefighting operations. Air transport operations are likely to occur overhead the vicinity of the Project area associated with approach and departure procedures from Adelaide airport.

Air transport operations are generally conducted under the instrument flying rules (IFR), while aerial work and private and recreational activities are likely to be conducted under visual flying rules (VFR).

Operations conducted under VFR are required to remain in visual meteorological conditions (VMC) (at least 5,000 m horizontal visibility at a similar height of the wind turbines) and clear of the highest point of the terrain by 500 ft vertical distance and 300 m horizontal distance. In visual meteorological conditions (VMC), the wind turbines will likely be sufficiently conspicuous to allow adequate time for pilots to avoid the obstacles. VFR operators will most likely avoid the Project Area once wind turbines are erected.

IFR and Night VFR (which are required to conform to IFR applicable altitude requirements) aircraft operations are addressed in Section 7.

4.8. Military operations

There may be some high-speed low-level military jet aircraft and helicopter operations conducted in the vicinity of the varied Project area, in restricted airspace located to the north of the Project Area. Military aircraft operations are likely to be contained within the Restricted airspace and not in the immediate vicinity of the varied Project area.

Refer to Section 6 for Department of Defence consultation.

4.9. Aerial application operations

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

The standard response from the Aerial Application Association of Australia in relation to wind farms has been included in Section 4.10 (below) for reference. Objections to windfarms are generally related to large scale wind farm projects in active areas of agriculture located in the vicinity of aerial agriculture operations.

There may be aerial application operations associated with fertiliser, pest and crop spraying in the area.

4.10. Aerial Application Association of Australia (AAAA)

In previous consultation with the AAAA, Aviation Projects has been directed to the AAAA Windfarm Policy (dated March 2011) which states in part:

As a result of the overwhelming safety and economic impact of wind farms and supporting infrastructure on the sector, AAAA opposes all wind farm developments in areas of agricultural production or elevated bushfire risk.

In other areas, AAAA is also opposed to wind farm developments unless the developer is able to clearly demonstrate they have:

- 1. consulted honestly and in detail with local aerial application operators;*
- 2. sought and received an independent aerial application expert opinion on the safety and economic impacts of the proposed development;*
- 3. clearly and fairly identified that there will be no short or long term impact on the aerial application industry from either safety or economic perspectives;*
- 4. if there is an identified impact on local aerial application operators, provided a legally binding agreement for compensation over a fair period of years for loss of income to the aerial operators affected; and*
- 5. adequately marked any wind farm infrastructure and advised pilots of its presence.*

AAAA had developed National Windfarm Operating Protocols (adopted May 2014). These protocols note the following comments:

At the development stage, AAAA remains strongly opposed to all windfarms that are proposed to be built on agricultural land or land that is likely to be affected by bushfire. These areas are of critical safety importance to legitimate and legal low-level operations, such as those encountered during crop protection, pasture fertilisation or firebombing operations.

However, AAAA realises that some wind farm proposals may be approved in areas where aerial application takes place. In those circumstances, AAAA has developed the following national

operational protocols to support a consistent approach to aerial application where windfarms are in the operational vicinity.

The protocols list considerations for developers during the design/build stage and the operational stage, for pilots/aircraft operators during aircraft operations and discusses economic compensation. NASF Guideline D is included in the Protocols document as Appendix 1, and AAAA Aerial Application Pilots Manual – excerpts on planning are provided as Appendix II.

This AIA has been prepared in consideration of the National Windfarm Operating Protocols, noting there are minimal known aerial application operations associated with fertiliser, pest, and crop spraying in the area.

4.11. Local aerial application operators

Aerial application operators consulted in previous studies undertaken by Aviation Projects have stated that a wind farm would, in all likelihood, prevent aerial agricultural operations in that particular area, but that properties adjacent to the wind farm would have to be assessed on an individual basis.

Aerial application operators generally align their positions with the AAAA policies.

Based on previous studies undertaken by Aviation Projects, and subject to the results of consultation with AAAA and any further consultation with local aerial application operators, it is reasonable to conclude that safe aerial application operations would still be possible on properties within the Project site and neighbouring the Project site, by implementing recommendations provided in this report.

It is possible that fixed wing aerial agriculture operations will be conducted in the vicinity of the varied Project, however consultation undertaken during the aviation impact assessment in 2014 for the Approved Project indicated there was limited aerial application activity in the vicinity of the Project site.

4.12. Aeromedical services – Royal Flying Doctor Service

The Royal Flying Doctor Service and other emergency services operations are generally conducted under the IFR, except when arriving/departing a destination that is not serviced by instrument approach aids or procedures.

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

The Royal Flying Doctor Service operations won't be affected by the varied Project.

4.13. Aerial firefighting

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

Most aerial firefighting organisations have formal risk management programs to assess the risks associated with their operations and implement applicable treatments to ensure an acceptable level of safety can be maintained. For example, pilots require specific training and approvals, additional equipment is installed in the aircraft, and special procedures are developed.

The Australasian Fire and Emergency Services Council has developed a national position on wind farms, their development and operations in relation to bushfire prevention, preparedness, response and recovery, set out in the document titled *Wind Farms and Bushfire Operations*, version 3.0, dated 25 October 2018.

Of specific interest in this document is the section extracted verbatim from under the 'Response' heading, copied below:

Wind farm operators should be responsible for ensuring that the relevant emergency protocols and plans are properly executed in an emergency event. During an emergency, operators need to react quickly to ensure they can assist and intervene in accordance with their planned procedures.

The developer or operator should ensure that:

- *liaison with the relevant fire and land management agencies is ongoing and effective*
- *access is available to the wind farm site by emergency services response for on-ground firefighting operations*
- *wind turbines are shut down immediately during emergency operations – where possible, blades should be stopped in the 'Y' or 'rabbit ear' position, as this positioning allows for the maximum airspace for aircraft to manoeuvre underneath the blades and removes one of the blades as a potential obstacle.*

Aerial personnel should assess risks posed by aerial obstacles, wake turbulence and moving blades in accordance with routine procedures.

Fixed wing aerial firefighting operations may be conducted in the vicinity of the Project. The previous aviation impact assessment conducted for the Approved Project by the Ambidji Group Pty Ltd included consultation with a regional aerial application operator who stated:

The decision to host wind turbines is one made by the landholder who must accept that there will most probably be limitations to any aerial applications on the property.

No hazards to aircraft operations were identified in the consultation.

5. INTERNAL CONTEXT

5.1. Wind farm description

The varied Palmer Wind Farm will comprise of up to 40 WTGs with a maximum height of up to 220 m AGL tip height, together with associated infrastructure.

The Project will be located on rural cropping and pastoral land.

The main permanent wind farm components of the proposed varied Project will include the following:

- a maximum of 40 WTGs with a maximum tip height of up to 220 m AGL
- hard standing areas for WTG construction
- access tracks
- up to 2 circuits of overhead 33kV transmission line with steel poles up to 30 m AGL
- approximately 12 km of 275kV overhead transmission line with lattice towers up to 55 m AGL spaced between 50 m – 1000 m apart
- two 33kV/275kV substations
- up to 5 permanent wind monitoring towers and up to 5 temporary calibration masts at approximately 130 m AGL.

Figure 5 and Figure 6 shows the general nature of the varied Project area. These locations are generally representative of the nature of Project area for all proposed WTG sites.



Figure 5 Central Project Area



Figure 6 Northern Project Area

5.2. Wind turbine generator (WTG) description

The maximum blade tip height of the proposed wind turbines will be up to 220 m AGL, with a rotor diameter up to 180 m and a hub height of up to 130 m AGL.

Figure 7 demonstrates the varied Project layout identifying the highest proposed wind turbine WTG-B47 (source: Tilt Renewables, Google Earth).

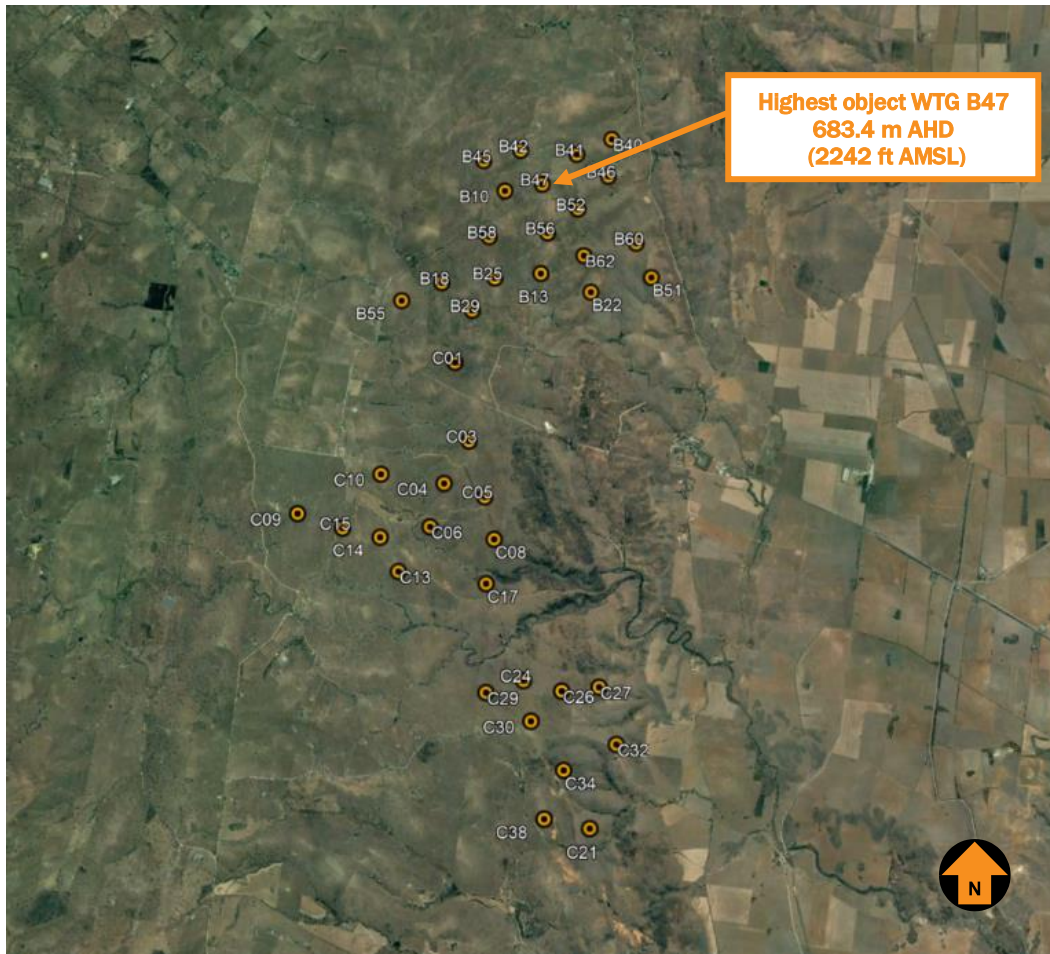


Figure 7 Proposed WTG locations and highest elevation WTG (WTG-B47)

5.3. Grid transmission

The varied Project will connect to the existing grid on the western side of the varied Project Area via the overhead 275kV transmission line with 55 m lattice towers to be developed within the varied Project Area.

WTGs will be connected via overhead 33kV transmission lines.

Figure 8 shows the configuration of the varied Project 275kV grid transmission infrastructure (Source, Tilt Renewables, Google Earth)

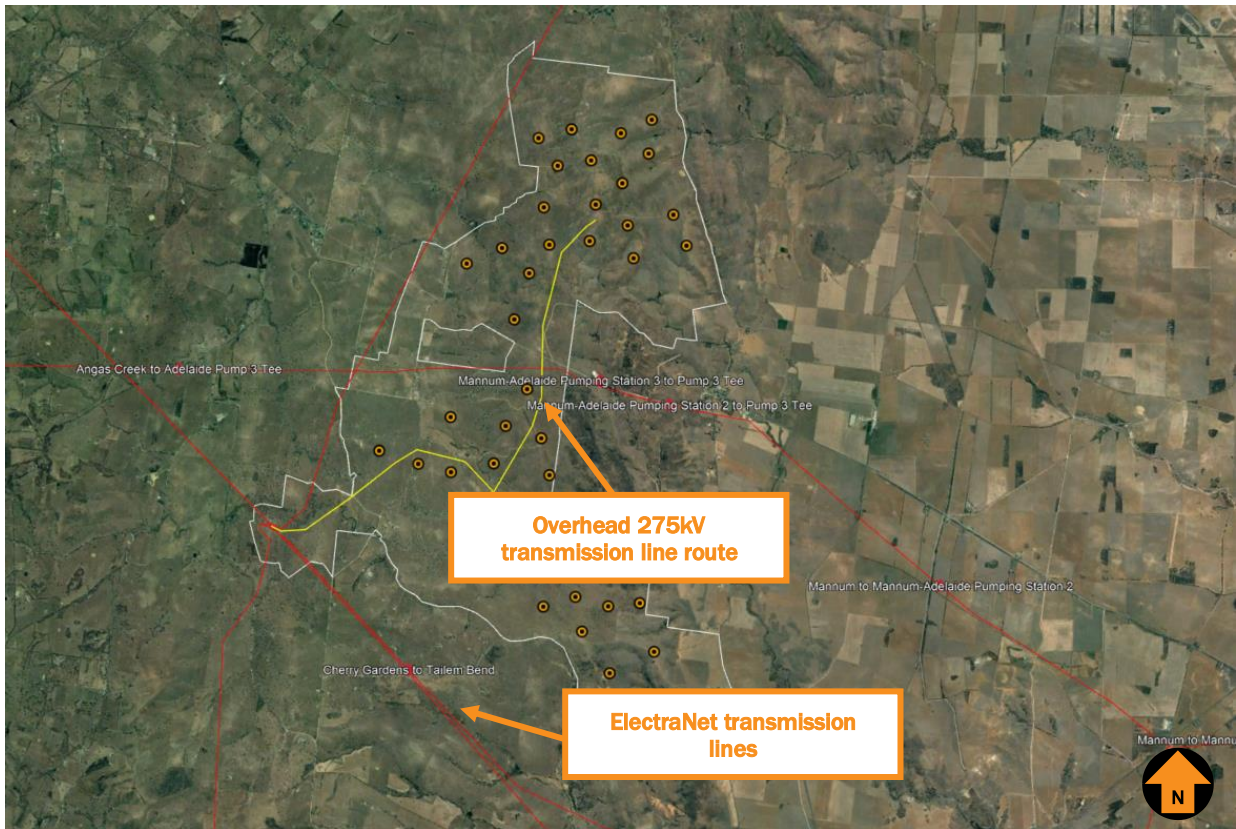


Figure 8 Grid transmission configuration

6. CONSULTATION

The following list of stakeholders were identified as requiring consultation for the varied Project:

- Airservices Australia
- Department of Defence
- Regional aircraft operators

The aeronautical assessment conducted for the approved Project consulted with the following parties during 2014 based on the approved Project configuration of 114 WTGs at 165 m AGL with a maximum Project height of 627.8 m AHD (2060 ft AMSL):

- Airservices Australia
- Department of Defence
- Aerotech Agriculture South Australia
- Country Fire Service South Australia
- Regional Flying Schools

Feedback from those aviation stakeholders consulted with for the approved Project generally indicated that the project would not affect their normal operations. Aerial agriculture operations were noted as minimal in the vicinity of the project. Aerial firefighting operations were possible in the vicinity of the project however the wind farm would not affect the safety of aerial firefighting activities.

Associated landowners were consulted with by Tilt on whether they had private aircraft landing areas and whether they were active. Relevant landowners were offered the opportunity to meet with Aviation Projects but declined as they had no concerns over the varied Project.

Details and results of the consultation activities conducted for the varied Project are provided in Table 3.

Table 3 Stakeholder consultation details

<i>Agency/Contact</i>	<i>Activity/Date</i>	<i>Response/ Date</i>	<i>Issues Raised During Consultation</i>	<i>Action Proposed</i>
Airservices Australia	06 February 2024 (regarding raising of the RTCC surface)	07 February 2024, from Alex Blight, Airspace Development & Protection Coordinator	<p><i>Airservices have received your request to amend Adelaide’s RTCC to accommodate the Palmer Wind Farm.</i></p> <p><i>We will reach out with our conclusion after our IFPD and ATC teams have reassessed.</i></p>	<p>Awaiting response from Airservices regarding request to raise the RTCC surface.</p> <p>Engage with Airservices as required once response is received. It is anticipated that Airservices will accommodate raising of the RTCC surface as required, as has occurred in other wind farm projects in Australia.</p>
Airservices Australia	28 November 2023	23 January 2024, from Alex Blight, Airspace Development & Protection Coordinator	<p><i>I refer to your request for an Airservices assessment of the proposed Palmer Wind Farm.</i></p> <p><i>Airspace Procedures</i></p> <p><i>With respect to procedures designed by Airservices in accordance with ICAO PANS-OPS and Document 9905, at a maximum height of 683.4m/2243ft AHD the wind farm will not affect any sector or circling altitude, nor any instrument approach or departure procedure at Adelaide, Edinburgh and Parafield aerodromes.</i></p> <p><i>Wind turbines C21, C26, C27, C32, C34 and C38 will affect the Adelaide RTCC. The maximum height of the wind turbines C21,</i></p>	<p>Engage further with Airservices Australia to request amending RTCC surface to accommodate Project. Request raised on behalf of Tilt Renewables on 06 February 2024.</p>

Agency/Contact	Activity/Date	Response/ Date	Issues Raised During Consultation	Action Proposed
			<p>C26, C27, C32, C34 and C38 without affecting the Adelaide RTCC is 457.2m/1500ft AHD.</p> <p>The wind farm will not affect any air route LSALT.</p> <p>Note: procedures not designed by Airservices at Adelaide, Edinburgh or Parafield aerodromes were not considered in this assessment.</p> <p>Communications/Navigation/Surveillance (CNS) Facilities</p> <p>We have assessed the proposed activity to the above specified height for any impacts to Airservices Precision/Non-Precision Navigation Aids, Anemometers, HF/VHF/UHF Communications, A-SMGCS, Radar, PRM, ADS-B, WAM or Satellite/Links and have no objections to it proceeding.</p> <p>Air Traffic Control (ATC) Operations</p> <p>There are no additional instructions or concerns from our ATC, provided the maximum height of the wind turbines C21, C26, C27, C32, C34 and C38 is 457.2m/1500ft AHD.</p> <p>Summary – permanent impact (WF)</p>	

<i>Agency/Contact</i>	<i>Activity/Date</i>	<i>Response/ Date</i>	<i>Issues Raised During Consultation</i>	<i>Action Proposed</i>
			<p><i>It is our view is that the proposed Palmer Wind Farm impacts Airservices designed airspace procedures, CNS facilities or ATC operations at Adelaide aerodrome.</i></p> <p><i>Airservices requests that you limit the height of wind turbines C21, C26, C27, C32, C34 and C38 to 457.2m/1500ft AHD. No further assessment/comment required if the listed proposed wind turbines remain at the aforementioned height.</i></p> <p><i>If you have any further queries, please let me know.</i></p>	
Department of Defence	28 November 2023	17 January 2024	The subject site is outside known constraints from our perspective, at this stage.	N/A
Aerotech	9 January 2024	17 January 2024	<p>Phone discussion held with Aerotech Mid North. No issues raised regarding wind farm development.</p> <p>Discussed preference for all WMTs to be marked to improve visibility during the day.</p>	N/A

7. AVIATION IMPACT STATEMENT

7.1. Overview

The NASF Guideline D: *Managing the Risk of Wind Turbine Farms as Physical Obstacles to Air Navigation* provides information to proponents and planning authorities to help identify any potential safety risks posed by WTG 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 Australia.

To facilitate these assessments all wind farm proposals submitted to Airservices Australia must include an Aviation Impact Statement (AIS).

This analysis considers the aeronautical impact of the WTGs on the following:

- The operation of nearby certified aerodromes
- The operation of nearby aircraft landing areas (uncertified aerodromes)
- Grid and air route Lowest Safe Altitudes (LSALTS)
- Airspace protection
- Aviation facilities
- Radar installations
- Local aircraft operations.

The approved Project was based on maximum height of 627.8 m AHD (2060 ft AMSL). This aviation impact statement will examine the maximum height of the varied Project of 683.4 m AHD (2242 ft AMSL).

7.2. Nearby certified aerodromes

The area of 30 nm (56 km) from a certified airport's aerodrome reference point (ARP) is used to identify possible constraints from the Project.

The 30 nm radius represents the 25 nm minimum sector altitude (MSA) for aerodromes with terminal instrument flight procedures. The 25 nm MSA minimum altitude is determined by assessing obstacles within 30 nm of the reference point.

The varied Project is located within 30 nm (55.56 km) of two certified aerodromes and one military aerodrome, and are:

- Edinburgh (YPED)
- Parafield (YPPF)
- Adelaide (YPAD)

Edinburgh airfield (YPED) is a military aerodrome operated by the Royal Australian Air Force (RAAF) and is not technically certified under CASR Part 139, however there are terminal instrument flight procedures implemented and the aerodrome is considered to be certified for the purpose of this assessment.

The location of the Project Area relative to the nearest certified aerodromes shown in Figure 9 (Source: Tilt Renewables, Google Earth).

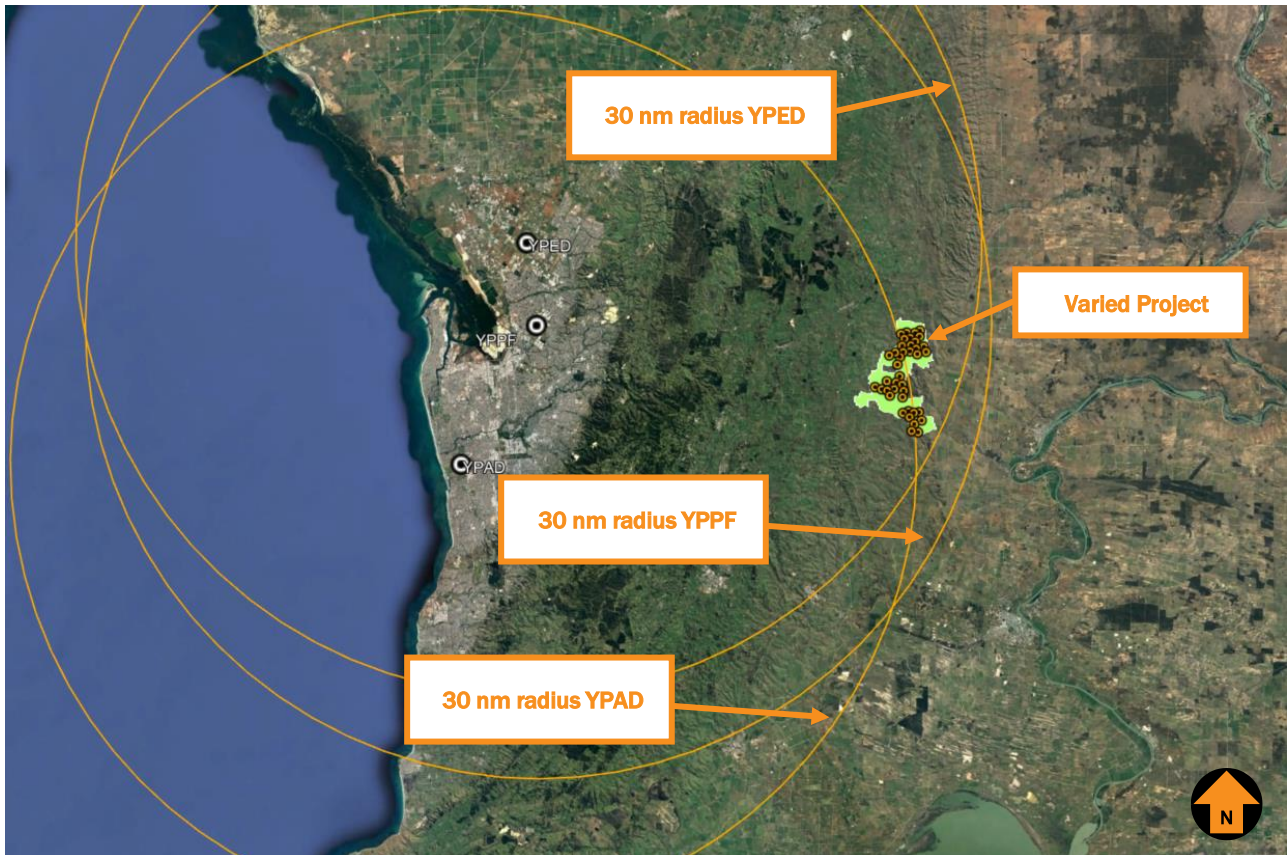


Figure 9 Project location in relation to certified aerodromes

7.3. Adelaide airport (YPAD)

Adelaide airport (YPAD) is a certified airport operated by Adelaide Airport Limited (AAL).

YPAD has two runways; runway 05/23, which is 3100 m long and 45 m wide with a runway strip width of 280 m, and runway 12/30, which is 1652 m long and 45 m, with a runway strip width of 280 m.

Figure 10 shows the published Adelaide airport runway layout (source, Airservices Australia)

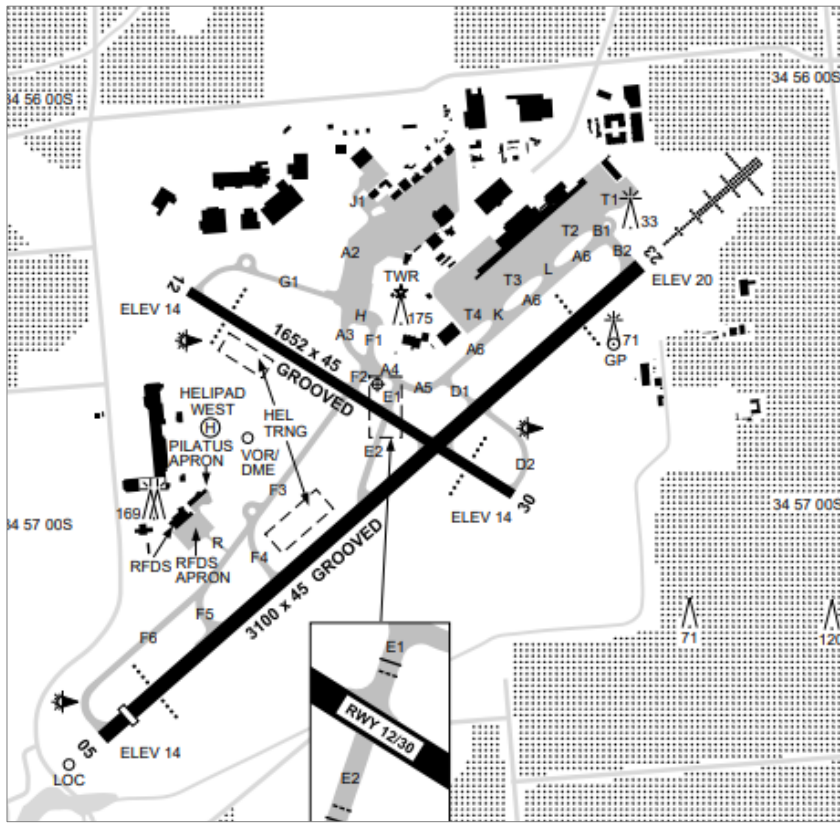


Figure 10 YPAD published layout

7.3.1. Obstacle limitation surface

An Obstacle Limitation Surface (OLS) must be established at a certified aerodrome in accordance with the specifications established in Part 139 MOS 2019 Chapter 7. Objects located or proposed to be located within the OLS of an aerodrome must be reported to CASA and there may be some kinds of aerodrome operations that are limited or not permitted, as determined.

The OLS of an aerodrome is established based on certain operating characteristics and design specifications of the aerodrome. A certified aerodrome operator is responsible for ensuring the OLS for their aerodrome is established in accordance with Part 139 MOS 2019 specifications, and for implementing procedures to monitor the OLS.

For the Code 4 instrument-precision runways at YPAD, the maximum lateral extent of the OLS is up to 15 km for the take-off and approach surfaces and outer horizontal surfaces, from the runway strip ends.

The nearest WTG of the varied Project is located at least 50 km from the runway strip end of the closest runway at YPAD and will not affect the obstacle limitation surface.

7.3.2. Instrument approach procedures

A non-precision instrument approach provides horizontal (lateral) guidance to an aircraft flying the published approach procedure and in general terms allows an aircraft to descend lower while in cloud or in low visibility conditions than what would otherwise be permitted when flying a visual approach. A precision approach is an instrument approach and landing using precision lateral and vertical guidance with minima as determined by the category of operation. Without instrument flight procedures, aircraft are only permitted to descend to the

established Lowest Safe Altitude (LSALT – based on a specified clearance above the highest object in the applicable location) until achieving the required visual reference to the ground or water that then allows further descent.

A check of Aeronautical Information Package (AIP) via the Airservices Australia website showed that YPAD is served by precision and non-precision terminal instrument flight procedures.

Table 4 YPAD aerodrome and procedure charts

<i>Chart name</i>	<i>Effective date</i>
AERODROME CHART Page 1 AsA	25 March 2021 (PADAD01-166)
SID ADELAIDE FOUR DEPARTURE (RADAR) AsA	23 March 2023 (PADDP01-174)
STAR ALEXI THREE X-RAY ARRIVAL (RNAV) AsA	01 December 2022 (PADSR33-173)
STAR ALEXI THREE VICTOR ARRIVAL (RNAV) AsA	17 June 2021 (PADSR26-167)
STAR ALEXI THREE ZULU ARRIVAL (RNAV) AsA	01 December 2022 (PADSR13-173)
STAR ATIP THREE ARRIVAL (NON JET) (RNAV) AsA	17 June 2021 (PADSR16-167)
STAR BLACK THREE ALPHA ZULU ARRIVALS (RNAV) AsA	01 December 2022 (PADSR02-173)
STAR BLACK THREE VICOTR ARRIVAL (RNAV) AsA	17 June 2021 (PADSR27-167)
STAR BLACK THREE X-RAY ARRIVAL (RNAV) AsA	01 December 2022 (PADSR24-173)
STAR DRINA NINE A Z ARR (RNAV) AsA	01 December 2022 (PADSR03-173)
STAR DRINA NINE V ARR (RNAV) AsA	17 June 2021 (PADSR28-167)
STAR ELROX FOUR V ARR (NON-JET)(RNAV) AsA	17 June 2021 (PADSR14-167)
STAR GULFS SEVEN V ARR (NON-JET) (RNAV) AsA	17 June 2021 (PADSR07-167)
STAR PAMMY SIX V ARR (NON-JET) (RNAV) AsA	17 June 2021 (PADSR08-167)
STAR RAYNA TWO A Z ARR (RNAV) AsA	01 December 2022 (PADSR11-173)
STAR RAYNA TWO V ARR (RNAV) AsA	17 June 2021 (PADSR31-167)
STAR RIKAB EIGHT A Z ARR (RNAV) AsA	01 December 2022 (PADSR12-173)
STAR RIKAB EIGHT V ARR (RNAV) AsA	17 June 2021 (PADSR29-167)
STAR RIKAB EIGHT W ARR (RNAV) AsA	01 December 2022 (PADSR18-173)
STAR RUSSL THREE ARR (NON-JET) (RNAV) AsA	17 June 2021 (PADSR15-167)
STAR SALTY THREE A Z ARR (RNAV) AsA	01 December 2022 (PADSR05-173)
STAR SALTY THREE V ARR (RNAV) AsA	17 June 2021 (PADSR30-167)
STAR SALTY THREE W ARR (RNAV) AsA	01 December 2022 (PADSR20-173)
STAR SURGN THREE (NON-JET)(RNAV) AsA	17 June 2021 (PADSR17-167)
DME OR GNSS ARRIVAL AsA	25 March 2021 (PADDG01-166)
VOR RWY 05 AsA	25 March 2021 (PADV001-166)

<i>Chart name</i>	<i>Effective date</i>
VOR RWY 12 AsA	24 March 2022 (PADV003-170)
ILS-Z OR LOC-Z RWY 23 AsA	01 December 2022 (PADII02-173)
ILS-Y OR LOC-Y RWY 23 AsA	01 December 2022 (PADII01-173)
VOR RWY 23 AsA	01 December 2022 (PADV004-173)
VOR RWY 30 AsA	24 March 2022 (PADV005-170)
RNP Z RWY 05 AsA	01 December 2022 (PADGN01-173)
RNP RWY 12 AsA	01 December 2022 (PADGN03-173)
RNP RWY 23 AsA	01 December 2022 (PADGN02-173)
RNP RWY 30 AsA	01 December 2022 (PADGN04-173)
RNP W RWY 05 (AR) AsA	01 December 2022 (PADGN17-173)
RNP X RWY 05 (AR) AsA	01 December 2022 (PADGN11-173)
RNP Y RWY 05 (AR) AsA	01 December 2022 (PADGN12-173)

An image of the Minimum Sector Altitude (MSA) published for YPAD is shown in Figure 11, for both the MSA based on the aerodrome reference point (ARP) and VHF omnidirectional range (VOR) (source: AsA, 2023).

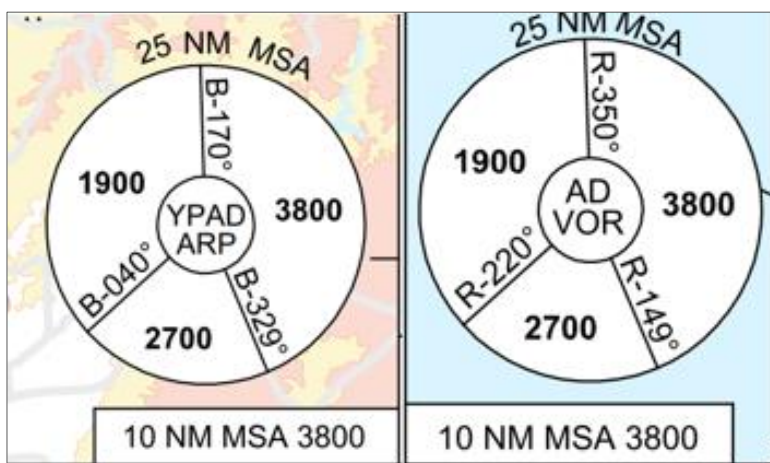


Figure 11 YPAD MSA

The minimum obstacle clearance specified in ICAO Document 8186 Volume II and as applied in Australia requires that minimum obstacle clearance of 984 ft below the published MSA is maintained. Obstacles within 15 nm (10 nm MSA + 5 nm buffer) and within 30 nm (25 nm MSA + 5 nm buffer) of YPAD's ARP and VOR define the minimum altitude at which an aircraft can fly when within 10 nm and 25 nm without the required visual reference to the ground or water until they commence the instrument approach procedure.

Figure 12 shows the Project Area in relation to the YPAD MSA (Source, Tilt, Google Earth)

The 25 nm MSA for YPAD is sectorised. The Project Area is located within the B-170°M to B-329°M 25 nm MSA sector based on the ARP, and within the R-350°M to R-149°M 25 nm MSA sector to the VOR, which has a protection surface of 853 m AHD (2800 ft AMSL).



Figure 12 varied Project in relation to YPAD MSA

Table 5 provides a summary of an impact analysis of the MSA based on the maximum varied Project height 683.4 m AHD (2242 ft AMSL).

Table 5 YPAD MSA analysis

<i>MSA</i>	<i>Minimum altitude (ft AMSL)</i>	<i>PANS OPS Surface (ft AMSL)</i>	<i>Impact on airspace design (WTGs)</i>	<i>Potential solution</i>	<i>Impact on aircraft ops</i>
10 nm	3800	2816	Nil – Project outside area	N/A	N/A
25 nm Sector B-170°M to B-329°M	3800	2816	Nil – Maximum Project height below surface by 574 ft	N/A	N/A

<i>MSA</i>	<i>Minimum altitude (ft AMSL)</i>	<i>PANS OPS Surface (ft AMSL)</i>	<i>Impact on airspace design (WTGs)</i>	<i>Potential solution</i>	<i>Impact on aircraft ops</i>
25 nm Sector B-329° M to B-040° M	2700	1716	Nil – Project outside sector	N/A	N/A
25 nm Sector B-040° M to B-170° M	1900	916	Nil – Project outside sector	N/A	N/A

The varied Project will not affect terminal instrument flight procedures at Adelaide airport.

7.3.3. Adelaide Radar Terrain Clearance Chart (RTCC)

The RTCC is used by air traffic controllers to determine the minimum altitudes that can be assigned by aircraft being vectored by ATC within 40 nm of YPAD.

The RTCC provides a 1000 ft margin above the highest terrain or obstacle within each particular area of the RTCC.

The RTCC is not publicly available. Consequently, it is not possible to determine height limitations for the RTCC above the Project site.

Airservices Australia have assessed the varied Project and confirmed there will be an impact to Adelaide's RTCC. Results of the assessment are included in Table 3.

Airservices Australia are evaluating the request to increase the RTCC surface to accommodate the varied Project.

7.4. Parafield airport

Parafield airport (YPPF) is a certified airport operated by Parafield Airports Limited.

YPPF has four runways; runway 08L/26R, which is 958 m long and 18 m wide, runway 08R/26L, which is 992 m long and 18 m wide, runway 03L/21R, which is 1350 m long and 18 m wide, and runway 03R/21L, which is 1270 m long and 18 m wide. All runways have a runway strip width of 90 m.

Figure 13 shows the published Parafield airport runway layout (source, Airservices Australia)

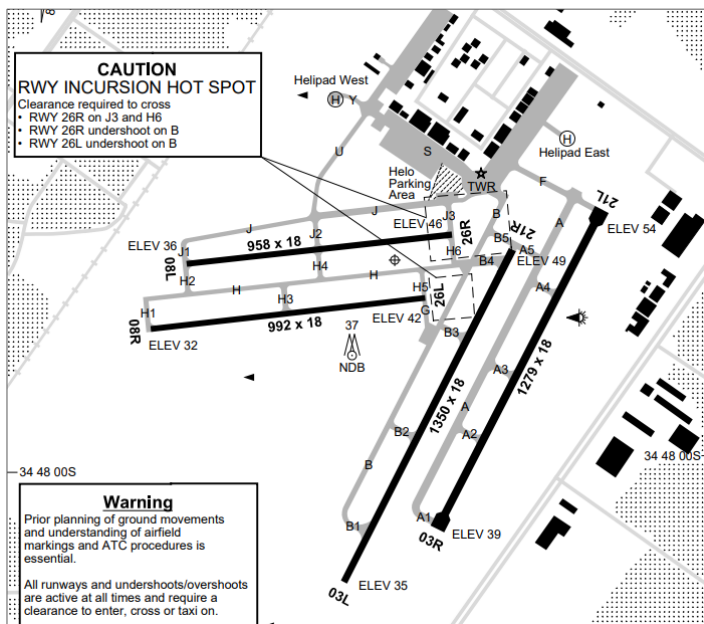


Figure 13 YPPF layout

7.4.1. Obstacle limitation surface

For the Code 2 instrument-non precision runways at YPPF, the maximum lateral extent of the OLS is up to 4.7 km from the runway strip ends. The nearest WTG of the varied Project is located at least 41 km from the nearest runway strip end at YPPF and will not affect the obstacle limitation surface of any runway.

7.4.2. Instrument approach and departure procedures

A check of Aeronautical Information Package (AIP) via the Airservices Australia website showed that YPPF is served by precision and non-precision terminal instrument flight procedures.

Table 6 identifies the aerodrome and procedure charts for YPPF designed by Airservices Australia (AsA).

Table 6 YPPF aerodrome and procedure charts

<i>Chart name</i>	<i>Effective date</i>
AERODROME CHART 1 (AsA)	17 June 2021 (PPFAD01-167)
AERODROME CHART 2 (AsA)	01 December 2022 (PPFAD02-173)
SID PARAFIELD ONE DEP (RADAR) – RWY 03L & 21R (AsA)	17 June 2021 (PPFDP01-167)
VOR-A (AsA)	02 December 2021 (PPFV001-169)
NDB-Y RWY 21R (AsA)	25 March 2021 (PPFNB01-166)
NDB-Z RWY 21R (AsA)	25 March 2021 (PPFNB02-166)
RNP RWY 21 (AsA)	23 March 2023 (PPFGN01-174)

An image of the Minimum Safe Altitude (MSA) published for YPPF is shown in Figure 14, for the MSA based on the aerodrome reference point (ARP) and Non-Directional Beacon (NDB) located at YPPF, and the VOR located at YPAD (source: AsA, 2023).

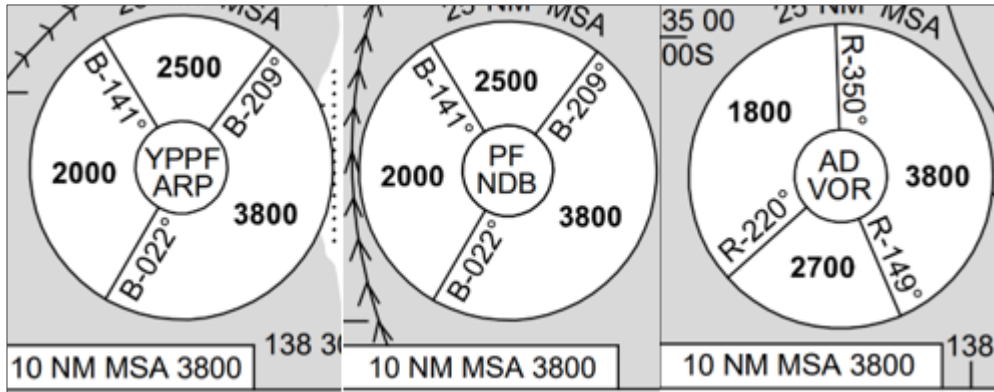


Figure 14 MSA at Parafield airport

Figure 15 shows the Project Area in relation to the YPPF MSA based on YPPF's ARP (Source, Tilt, Google Earth)

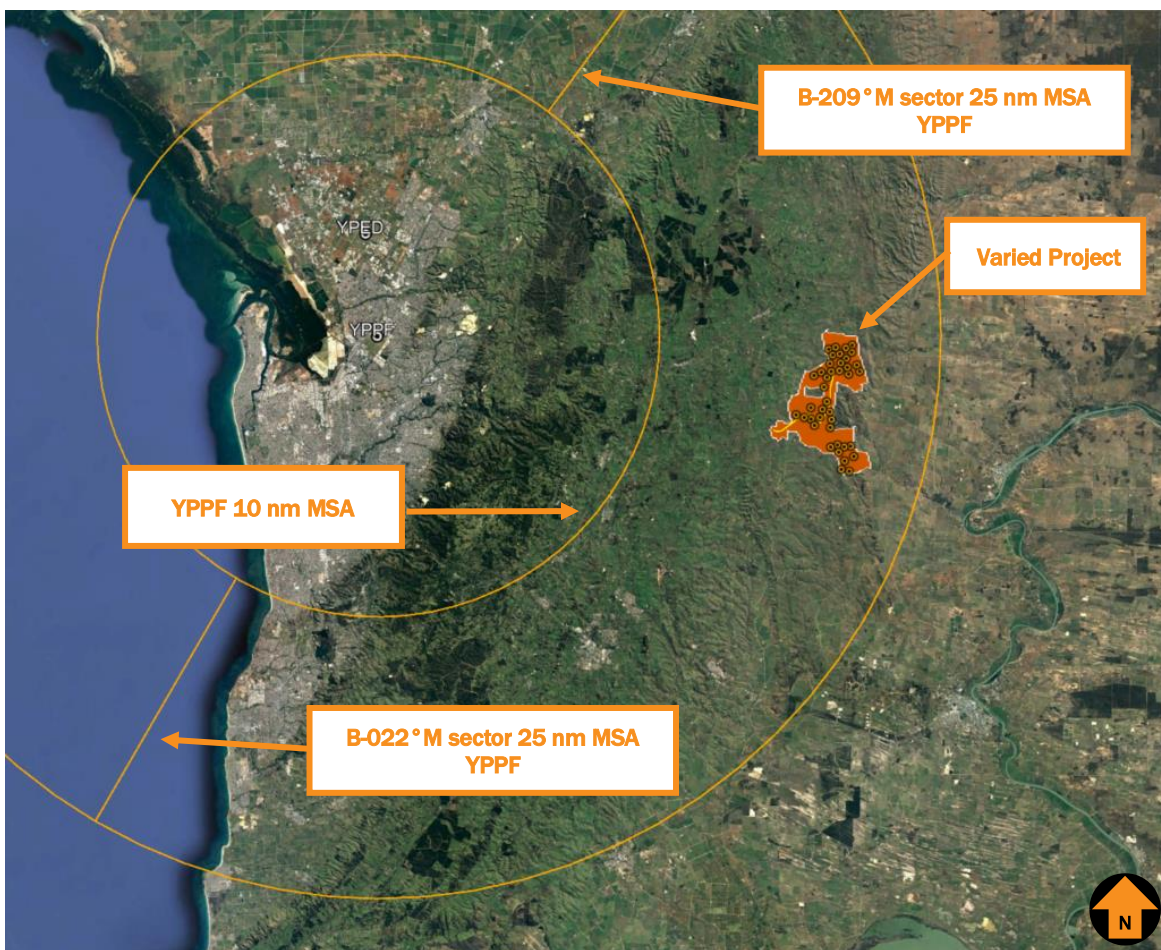


Figure 15 varied Project in relation to YPPF's MSA

The varied Project is located within the B-209°M to B-022°M 25 nm MSA sector based on YPPF's ARP and NDB, and within the 25 nm MSA sector R-350°M to R-149°M based on the AD VOR.

Table 7 provides a summary of an impact analysis of the MSA based on the maximum varied Project height 683.4 m AHD (2242 ft AMSL).

Table 7 YPPF MSA analysis

<i>MSA</i>	<i>Minimum altitude (ft AMSL)</i>	<i>PANS OPS Surface (ft AMSL)</i>	<i>Impact on airspace design (WTGs)</i>	<i>Potential solution</i>	<i>Impact on aircraft ops</i>
10 nm	3800	2816	Nil – Project outside area	N/A	N/A
25 nm Sector B-209°M to B-022°M	3800	2816	Nil – Project maximum height below protection surface by approximately 574 ft	N/A	N/A
25 nm Sector B-022°M to B-141°M	2700	1716	Nil – Project outside sector	N/A	N/A
25 nm Sector B-022°M to B-141°M	2000	1016	Nil – Project outside sector	N/A	N/A
AD VOR R-350°M to R-149°M	3800	2816	Nil – Project maximum height below protection surface by approximately 574 ft		
AD VOR R-149°M to R-220°M	2700	1716	Nil – Project outside sector	N/A	N/A
AD VOR R-220°M to R-350°M	1800	816	Nil – Project outside sector	N/A	N/A

Based on the maximum varied Project height, the Project will not affect YPPF's MSA or terminal instrument flight procedures.

7.5. Edinburgh (YPED)

Edinburgh airfield (YPED) is a military aerodrome operated by the Royal Australian Air Force (RAAF).

YPED has one runway; runway 18/36, which is 2966 m long and 45 m wide with a runway strip width of 230 m.

Figure 16 shows the published YPED runway layout (source, Airservices Australia)

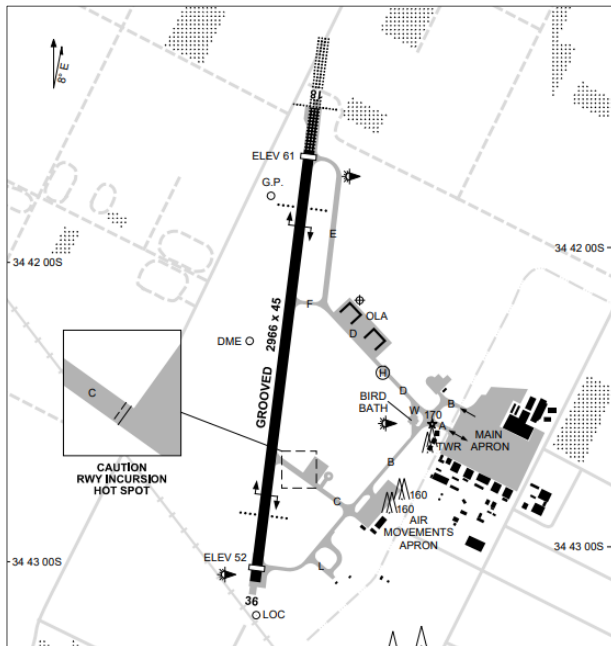


Figure 16 YPED published layout

7.5.1. Obstacle limitation surfaces

YPED is a military airfield and the aerodrome reference code used for the application of aerodrome design specifications is currently not technically applicable. The maximum distance an obstacle limitation surface may extend in Australia is 15 km from a runway strip end for the horizontal sections and take-off and approach sections.

The nearest WTG of the varied Project is located at least 46 km from the nearest runway strip end at YPED and will not affect the obstacle limitation surface.

7.5.2. Instrument approach procedures

A check of Aeronautical Information Package (AIP) via the Airservices Australia website showed that YPED is served by precision and non-precision terminal instrument flight procedures available for civilian aircraft use.

Table 8 identifies the aerodrome and procedure charts for YPED designed by Airservices Australia (AsA).

Table 8 YPED aerodrome and procedure charts

<i>Chart name</i>	<i>Effective date</i>
AERODROME CHART 1 (AsA)	08 September 2022 (PEDAD01-172)
AERODROME CHART 2 (AsA)	08 September 2022 (PEDAD02-172)
ILS-Z OR LOC-Z RWY 18	15 June 2023 (PEDI01-175)

An image of the Minimum Safe Altitude (MSA) published for YPED is shown in Figure 17, based on the aerodrome reference point (ARP) (source: AsA, 2023).

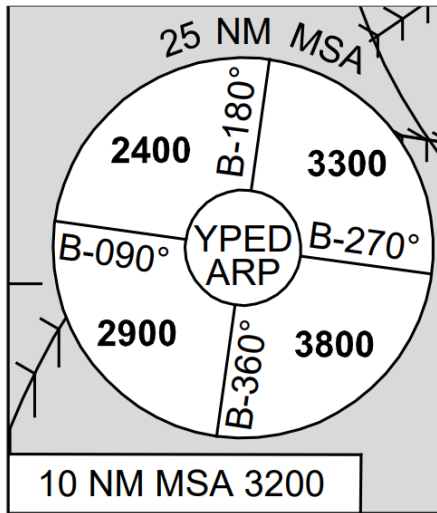


Figure 17 YPED MSA

Figure 18 shows the varied Project in relation to the YPED MSA (Source, Tilt, Google Earth)



Figure 18 Project in relation to YPED MSA

Table 9 provides a summary of an impact analysis of the MSA based on the maximum varied Project height 683.4 m AHD (2242 ft AMSL).

Table 9 YPED MSA analysis

<i>MSA</i>	<i>Minimum altitude (ft AMSL)</i>	<i>PANS OPS Surface (ft AMSL)</i>	<i>Impact on airspace design (WTGs)</i>	<i>Potential solution</i>	<i>Impact on aircraft ops</i>
10 nm	3200	2216	Nil – Project outside area	N/A	N/A
25 nm Sector B-180°M to B-270°M	3300	2316	Project located within sector buffer. Project maximum height below protection surface by approximately 74 ft	N/A	N/A
25 nm Sector B-270°M to B-360°M	3800	2816	Project maximum height below protection surface by approximately 574 ft	N/A	N/A
25 nm Sector B-360°M to B-090°M	2900	1916	Nil – Project outside sector	N/A	N/A
25 nm Sector B-090°M to B-180°M	2400	1416	Nil – Project outside sector	N/A	N/A

The varied Project will not affect YPED’s MSA based on the maximum Project height 683.4 m AHD (2242 ft AMSL).

7.5.3. Military instrument approach and departure procedures

The Australian Department of Defence publishes instrument approach and departure procedures in ADF- FLIP Terminal Australia (TERMA).

There are several instrument approach and departure procedures published for the use of military aircraft at RAAF Base Edinburgh.

Preliminary assessment of these military procedures indicated that the Project does not infringe any of them.

Confirmation will be provided by Defence following the provision of this report to them in the consultation phase of the AIA.

7.6. Nearby aircraft landing areas (ALAs)

As a guide, an area of interest within a 3 nm radius of an aircraft landing area (ALA – uncertified aerodrome) is used to assess potential impacts of proposed developments on aircraft operations at or within the vicinity of the ALA. There are no specified obstacle protection surfaces established for ALAs, and a 3 nm radius from an ALA generally represents the distance beyond which normal aircraft operations that are anticipated to occur at ALAs would not be adversely affected.

A search of various aviation datasets was undertaken to identify ALAs in the vicinity of the Project. The aviation datasets used are:

- OzRunways - which sources its data from Airservices Australia (AIP). The aeronautical data provided by OzRunways is approved under CASA CASR Part 175.
- Australian Government National Map online.

Figure 19 shows the location of the nearest ALAs in relation to the Project. A 3nm radius from each ALA is shown. (Source, Tilt, Google Earth, OzRunways)

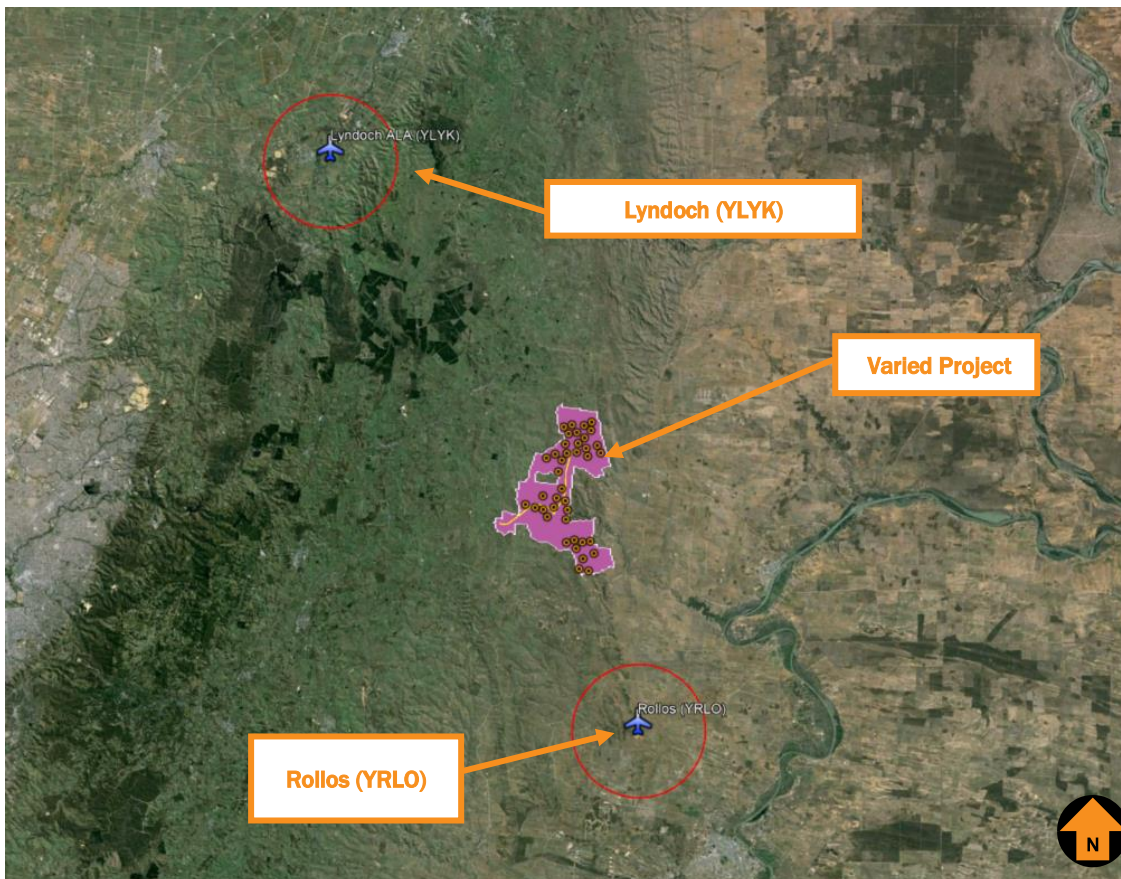


Figure 19 ALAs in relation to Project Area

There are no ALAs located within 3 nm of any part of the varied Project, and there will be no impact to any verified ALA caused by the Project.

7.7. Air route LSALTs and Grid LSALT

MOS 173 requires that the published lowest safe altitude (LSALT), for a particular airspace grid or air route, provides a minimum of 1000 ft clearance above the controlling (highest) obstacle within the relevant grid or air route tolerances.

Grid LSALTs are specified for grid squares formed by the parallels and meridians at 1° intervals for low-level charts and 2° intervals for the high-level chart applicable to the Project Area.

The varied Project is located in a grid identified in the EnRoute Chart – Low. (ERCL 7) The grid LSALT applicable to the proposed WTG locations is 3400 ft AMSL. The Project is located in the vicinity of three low-level air routes, H309, between waypoint BLACK and the VOR located at Adelaide airport (AD VOR), V796, between waypoints DOLVU and PANKI, and H247, between AD VOR and waypoint PANKI.

Figure 20 provides the low-level air routes and grid LSALTs in proximity to the Project site (source: ERC Low National, Tilt Renewables).

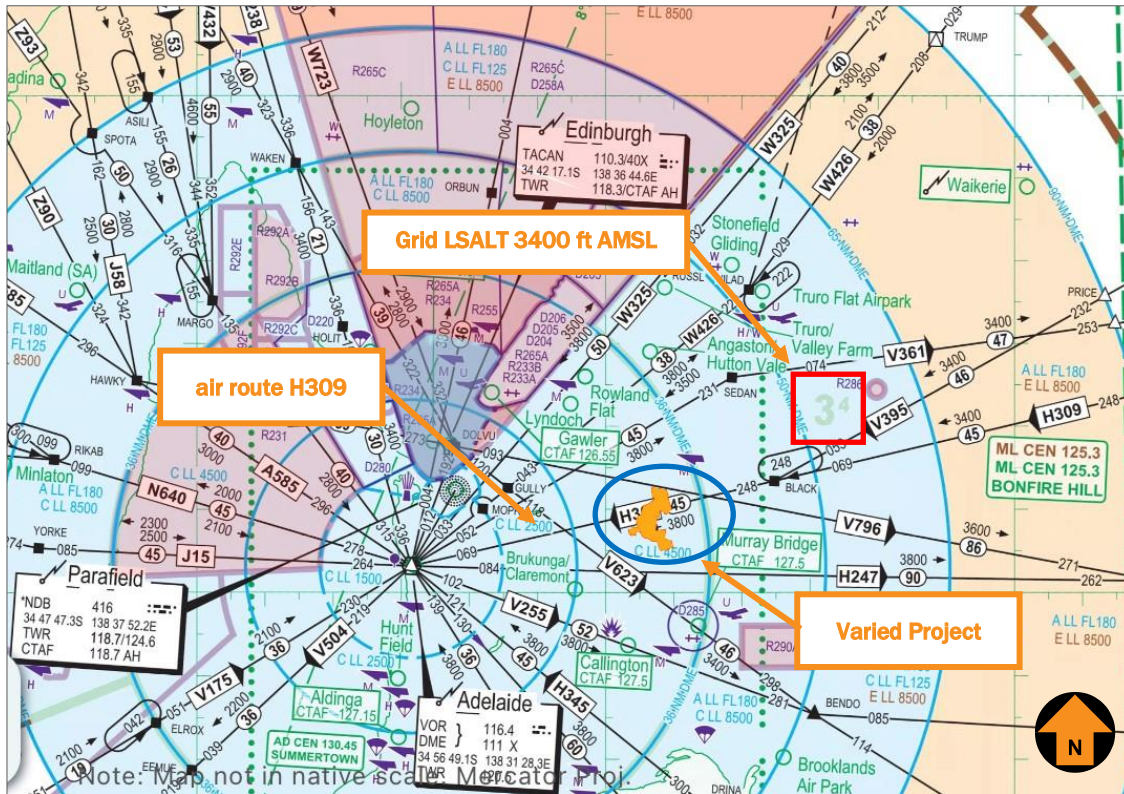


Figure 20 Low-level air routes and Grid LSALT in relation to the Project site

The Project is identified in a grid in the EnRoute Chart – High (ERC H3 South). The applicable grid LSALT is 3800 ft AMSL. The Project is in the vicinity of two high-level air routes, Q60, between waypoints WOONA and BLACK, and H44, between waypoint MAXEM and AD VOR.

Figure 21 provides the high-level air routes and grid LSALT in proximity to the Project site (source: ERC High 3, Tilt Renewables).

Table 10 LSALT analysis

<i>Air route</i>	<i>Waypoint pair</i>	<i>LSALT (ft AMSL)</i>	<i>Protection surface (ft AMSL)</i>	<i>Impact on airspace design</i>	<i>Potential solution</i>	<i>Impact on aircraft ops</i>
H309	AD VOR – BLACK	3800	2800	Nil – maximum Project height below surface by 558 ft	N/A	N/A
V796	DOLVU-PANKI	3600	2600	Nil – maximum Project height below surface by 358 ft	N/A	N/A
H247	AD VOR - PANKI	3800	2800	Nil – maximum Project height below surface by 558 ft	N/A	N/A
Q60	WOONA - BLACK	N/A – grid LSALT 3800 applies	2800	Nil – maximum Project height below surface by 558 ft	N/A	N/A
H44	MAXEM - AD VOR.	3800	2800	Nil – maximum Project height below surface by 558 ft	N/A	N/A
Grid (ERCL)	N/A	3400	2400	Nil – maximum Project height below surface by 158 ft	N/A	N/A
Grid (ERCH)	N/A	3800	2800	Nil – maximum Project height below surface by 558 ft	N/A	N/A

There will be no impact to any grid or route LSALT caused by the varied Project, based on the proposed WTG configuration.

7.8. Airspace Protection

The Project site is located outside controlled airspace (wholly within Class G uncontrolled airspace). The varied Project is not located within the lateral limits of any Prohibited, Restricted or Danger Areas.

7.9. Aviation facilities – Communication, Navigation and Surveillance Systems (CNS)

NASF Guideline G (Protection Aviation Facilities - Communication, Navigation and Surveillance (CNS)) and Part 139 MOS 2019 specify the area where development of buildings and structures has the potential to cause unacceptable interference to CNS facilities.

There are no aviation CNS located in the vicinity of any WTGs, and the varied Project will not penetrate any protection areas associated with CNS facilities as specified in Part 139 MOS 2019 and the National Airports Safeguarding Framework.

7.10. Radar

Airservices Australia currently requires an assessment of the potential for wind turbine generators to affect radar line of sight.

With respect to aviation radar facilities, the closest radar to the varied Project Area is the Summertown Route Surveillance Radar (RSR), located approximately 35 km (19 nm) west-southwest of the nearest WTG site. Adelaide Primary Surveillance Radar (PSR) and Secondary Surveillance Radar (SSR) located at Adelaide Airport are approximately 51 km (28 nm) west-southwest of the nearest proposed WTG.

EUROCONTROL guidelines for assessing the potential impact on wind turbines and WMTs on radar surveillance sensors stipulate the following assessment requirements:

Primary Surveillance Radar (PSR)

Zone 1 0-500 m: Not permitted

Zone 2 500 m – 15 km: Detailed assessment

Zone 3: Further than 15 km but within maximum instrumented range and in radar line of sight: Simple assessment

Zone 4: Anywhere within maximum instrumented range but not in radar line of sight or outside the maximum instrumented range: No assessment

Secondary Surveillance Radar (SSR)

Zone 1: 0-500 m: Not permitted

Zone 2 500 m – 16 km but within maximum instrumented range and in radar line of sight: Detailed assessment

Zone 4: Further than 16 km or not in radar line of sight: No assessment

(Zone 3 is not established for secondary surveillance radar)

The varied Project is located further than 16 km (beyond Zone 4) of Secondary Surveillance Radar facilities, and there will be no impact to those facilities caused by the varied Project.

The varied Project is located within the maximum instrumented range of the Primary Surveillance Radar (PSR) at Adelaide airport. The aeronautical assessment for the approved Project determined that all WTGs were beyond the radar range of the Adelaide PSR.

Due to the distance and terrain profile of the Project Area from the facilities, it is anticipated that the varied Project will not impact the Adelaide Primary Radar facility.

Note: RSR and SSR is the same radar system.

7.11. AIS Summary

Based on the varied Project WTG layout and maximum blade tip height of up to 220 m AGL, the blade tip elevation of the highest WTG will not exceed 683.4 m AHD (2242 ft AMSL) and:

- is located within 30 nm of three certified aerodromes:
 - Adelaide Airport
 - Parafield Airport

- Edinburgh military aerodrome
- will not affect any terminal instrument flight procedures
- will not penetrate any OLS surfaces
- will not have an impact on nearby designated air routes
- will not have an impact on the grid LSALT
- will not have an impact on operational airspace
- is wholly contained within Class G airspace
- is outside the clearance zones associated with civil aviation navigation aids and communication facilities
- will affect Adelaide’s Radar Terrain Clearance Chart (RTCC), with WTGs C21, C26, C27, C32, C34 and C38 infringing the RTCC sector. Airservices Australia will need to increase the RTCC sector height to accommodate the Project.

Table 11 Comparison of AIS summary

<i>Element</i>	<i>Approved Project</i>	<i>Varied Project</i>
Certified aerodromes – obstacle limitation surface	No impact	No impact
Terminal Instrument flight procedures	No impact	No impact
Designated air routes	No impact	No impact
Grid LSALT	No impact	No impact
Operational airspace	No impact	No impact
Communications, Navigation and Surveillance Systems	No impact	No impact
RADAR Terrain Clearance charts	Not specified. It is anticipated the Approved Project would have infringed Adelaide’s RTCC based on the maximum project height of 627.8 m AHD.	WTGs C21, C26, C27, C32, C34 and C38 impact RTCC. Surface needs to be raised to accommodate Project – request made to Airservices Australia 06 February 2024.

7.12. ALA analysis summary

There are no verified ALAs located within 3 nm of the varied Project and there is no impact anticipated to any ALA caused by the varied Project.

7.13. Assessment recommendations

Based on the information contained within this section and the analysis conducted, the following recommendations are made:

- Consultation should be undertaken with Airservices Australia to assess potential impacts of the Project (undertaken during this assessment)
- Department of Defence should be consulted to identify any potential impacts from the Project on military operations.

An appropriate and justified level of consultation was undertaken with relevant parties. Refer to **Section 6** for details of the stakeholders and a summary of the consultation.

8. HAZARD LIGHTING AND MARKING

Based on the risk assessment set out in Section 10 it is concluded that aviation lighting is not required for WTGs.

For completeness, relevant lighting standards and guidelines are summarised in **Annexure 3**.

9. ACCIDENT STATISTICS

This section establishes the external context to ensure that stakeholders and their objectives are considered when developing risk management criteria, and that externally generated threats and opportunities are properly taken into account.

9.1. General aviation operations

The general aviation (GA) activity group is considered by the Australian Transport Safety Bureau (ATSB) to be all flying activities that do not involve commercial air transport (activity group), which includes scheduled (RPT) and non-scheduled (charter) passenger and freight type. It may involve Australian civil (VH-) registered aircraft, or aircraft registered outside of Australia. General aviation/recreational encompasses:

- Aerial work (activity type). Includes activity subtypes: agricultural mustering, agricultural spreading/spraying, other agricultural flying, photography, policing, firefighting, construction – sling loads, other construction, search and rescue, observation and patrol, power/pipeline surveying, other surveying, advertising, and other aerial work.
- Own business travel (activity type).
- Instructional flying (activity type). Includes activity subtypes: solo and dual flying training, and other instructional flying.
- Sport and pleasure flying (activity type). Includes activity subtypes: pleasure and personal transport, glider towing, aerobatics, community service flights, parachute dropping, and other sport and pleasure flying.
- Other general aviation flying (activity type). Includes activity subtypes: test flights, ferry flights and other flying.

9.2. ATSB occurrence taxonomy

The ATSB uses a taxonomy of occurrence sub-type. Of specific relevance to the subject assessment are terms associated with **terrain collision**. Definitions sourced from the ATSB website are provided below:

- **Collision with terrain:** Occurrences involving a collision between an airborne aircraft and the ground or water, where the flight crew were aware of the terrain prior to the collision.
- **Controlled flight into terrain (CFIT):** Occurrences where a serviceable aircraft, under flight crew control, is inadvertently flown into terrain, obstacles, or water without either sufficient or timely awareness by the flight crew to prevent the event.
- **Ground strike:** Occurrences where a part of the aircraft drags on, or strikes, the ground or water while the aircraft is in flight, or during take-off or landing.
- **Wirestrike:** Occurrences where an aircraft strikes a wire, such as a powerline, telephone wire, or guy wire, during normal operations.

9.3. National aviation occurrence statistics 2010-2019

The Australian Transport Safety Bureau (ATSB) recently published a summary of aviation occurrence statistics for the period 2010-2019 (AR-2020-014, Final - 29 April 2020).

According to the report, there were no fatalities in high or low capacity RPT operations during the period 2010-2019. In 2019, 220 aircraft were involved in accidents in Australia, and a further 154 aircraft involved in serious incidents (an incident with a high probability of becoming an accident). In 2019 there were 35 fatalities from 22 fatal accidents. There have been no fatalities in scheduled commercial air transport in Australia since 2005.

Of the 326 fatalities recorded in the 10-year period, almost two thirds (175 or 53.68%) occurred in the general aviation segment. On average, there were 1.51 fatalities per aircraft associated with a fatality in this segment. The fatalities to aircraft ratio ranges from 1.09 to 177:1. Whilst it can be inferred from the data that the majority of fatal accidents are single person fatalities, it is reasonable to assert that the worst credible effect of an aircraft accident in the general aviation category will be multiple fatalities.

A breakdown of aircraft and fatalities by general aviation sub-categories is provided in Table 12 (source: ATSB).

Table 12 Number of fatalities by General Aviation sub-category – 2010 to 2019

<i>Sub-category</i>	<i>Aircraft assoc. with fatality</i>	<i>Fatalities</i>	<i>Fatalities to aircraft ratio</i>
Aerial work	37	44	1.18:1
Instructional flying	11	19	1.72:1
Own business travel	3	5	1.6:1
Sport and pleasure flying	53	94	1.77:1
Other general aviation flying	11	12	1.09:1
Totals	115	174	1.51:1

Figure 22 refers to Fatal Accident Rate by operation type per million departures over the 6-year period (source: ATSB). Note the rates presented are not the full year range of the study (2010–2019). This was due to the availability of exposure data (departures and hours flown) which was only available between these years. According to the ATSB report, the number of fatal accidents per million departures for GA aircraft over the 6-year reporting period ranged between 6.6 in 2014 and 4.9 in 2019.

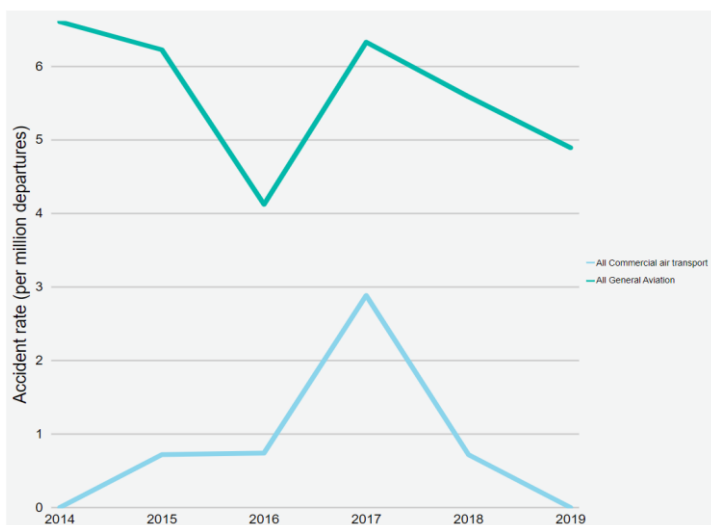


Figure 22 Fatal Accident Rate (per million departures) by Operation Type

In 2018, there were 9 fatal accidents and 9 fatalities involving GA aircraft, resulting in a rate of 5.6 fatal accidents per million departures and 7.7 fatal accidents per million hours flown.

In 2019, there were 1,760,000 landings, and 1,320,000 hours flown by VH-registered general aviation aircraft in Australia, with 8 fatal accidents and 17 fatalities. Based on these results, in 2019 there were 4.9 fatal accidents per million departures and 6.4 fatal accidents per million hours flown. A summary of fatal accidents from 2010-2019 by GA sub-category is provided in Table 13 (source: ATSB).

Table 13 Fatal accidents by GA sub-category – 2010 -2019

<i>Sub-category</i>	<i>Fatal accidents</i>	<i>Fatalities</i>
Agricultural spreading/spraying	13	13
Agricultural mustering	11	12
Other agricultural	1	1
Survey and photographic	5	10
Search and rescue	2	2
Firefighting	2	2
Other aerial work	3	4
Instructional flying	11	19
Own business travel	3	5
Sport and pleasure flying	53	94
Other general aviation flying	11	12
Total	115	174

Over the 10-year period, no aircraft collided with a WTG or WMT in Australia.

Of the 20,529 incidents, serious incidents and accidents in GA operations in the 10-year period, 1,404 (6.83%) were terrain collisions.

The underlying fatality rate for GA operations discussed above is considered tolerable within Australia's regulatory and social context.

9.4. Worldwide accidents involving wind farms

Worldwide since aviation accident statistics have been recorded, there have been a total of 4 aviation accidents involving a wind farm (i.e. where WTGs were erected). To provide some perspective on the likelihood of a VFR aircraft colliding with a WTG, a summary of the 4 accidents and the relevant factors applicable to this assessment is incorporated in this section.

Based on the statistics set out in the Global Wind Energy Council (GWEC) report 2016, there were 341,320 WTGs operating around the world at the end of 2016. In 2019, approximately 60.4 GW of wind power had been installed worldwide.

Based on the Australia's Clean Energy Council statistics there were 102 wind farms in Australia at the end of 2019. Aviation Projects has researched public sources of information, accessible via the world wide web,

regarding aviation safety occurrences associated with wind farms. Occurrence information published by Australia, Canada, Europe (Belgium, Denmark, France, Germany, Norway, Sweden and The Netherlands), New Zealand, the United Kingdom and the United States of America was reviewed.

The 4 recorded aviation accidents involving a wind farm are summarised as follows:

- One accident, which resulted in 2 fatalities, occurred in Palm Springs in 2001. This accident involved a wind farm but was not caused by the wind farm. The cause of the accident was the inflight separation of the majority of the right canard and all of the right elevator resulting from a failure of the builder to balance the elevators per the kit manufacturer's instructions. The accident occurred above a wind farm, and the aircraft struck a WTG on its descent and therefore the cause of the accident was not attributable to the wind farm and not applicable to this AIA.
- Two accidents involving collision with a WTG were during the day, as follows:
 - One accident occurred in Melle, Germany in 2017 as the result of a collision with a WTG mounted on a steel lattice tower at a very low altitude during the day with good visibility and no cloud. The accident resulted in one fatality. If the tower was solid and painted white, as is standard on contemporary wind farms, then it more than likely would have been more visible than if it were to be equipped with an obstacle light which in all likelihood would not have been operating during daylight with good visibility conditions.
 - One accident occurred in Plouguin, France in 2008 when the pilot decided to descend below cloud in an attempt to find the destination aerodrome. The aircraft was flying in conditions of significantly reduced horizontal visibility in fog where the top of the WTGs were obscured by cloud. The WTGs became visible too late for avoidance manoeuvring and the aircraft made contact with two WTGs. The aircraft was damaged but landed safely. No fatalities were recorded.
 - In both of the above cases, it is difficult to conclude that obstacle lighting would have prevented the accidents.
- One fatal accident, near Highmore, South Dakota in 2014 occurred at night in Instrument Meteorological Conditions (IMC).

There is one other accident mentioned in a database compiled by an anti-wind farm lobby group (wind-watch.org), which suggests a Cessna 182 collided with a WTG near Baraboo, Wisconsin, on 29 July 2000. The NTSB database records details of an accident involving a Cessna 182 that occurred on 28 July 2000 in the same area. For this particular accident, NTSB found that the probable cause of the accident was VFR flight into IMC encountered by the pilot and exceeding the design limits of the aircraft. A factor was flight to a destination alternate not performed by the pilot. No mention in the NTSB database is made of WTGs or a wind farm.

A summary of the 4 accidents is provided in Table 14.

Table 14 Summary of accidents involving collision with a WTG

<i>ID</i>	<i>Description</i>	<i>Date</i>	<i>Location</i>	<i>Fatalities</i>	<i>Flight rules</i>	<i>WTG height</i>	<i>Obstacle lighting</i>	<i>Cause of accident</i>	<i>Relevant to obstacle lighting at night</i>
1	Diamond DA320-A1 D-EJAR Collided with a WTG approximately 20 m above the ground, during the day in good visibility. The mast was grey steel lattice, rather than white, although the blades were painted in white and red bands.	02 Feb 2017	Melle, Germany	1	Day VFR No cloud and good visibility	Not specified	Not specified	Not specified	Not applicable

<i>ID</i>	<i>Description</i>	<i>Date</i>	<i>Location</i>	<i>Fatalities</i>	<i>Flight rules</i>	<i>WTG height</i>	<i>Obstacle lighting</i>	<i>Cause of accident</i>	<i>Relevant to obstacle lighting at night</i>
2	<p>The Piper PA-32R-300, N8700E, was destroyed during an impact with the blades of a WTG, at night in IMC.</p> <p>The wind farm was not marked on either sectional chart covering the accident location; however, the pilot was reportedly aware of the presence of the wind farm.</p>	27 Apr 2014	10 miles south of Highmore, South Dakota	4	Night IMC Low cloud and rain	420 ft AGL overall	Fitted but reportedly not operational on the WTG that was struck	<p>The NTSB determined the probable cause(s) of this accident to be the pilot's decision to continue the flight into known deteriorating weather conditions at a low altitude and his subsequent failure to remain clear of an unlit WTG.</p> <p>Contributing to the accident was the inoperative obstacle light on the WTG, which prevented the pilot from visually identifying the WTG.</p>	An operational obstacle light may have prevented the accident.

<i>ID</i>	<i>Description</i>	<i>Date</i>	<i>Location</i>	<i>Fatalities</i>	<i>Flight rules</i>	<i>WTG height</i>	<i>Obstacle lighting</i>	<i>Cause of accident</i>	<i>Relevant to obstacle lighting at night</i>
3	<p>Beechcraft B55</p> <p>The pilot was attempting to remain in VMC by descending the aircraft through a break in the clouds. The pilot, distracted by trying to visually locate the aerodrome, flew into an area of known presence of WTGs.</p> <p>After sighting the WTGs he was unable to avoid them. The tip of the left wing struck the first WTG blade, followed by the tip of the right wing striking the blade of a second WTG.</p> <p>The pilot was able to maintain control of the aircraft and landed safely.</p>	04 Apr 2008	Plouguin, France	0	<p>Day VFR</p> <p>The weather in the area of the WTGs had deteriorated to an overcast of stratus cloud, with a base between 100 ft to 350 ft and tops of 500 ft.</p>	<p>328 ft AGL hub height, 393 ft AGL overall</p>	Not specified	<p>This pilot reported having been distracted by a troubling personal matter which he had learned of before departing for the flight.</p> <p>The wind farm was annotated on aeronautical charts.</p>	Not applicable

<i>ID</i>	<i>Description</i>	<i>Date</i>	<i>Location</i>	<i>Fatalities</i>	<i>Flight rules</i>	<i>WTG height</i>	<i>Obstacle lighting</i>	<i>Cause of accident</i>	<i>Relevant to obstacle lighting at night</i>
4	VariEze N25063 The aircraft collided with a WTG following in-flight separation of the majority of the right canard and all of the right elevator.	20 July 2001	Palm Springs, USA	2	Day VFR	N/A	N/A	The failure of the builder to balance the elevators per the kit manufacturer's instructions. The cause of this accident is not attributable to the wind farm.	Not applicable

10. RISK ASSESSMENT

A risk management framework is comprised of likelihood and consequence descriptors, a matrix used to derive a level of risk, and actions required of management according to the level of risk.

The risk assessment framework used by Aviation Projects and risk event description is provided in **Annexure 4**.

10.1. Risk Identification

The primary risk being assessed is that of aviation safety associated with the height and location of WTGs proposed by the Project.

The aeronautical assessment conducted for the approved Project determined that the project was not of operational significance nor a hazard to aircraft and obstacle lighting was not required.

The aviation impact assessment conducted for the varied Project examines the potential impact to aircraft operations considering the increase in maximum tip height of WTGs of 220 m AGL compared to 165 m AGL for the approved Project.

Based on an extensive review of accident statistics data (see summary in Section 9 (above) and stakeholders who were consulted during the preparation of this AIA (see Section 6), 4 identified risk events associated with WTGs relate to aviation safety or potential visual impact, and are listed as follows:

1. potential for an aircraft to collide with a WTG, controlled flight into terrain (CFIT) (related to aviation safety).
2. potential for a pilot to initiate manoeuvring in order to avoid colliding with a WTG resulting in collision with terrain (related to aviation safety).
3. potential for the hazards associated with the Project to invoke operational limitations or procedures on operating crew (related to aviation safety).
4. potential effect of obstacle lighting on neighbours (related to potential visual impact).

It should be noted that according to guidance provided by the Commonwealth Department of Infrastructure Transport, Regional Development, Communications and the Arts (Airspace and Air Traffic Management Risk Management Policy Statement), and in line with generally accepted practice, the risk to be assessed should primarily be associated with passenger transport services. The risk being assessed herein is primarily associated with smaller aircraft likely to be flying under the VFR, and so the maximum number of passengers exposed to the nominated consequences is likely to be limited.

The four risk events identified here are assessed in detail in the following section.

10.2. Risk Analysis, Evaluation and Treatment

For the purpose of considering applicable consequences, the concept of worst credible effect has been used. Untreated risk is first evaluated, then, if the resulting level of risk is unacceptable, further treatments are identified to reduce the residual level of risk to an acceptable level.

A summary of the level of risk associated with the Project, under the proposed treatment regime, with specific consideration of the effect of obstacle lighting, is provided in Table 15 through to Table 17.

Table 15 Aircraft collision with wind turbine generator (WTG)

Risk ID:	1. Aircraft collision with wind turbine generator (WTG) (CFIT)
Discussion	
<p>An aircraft collision with a WTG would result in harm to people and damage to property. Property could include the aircraft itself, as well as the WTG.</p> <p>There have been 4 reported occurrences worldwide of aircraft collisions with a component of a WTG structure since the year 2000 as discussed in Section 9. These reports show a range of situations where pilots were conducting various flying operations at low level and in the vicinity of wind farms in both IMC and VMC. No reports of aircraft collisions with wind farms in Australia have been found.</p> <p>In consideration of the circumstances that would lead to a collision with a WTG:</p> <ol style="list-style-type: none"> 1. GA VFR aircraft operators generally don't individually fly a significant number of hours in total, let alone in the area in question 2. Military aircraft are likely to operate in the vicinity of the Project Area however would be contained within the designed airspace of Restricted Areas, away from the varied Project area 3. There is a very small chance that a pilot, suffering the stress of weather, will continue into poor weather conditions (contrary to the rules of flight) rather than divert away from it, is not aware of the wind farm, will not consider it or will not be able to accurately navigate around it. 4. If the aircraft was flown through the wind farm, there is still a very small chance that it would hit a WTG. <p>Refer to the discussion of worldwide accidents in Section 9.</p> <p>There may be aerial application operations during the day in the vicinity of the Project site.</p> <p>There are no known aerial application operations conducted at night in the vicinity of the Project site.</p> <p>If a proposed object or structure will be 100 m or more AGL, details of the relevant proposal must be referred to CASA for CASA to determine, in writing:</p> <ol style="list-style-type: none"> (a) whether the object or structure will be a hazard to aircraft operations (b) whether it requires an obstacle light that is essential for the safety of aircraft operations. <p>CASA don't have the regulatory authority to mandate obstacle lighting as the Project is clear of the obstacle limitation surfaces (OLS) of any aerodrome.</p> <p>CASA generally may recommend obstacle lighting for objects over 200 m AGL.</p>	
Consequence	
<p>If an aircraft collided with a WTG, the worst credible effect would be multiple fatalities and damage beyond repair. This would be a Catastrophic consequence.</p>	
Consequence	
Catastrophic	
Untreated Likelihood	
<p>There have been 4 reports of aircraft collisions with WTGs worldwide, which have resulted in a range of consequences, where aircraft occupants sustained minor injury in some cases and fatal injuries in others (see Section 9). Similarly, aircraft damage sustained ranged from minor to catastrophic. One of these accidents resulted from structural failure of the aircraft before the collision with the WTG. Only two relevant accidents</p>	

<p>occurred during the day, and only one resulted in a single fatality. It is assessed that collision with a WTG resulting in multiple fatalities and damage beyond repair is unlikely to occur, but possible (has occurred rarely), which is classified as Possible.</p>	
<i>Untreated Likelihood</i>	Possible
<p>Current Treatments (without lighting)</p> <ul style="list-style-type: none"> The Project site is not located within 30 nm of any certified aerodrome The Project site is clear of the obstacle limitation surfaces (OLS) of any certified aerodrome. There are no WTGs proposed to be located within 3 nm of any active aircraft landing area (ALA) Aircraft flying at night are required to maintain at least the established LSALT with at least 1000 ft clearance over the highest obstacle except within 3 nm of the aerodrome during landing and take-off operations. Aircraft are restricted to a minimum height of 500 ft (152.4 m) AGL above the highest point of the terrain and any object on it within a radius of 300 m in visual flight during the day when not in the vicinity of built-up areas. The proposed WTGs will be a maximum of 220 m (723 ft) at the top of the blade tip. The rotor blade at its maximum height will be approximately 67.6 m (223 ft) above aircraft flying at the minimum altitude of 152.4 m AGL (500 ft). In the event that descending cloud forces an aircraft lower than 500 ft (152.4 m) AGL, the minimum visibility of 5,000 m required for visual flight during the day should provide adequate time for pilots to observe and manoeuvre their aircraft clear of WTGs. The WTGs are typically coloured white so they should be visible to pilots during the day. The 'as constructed' details of WTGs are required to be notified to Airservices Australia so that the location and height of all WTGs can be noted on aeronautical maps and charts. Because the Project WTGs are proposed to be above 100 m AGL, there is a statutory requirement to report the WTGs to CASA and notified to Airservices Australia prior to construction. CASA will review the Project for potential hazards to aircraft operations. 	
<p>Level of Risk</p> <p>The level of risk associated with a Possible likelihood of a Catastrophic consequence is 8 (Unacceptable).</p>	
<i>Current Level of Risk</i>	8 - Unacceptable
<p>Risk Decision</p> <p>A risk level of 8 is classified as Unacceptable: Immediate action required by either treating or avoiding risk. Refer to executive management.</p>	
<i>Risk Decision</i>	Unacceptable
<p>Recommended Treatments</p> <p>The following treatments which can be implemented which will provide an acceptable level of safety:</p> <ul style="list-style-type: none"> Details of the Project should be communicated to local and regional aircraft operators (refer to Section 6) prior to construction to heighten their awareness of its location and so that they can 	

<p>plan their operations accordingly (regional aircraft operators will be consulted with during this aviation impact assessment).</p>	
<p>Residual Risk</p> <p>With the implementation of the Recommended Treatments listed above, the likelihood of an aircraft collision with a WTG resulting in multiple fatalities and damage beyond repair will be Unlikely, and the consequence remains Catastrophic, resulting in an overall risk level of 7 - Tolerable.</p> <p>The level of risk with the implementation of the Recommended Treatments is considered As Low As Reasonably Practicable (ALARP).</p> <p>It is our assessment that there will be an acceptable level of aviation safety risk associated with the potential for an aircraft collision with a Project WTG without obstacle lighting on the WTGs.</p>	
<p>Residual Risk</p>	<p>7 - Tolerable</p>

Table 16 Harsh manoeuvring leading to controlled flight into terrain

Risk ID:	2. Harsh manoeuvring leads to controlled flight into terrain (CFIT)
Discussion	
<p>An aircraft colliding with terrain as a result of manoeuvring to avoid colliding with a WTG would result in harm to people and damage to property.</p> <p>There are a few ground collision accidents resulting from manoeuvring to avoid wind farms, but none in Australia, and all were during the day.</p> <p>The Project is clear of the OLS of any aerodrome.</p> <p>Aircraft are restricted to a minimum height of 152.4 m (500 ft) above the highest point of the terrain and any object on it within a radius of 300 m in visual flight during the day when not in the vicinity of built up areas.</p> <p>The proposed WTGs will be a maximum of 220 m (723 ft) at the top of the blade tip. The rotor blade at its maximum height will be approximately 67.6 m (223 ft) above aircraft flying at the minimum altitude of 152.4 m AGL (500 ft).</p> <p>Nevertheless, the minimum visibility of 5000 m required for visual flight during the day should provide adequate time for pilots to observe and manoeuvre their aircraft clear of WTGs.</p> <p>Aircraft are restricted to a minimum height of 304.8 m (1000 ft) above obstacles within 10 nm of the aircraft in visual flight at night and potentially even higher during instrument flight (day or night).</p> <p>Aircraft authorised to intentionally fly below 152.4 m (500 ft) AGL (day) or below safety height (night) are operated in accordance with procedures developed as an outcome of thorough risk management activities.</p>	
Assumed risk treatments	
<ul style="list-style-type: none"> • The WTGs are typically coloured white so they should be visible during the day. • The 'as constructed' details of WTGs are required to be notified to Airservices Australia so that the location and height of WTGs can be noted on aeronautical maps and charts. • Since the WTGs will be higher than 100 m AGL, there is a statutory requirement to report the WTG to CASA. 	
Consequence	
<p>If an aircraft collided with terrain, the worst credible effect would be multiple fatalities and damage beyond repair. This would be a Catastrophic consequence.</p>	
Consequence	Catastrophic
Untreated Likelihood	
<p>There are a few ground collision accidents resulting from manoeuvring to avoid WTGs, but none in Australia, and all were during the day (see Section 9). It is assessed that a ground collision accident following manoeuvring to avoid a WTG is unlikely to occur, but possible (has occurred rarely), which is classified as Possible.</p>	
Untreated Likelihood	Possible
Current Treatments (without lighting)	

<ul style="list-style-type: none"> • The Project site is clear of the obstacle limitation surfaces (OLS) of any aerodrome. • Aircraft are restricted to a minimum height of 152.4 m (500 ft) above the highest point of the terrain and any object on it within a radius of 300 m in visual flight during the day when not in the vicinity of built-up areas. • Aircraft flying at night are required to maintain at least the established LSALT with at least 1000 ft clearance over the highest obstacle except within 3 nm of the aerodrome during landing and take-off operations • The proposed WTGs will be a maximum of 220 m (723 ft) at the top of the blade tip. The rotor blade at its maximum height will be approximately 67.6 m (223 ft) above aircraft flying at the minimum altitude of 152.4 m AGL (500 ft). Nevertheless, the minimum visibility of 5000 m required for visual flight during the day should provide adequate time for pilots to observe and manoeuvre their aircraft clear of WTGs. • Aircraft authorised to intentionally fly below 152.4 m AGL (500 ft) (day) or below safety height (night) are operated in accordance with procedures developed as an outcome of thorough risk management activities. • The WTGs are typically coloured white, typical of most WTGs operational in Australia, so they should be visible during the day. • The 'as constructed' details of WTGs are required to be notified to Airservices Australia so that the location and height of wind farms can be noted on aeronautical maps and charts. • Since the WTGs will be higher than 100 m AGL, there is a statutory requirement to report the WTGs to CASA. 	
<p>Level of Risk</p> <p>The level of risk associated with a Possible likelihood of a Catastrophic consequence is 8.</p>	
Current Level of Risk	8 – Unacceptable
<p>Risk Decision</p> <p>A risk level of 8 is classified as Unacceptable: Immediate action required by either treating or avoiding risk. Refer to executive management.</p>	
Risk Decision	Unacceptable
<p>Recommended Treatments</p> <p>The following treatments which can be implemented which will provide an acceptable level of safety:</p> <ul style="list-style-type: none"> • Details of the Project should be communicated to local and regional aircraft operators (refer to Section 6) prior to construction to heighten their awareness of its location and so that they can plan their operations accordingly (regional aircraft operators will be consulted with during this aviation impact assessment). • Ensure details of the Project WTGs have been communicated to Airservices Australia prior to construction, for publication in relevant aeronautical publications. 	

Residual Risk

With the implementation of the Recommended Treatments listed above, the likelihood of an aircraft collision with a WTG resulting in multiple fatalities and damage beyond repair will be **Unlikely**, and the consequence remains **Catastrophic**, resulting in an overall risk level of **7 - Tolerable**.

The level of risk with the implementation of the Recommended Treatments is considered **As Low As Reasonably Practicable (ALARP)**.

It is our assessment that there will be an acceptable level of aviation safety risk associated with the potential for an aircraft collision with a Project WTG without obstacle lighting on the WTGs.

	Residual Risk 7 - Tolerable
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Table 17 Effect of the Project on operating crew

Risk ID:	3. Effect of the Project on operating crew	
Discussion		
<p>Introduction or imposition of additional operating procedures or limitations can affect an aircraft's operating crew.</p> <p>There are no known aerial application operations conducted at night in the vicinity of the Project site.</p>		
Consequence		
<p>The worst credible effect a wind farm could have on flight crew would be the imposition of operational limitations, and in some cases, the potential for use of emergency procedures. This would be a Minor consequence.</p>		
Consequence		Minor
Untreated Likelihood		
<p>The imposition of operational limitations is unlikely to occur, but possible (has occurred rarely), which is classified as Possible.</p>		
Untreated Likelihood		Possible
Current Treatments (without lighting)		
<ul style="list-style-type: none"> • The Project site is clear of the obstacle limitation surfaces (OLS) of any certified aerodrome. • Aircraft flying at night are required to maintain at least the established LSALT with at least 1000 ft clearance over the highest obstacle except within 3 nm of the aerodrome during landing and take-off operations • Aircraft are restricted to a minimum height of 500 ft (152.4 m) AGL above the highest point of the terrain and any object on it within a radius of 300 m in visual flight during the day when not in the vicinity of built-up areas. The proposed WTGs will be a maximum of 220 m (723 ft) at the top of the blade tip. The rotor blade at its maximum height will be approximately 67.6 m (223 ft) above aircraft flying at the minimum altitude of 152.4 m AGL (500 ft). • In the event that descending cloud forces an aircraft lower than 500 ft (152.4 m) AGL, the minimum visibility of 5,000 m required for visual flight during the day should provide adequate time for pilots to observe and manoeuvre their aircraft clear of WTGs. • The WTGs are typically coloured white so they should be visible to pilots during the day. • The 'as constructed' details of WTGs are required to be notified to Airservices Australia so that the location and height of all WTGs can be noted on aeronautical maps and charts. • Because the Project WTGs are proposed to be above 100 m AGL, there is a statutory requirement to report the WTGs to CASA and notified to Airservices Australia prior to construction. CASA will review the Project for potential hazards to aircraft operations and may recommend the use of obstacle lighting, however this will not be mandatory. 		

<p>Level of Risk</p> <p>The level of risk associated with a Possible likelihood of a Minor consequence is 5.</p>	
Current Level of Risk	5 - Tolerable
<p>Risk Decision</p> <p>A risk level of 5 is classified as Tolerable: Treatment action possibly required to achieve ALARP - conduct cost/benefit analysis. Relevant manager to consider for appropriate action.</p>	
Risk Decision	Accept, conduct cost benefit analysis
<p>Recommended Treatments</p> <p>Given the current treatments and the limited scale and scope of flying operations conducted within the immediate vicinity of the Project, there is likely to be little additional safety benefit to be gained by installing obstacle lighting. The following treatment, which can be implemented at little cost, will provide an additional margin of safety:</p> <ul style="list-style-type: none"> • Ensure details of the Project WTGs have been communicated to Airservices Australia, and local and regional aerodrome and aircraft operators prior to construction. 	
<p>Residual Risk</p> <p>Notwithstanding the current level of risk is considered Tolerable, the additional Recommended Treatments listed above will enhance aviation safety. The likelihood remains Possible, and consequence remains Minor. In the circumstances, the risk level of 5 is considered ALARP.</p> <p>It is our assessment that there is an acceptable level of aviation safety risk associated with the potential for operational limitations to affect aircraft operating crew, without obstacle lighting on the Project WTGs.</p>	
Residual Risk	5 - Tolerable

Table 18 Effect of obstacle lighting on neighbours

Risk ID:	4. Effect of obstacle lighting on neighbours
Discussion	
<p>This scenario discusses the consequential impact of a decision to install obstacle lighting on the wind farm.</p> <p>The varied Project is partially located within the boundary of the River Murray International Dark Sky Reserve. The installation of obstacle lighting would likely affect the strategic vision of the reserve.</p> <p>Installation and operation of obstacle lighting on WTGs can have an effect on neighbours' visual amenity and enjoyment, specifically at night and in good visibility conditions.</p> <p>Details of the relevant proposal (for objects 100 m AGL or above) must be referred to CASA for CASA to determine, in writing:</p> <ul style="list-style-type: none"> (a) whether the object or structure will be a hazard to aircraft operations (b) whether it should be lit with obstacle light(s) that is essential for the safety of aircraft operations. <p>In general, objects outside an OLS and above 200 m would be recommended by CASA to have obstacle lighting unless CASA, in an aeronautical study, assesses it is shielded by another lit object or it is of no operational significance.</p> <p>The Project is not located within the River Murray International Dark Sky Reserve.</p>	
Consequence	
<p>The worst credible effect of obstacle lighting specifically at night in good visibility conditions would be:</p> <ul style="list-style-type: none"> • Moderate site impact, minimal local impact, important consideration at local or regional level, possible long-term cumulative effect. Not likely to be decision making issues. Design and mitigation measures may ameliorate some consequences. <p>This would be a Moderate consequence.</p>	
Consequence	Moderate
Untreated Likelihood	
<p>The likelihood of moderate site impact, minimal local impact is Almost certain - the event is likely to occur many times (has occurred frequently).</p>	
Untreated Likelihood	Almost certain
Current Treatments	
<p>If the WTGs will be higher than 150 m (492 ft) AGL, they would generally be regarded as obstacles unless CASA assess otherwise. In general, objects outside an OLS and above 200 m may be recommended by CASA to have obstacle lighting unless CASA, in an aeronautical study, assesses it is shielded by another lit object or it is of no operational significance.</p>	
Level of Risk	
<p>The level of risk associated with an Almost certain likelihood of a Moderate consequence is 8.</p>	
Current Level of Risk	8 - Unacceptable

<p>Risk Decision</p> <p>A risk level of 8 is classified as Unacceptable: Immediate action required by either treating or avoiding risk. Refer to executive management.</p>	
Risk Decision	Unacceptable
<p>Recommended Treatments</p> <p>Not installing obstacle lighting would completely remove the source of the impact.</p> <p>As per the above safety risk assessment, the provision of lighting for the WTGs is not considered necessary to provide an acceptable level of safety.</p> <p>If CASA or a planning authority decide that obstacle lighting is required there are impact reduction measures that can be implemented to reduce the impact of lighting on surrounding neighbours and the function of the Dark Sky Reserve, including:</p> <ul style="list-style-type: none"> • reducing the number of WTGs with obstacle lights • specifying an obstacle light that minimises light intensity at ground level • specifying an obstacle light that matches light intensity to meteorological visibility • mitigating light glare from obstacle lighting through measures such as baffling. <p>These measures are designed to optimise the benefit of the obstacle lights to pilots while minimising the visual impact to residents within and around the Project site.</p> <p>Consideration may be given to activating the obstacle lighting via a pilot activated lighting system.</p> <p>An option is to consider using Aircraft Detection Lighting Systems (referred in the United States Federal Aviation Administration Advisory Circular AC70/7460-1L CHG1 – <i>Obstruction Marking and Lighting</i>). Such a system would only activate the lights when an aircraft is detected in the near vicinity and deactivate the lighting once the aircraft has passed. This technology reduces the impact of night lighting on nearby communities and migratory birds and extends the life expectancy of obstruction lights.</p>	
<p>Residual Risk</p> <p>Not installing obstacle lights would clearly be an acceptable outcome to those potentially affected by visual impact.</p> <p>If lighting is required, consideration of visual impact in the lighting design should enable installation of lighting that reduces the impact to neighbours.</p> <p>The likelihood of a Moderate consequence remains Likely, with a resulting risk level of 7 – Tolerable.</p> <p>It is our assessment that visual impact from obstacle lights can be negated if they are not installed. If obstacle lights are to be installed, they can be designed so that there is an acceptable risk of visual impact to neighbours.</p>	
Residual Risk	7 - Tolerable

11. CONCLUSIONS

The key conclusions of this AIA are summarised as follows:

11.1. Project description

The varied Project will comprise the following:

- up to a maximum of 40 WTGs with a maximum overall height (tip height) of up to 220 m AGL
- the highest proposed wind turbine is WTG-B47, with a maximum tip height of 683.4 m AHD (2242 ft AMSL)
- associated transmission infrastructure, including an overhead 275kV transmission line with 55m AGL towers connecting to the existing grid.

The Project is located within the Mid-Murray Council LGA.

11.2. Aviation Impact Statement

Based on the varied Project WTG layout and maximum blade tip height of up to 220 m AGL, the blade tip elevation of the highest WTG will not exceed 683.4 m AHD (2242 ft AMSL) and:

- is located within 30 nm of three certified aerodromes:
 - Adelaide Airport
 - Parafield Airport
 - Edinburgh military aerodrome
- will not affect any terminal instrument flight procedures
- will not penetrate any OLS surfaces
- will not have an impact on nearby designated air routes
- will not have an impact on the grid LSALT
- will not have an impact on operational airspace
- is wholly contained within Class G airspace
- is outside the clearance zones associated with civil aviation navigation aids and communication facilities
- will affect Adelaide's RTCC, however, the RTCC surface is likely to be able to be raised in consultation with Airservices Australia and consultation is underway.

Table 19 provides a comparison of the Approved and Varied Project aviation impact statement

Table 19 Comparison of AIS for Approved and Varied Project

<i>Element</i>	<i>Approved Project</i>	<i>Varied Project</i>
Certified aerodromes located within 30 nm of Project	<ul style="list-style-type: none"> Adelaide Airport Parafield Airport Edinburgh military aerodrome 	<ul style="list-style-type: none"> Adelaide Airport Parafield Airport Edinburgh military aerodrome
Impact to terminal Instrument flight procedures	will not affect any terminal instrument flight procedures	will not affect any terminal instrument flight procedures
Impact to obstacle limitation surface	will not penetrate any OLS surfaces	will not penetrate any OLS surfaces
Designated air routes	will not have an impact on nearby designated air routes	will not have an impact on nearby designated air routes
Grid LSALT	will not have an impact on the grid LSALT	will not have an impact on the grid LSALT
Operational airspace	is wholly contained within Class G airspace	is wholly contained within Class G airspace
Communications, Navigation and Surveillance Systems	is outside the clearance zones associated with civil aviation navigation aids and communication facilities	is outside the clearance zones associated with civil aviation navigation aids and communication facilities
RADAR Terrain Clearance charts	Not specified. It is anticipated the Approved Project would have infringed Adelaide's RTCC based on the maximum project height of 627.8 m AHD.	WTGs C21, C26, C27, C32, C34 and C38 impact RTCC. Surface needs to be raised to accommodate Project – request made to Airservices Australia 06 February 2024.

11.3. ALA analysis summary

There are no active verified ALAs located within 3 nm of the Project and there is no impact anticipated for any aircraft operations at uncertified aerodromes caused by the varied Project.

11.4. Aircraft operator characteristics

Aircraft operators flying in vicinity of the Project would mostly include private and recreational activities, flight training flights flying enroute between Parafield airport and open space east of the Project. Aerial firefighting and aerial application operations may be possible in the vicinity of the Project Area. Military aircraft may operate in the vicinity of the Project however would be mostly contained within restricted areas which are not affected by the varied Project.

There are no regular high-capacity air transport operations that would be conducted in the immediate vicinity of the Project Area.

11.5. Hazard marking and lighting

The following conclusions apply to hazard marking and lighting:

- With respect to CASR Part 139 Division 139.E.1 Notifying potential hazards 139.165, the proposed WTGs must be reported to CASA.
- WTGs and WMTs should be marked in accordance with NASF Guideline D.
- CASA will review the proposed WTG development and may make a recommendation for obstacle lighting, however this would not be mandatory. This assessment considers that obstacle lighting should not be required for WTGs, which was also the conclusion of the aeronautical assessment conducted for the approved Project. The local planning authority will weigh up any recommendation by CASA against public amenity intrusion caused by obstacle lights.
- With respect to marking of WTGs, a white colour will provide sufficient contrast with the surrounding environment to maintain an acceptable level of safety while lowering visual impact to the neighbouring residents.

11.6. Summary of risks

A summary of the level of residual risk associated with the varied Project with the Recommended Treatments implemented, is provided in Table 20.

Table 20 Summary of Residual Risks

<i>Identified Risk</i>	<i>Consequence</i>	<i>Likelihood</i>	<i>Risk</i>	<i>Actions Required</i>
Aircraft collision with wind turbine generator (WTG)	Catastrophic	Unlikely	7	Acceptable without obstacle lighting (ALARP). Communicate details of the Project WTGs to local and regional operators.
Avoidance manoeuvring leads to ground collision	Catastrophic	Unlikely	7	Acceptable without obstacle lighting (ALARP). Communicate details of the Project WTGs to local and regional operators.
Effect on crew	Minor	Possible	5	Acceptable without obstacle lighting (ALARP) Communicate details of the Project WTGs to local and regional operators.
Effect of obstacle lighting on neighbours	Moderate	Likely	7	Acceptable without obstacle lighting (ALARP)

11.7. Comparison of Approved Project aviation risk assessment

The Aviation Impact assessment for the Approved Project (conducted by the Ambidji Group Pty Ltd, February 2014) included a risk assessment of various elements associated with aviation operations that may be affected by the Project. The risk elements included aerodrome operations, ALA operations, air routes, airspace, flight training, aerial application operations and weather and visibility issues.

The assessed level of risk for each of these elements was assessed as Low.

The risk assessment for the Approved Project concluded that the Project:

Will not be of operational significance nor be a hazard to aircraft safety so therefor does not require obstacle lighting.

It is considered that the varied Project does not result in an increased aviation risk compared with the Approved Project.

12. RECOMMENDATIONS

Recommended actions resulting from the conduct of this assessment are provided below.

Notification and reporting

1. Details of WTGs exceeding 100 m AGL must be reported to CASA as soon as practicable after forming the intention to construct or erect the proposed object or structure, in accordance with CASR Part 139.165(1)(2).
2. 'As constructed' details of WTG coordinates and elevation should be provided to Airservices Australia, by submitting the form at this webpage: https://www.airservicesaustralia.com/wp-content/uploads/ATS-FORM-0085_Vertical_Obstruction_Data_Form.pdf to the following email address: vod@airservicesaustralia.com
3. Any obstacles above 100 m AGL (including temporary construction equipment) should be reported to Airservices Australia NOTAM office until they are incorporated in published operational documents. With respect to crane operations during the construction of the Project, a notification to the NOTAM office may include, for example, the following details:
 - a. The planned operational timeframe and maximum height of the crane; and
 - b. Either the general area within which the crane will operate and/or the planned route with timelines that crane operations will follow.
4. To facilitate the flight planning of aerial application operators, details of the Project, including the 'as constructed' location and height information of WTGs, WMTs and overhead transmission lines should be provided to landowners so that, when asked for hazard information on their property, the landowner may provide the aerial application pilot with all relevant information

Marking of WTGs and WMTs

5. The rotor blades, nacelle and the supporting mast of the WTGs should be painted white, typical of most WTGs operational in Australia. No additional marking measures are required for WTGs.
6. The WMTs should be marked or lit in accordance with NASF Guideline D.

Lighting of WTGs and WMTs

7. Aviation Projects has assessed that installing obstacle lights on WTGs and WMTs is not required to maintain an acceptable level of safety to aircraft.

Overhead transmission line

8. Overhead transmission lines and/or supporting poles that are located where they could adversely affect aerial application operations should be identified in consultation with local aerial application operators.

Triggers for review

9. Triggers for review of this risk assessment are provided for consideration:
 - a) prior to construction to ensure the regulatory framework has not changed
 - b) following any significant changes to the context in which the assessment was prepared, including the regulatory framework

- c) following any near miss, incident or accident associated with operations considered in this risk assessment.

ANNEXURES

1. References
2. Definitions
3. CASA regulatory requirements – Lighting and Marking
4. Risk Framework

ANNEXURE 1 – REFERENCES

References used or consulted in the preparation of this report include:

- Airservices Australia, Aeronautical Information Package; including AIP Book, Departure and Approach Procedures and En Route Supplement Australia dated 30 November 2023
- Airservices Australia, Designated Airspace Handbook, effective 30 November 2023
- Government of South Australia, PlanSA, Planning and Design Code, Version 2023.13
- Civil Aviation Safety Authority, Civil Aviation Safety Regulations 1998 (CASR)
- Civil Aviation Safety Authority, Advisory Circular (AC) 91-10 v1.1: *Operations in the vicinity of non-controlled aerodromes*, dated November 2021
- Civil Aviation Safety Authority, Manual of Standards Part 173 – Standards Applicable to Instrument Flight Procedure Design, version 1.8, dated August 2022
- Civil Aviation Safety Authority, *Part 139 (Aerodromes) Manual of Standards 2019*, Version F2020L00931 dated 13 August 2020
- Civil Aviation Safety Authority, Advisory Circular 139.E-01 v1.0—Reporting of Tall Structures, dated December 2021
- Civil Aviation Safety Authority, Advisory Circular (AC) 139.E-05 v1.1 Obstacles (including wind farms) outside the vicinity of a CASA certified aerodrome, October 2022
- Department of Infrastructure and Regional Development, Australian Government, National Airport Safeguarding Framework, Guideline D *Managing the Risk to Aviation Safety of Wind Turbine Installations (Wind Farms)/Wind Monitoring Towers* dated July 2012
- International Civil Aviation Organization (ICAO) Doc 8168 Procedures for Air Navigation Services—Aircraft Operations (PANS-OPS)
- ICAO Standards and Recommended Practices, Annex 14—Aerodromes
- OzRunways, aeronautical navigation charts extracts, dated November 2023
- Standards Australia, ISO 31000:2018 *Risk management – Guidelines*
- Aeronautical Impact Assessment v7.0, August 2014, 114 turbines, Ambidji Group Pty Ltd

ANNEXURE 2 – DEFINITIONS

<i>Term</i>	<i>Definition</i>
Aerial Agricultural Operator	Specialist pilot and/or company who are required to have a commercial pilot's licence, an agricultural rating and a chemical distributor's licence
Aerodrome	A defined area on land or water (including any buildings, installations, and equipment) intended to be used either wholly or in part for the arrival, departure, and surface movement of aircraft.
Aerodrome facilities	Physical things at an aerodrome which could include: <ol style="list-style-type: none"> a. the physical characteristics of any movement area including runways, taxiways, taxilanes, shoulders, aprons, primary and secondary parking positions, runway strips and taxiway strips; b. infrastructure, structures, equipment, earthing points, cables, lighting, signage, markings, visual approach slope indicators.
Aerodrome reference point (ARP)	The designated geographical location of an aerodrome.
Aeronautical Information Publication (AIP)	Details of regulations, procedures, and other information pertinent to the operation of aircraft
Aeronautical Information Publication En-route Supplement Australia (AIP ERSA)	Contains information vital for planning a flight and for the pilot in flight as well as pictorial presentations of all licensed aerodromes
Civil Aviation Safety Regulations 1998 (CASR)	Contain the mandatory requirements in relation to airworthiness, operational, licensing, enforcement.
Instrument meteorological conditions (IMC)	Meteorological conditions expressed in terms of visibility, distance from cloud, and ceiling, less than the minimum specified for visual meteorological conditions.
Manual of Standards (MOS)	The means CASA uses in meeting its responsibilities under the Act for promulgating aviation safety standards
National Airports Safeguarding Framework (NASF)	The Framework has the objective of developing a consistent and effective national framework to safeguard both airports and communities from inappropriate on and off airport developments.
Obstacles	All fixed (whether temporary or permanent) and mobile objects, or parts thereof, that are located on an area intended for the surface movement of aircraft or that extend above a defined surface intended to protect aircraft in flight.

<i>Term</i>	<i>Definition</i>
Runway	A defined rectangular area on a land aerodrome prepared for the landing and take-off of aircraft.
Runway strip	A defined area including the runway and stopway, if provided, intended: <ul style="list-style-type: none">a. to reduce the risk of damage to aircraft running off a runway; andb. to protect aircraft flying over it during take-off or landing operations.
Safety Management System	A systematic approach to managing safety, including organisational structures, accountabilities, policies and procedures.

ANNEXURE 3 – CASA REGULATORY REQUIREMENTS – LIGHTING AND MARKING

In considering the need for aviation hazard lighting and marking, the applicable regulatory context was determined.

The Civil Aviation Safety Authority (CASA) regulates aviation activities in Australia. Applicable requirements include the Civil Aviation Regulations 1988, Civil Aviation Safety Regulations 1998 (CASR) and associated Manual of Standards (MOS) and other guidance material. Relevant provisions are outlined in further detail in the following section.

Civil Aviation Safety Regulations 1998, Part 139—Aerodromes

CASR 139.165 requires the owner of a structure (or proponents of a structure) that will be 100 m or more above ground level to inform CASA. This must be given in written notice and contain information on the proposal, the height and location(s) of the object(s) and the proposed timeframe for construction. This is to allow CASA to assess the effect of the structure on aircraft operations and determine whether the structure will be hazardous to aircraft operations.

Manual of Standards Part 139—Aerodromes

Chapter 9 sets out the standards applicable to Visual Aids Provided by Aerodrome Lighting in relation to infringements of certified airport airspace.

Section 9.30 provides guidance on Types of Obstacle Lighting and Their Use:

1. *The following types of obstacle lights must be used, in accordance with this MOS, to light hazardous obstacles:*
 - a. *low-intensity;*
 - b. *medium-intensity;*
 - c. *high-intensity;*
 - d. *a combination of low, medium or high-intensity.*
2. *Low-intensity obstacle lights:*
 - a. *are steady red lights; and*
 - b. *must be used on non-extensive objects or structures whose height above the surrounding ground is less than 45 m.*
3. *Medium-intensity obstacle lights must be:*
 - a. *flashing white lights; or*
 - b. *flashing red lights; or*
 - c. *steady red lights.*

Note CASA recommends the use of flashing red medium-intensity obstacle lights.

4. *Medium-intensity obstacle lights must be used if:*

- a. *the object or structure is an extensive one; or*
- b. *the top of the object or structure is at least 45 m but not more than 150 m above the surrounding ground; or*
- c. *CASA determines in writing that early warning to pilots of the presence of the object or structure is desirable in the interests of aviation safety.*

Note For example, a group of trees or buildings is regarded as an extensive object.

5. *For subsection (4), low-intensity and medium-intensity obstacle lights may be used in combination.*
6. *High-intensity obstacle lights:*
 - a. *must be used on objects or structures whose height exceeds 150 m; and*
 - b. *must be flashing white lights.*
7. *Despite paragraph (6) (b), a medium-intensity flashing red light may be used if necessary, to avoid an adverse environmental impact on the local community.*

Sections 9.31 (8) and (9) provide guidance on obstacle lighting specific to wind farms:

8. *Subject to subsection (9), for wind turbines in a wind farm, medium-intensity obstacle lights must:*
 - a. *mark the highest point reached by the rotating blades; and*
 - b. *be provided on a sufficient number of individual wind turbines to indicate the general definition and extent of the wind farm, but such that intervals between lit turbines do not exceed 900 m; and*
 - c. *all be synchronised to flash simultaneously; and*
 - d. *be seen from every angle in azimuth.*

Note: This is to prevent obstacle light shielding by the rotating blades of a wind turbine and may require more than 1 obstacle light to be fitted.

9. *If it is physically impossible to light the rotating blades of a wind turbine:*
 - a. *the obstacle lights must be placed on top of the generator housing; and*
 - b. *a note must be published in the AIP-ERSA indicating that the obstacle lights are not at the highest position on the wind turbines.*
10. *If the top of an object or structure is more than 45 m above:*
 - a. *the surrounding ground (ground level); or*
 - b. *the top of the tallest nearby building (building level); then the top lights must be medium-intensity lights, and additional low-intensity lights must be:*
 - c. *provided at lower levels to indicate the full height of the structure; and*
 - d. *spaced as equally as possible between the top lights and the ground level or building level, but not so as to exceed 45 m between lights.*

Advisory Circular 139.E-01 v1.0—Reporting of Tall Structures

In Advisory Circular (AC) 139.E-01 v1.0—Reporting of Tall Structures, CASA provides guidance to those

authorities and persons involved in the planning, approval, erection, extension or dismantling of tall structures so that they may understand the vital nature of the information they provide.

Airservices Australia has been assigned the task of maintaining a database of tall structures. RAAF and Airservices Australia require information on structures which are:

- a) 30 metres or more above ground level—within 30 kilometres of an aerodrome; or
- b) 45 metres or more above ground level elsewhere for the RAAF, or
- c) 30 m or more above ground level elsewhere for Airservices Australia.

The purpose of notifying Airservices Australia of these structures is to enable their details to be provided in aeronautical information databases and maps/charts etc used by pilots, so that the obstacles can be avoided.

The proposed WTGs must be reported to Airservices Australia. This action should occur once the final layout after micrositing is confirmed and prior to construction.

International Civil Aviation Organisation

Australia, as a contracting State to the International Civil Aviation Organisation (ICAO) and signatory to the Chicago Convention on International Civil Aviation (the Convention), has an obligation to implement ICAO's standards and recommended practices (SARPs) as published in the various annexes to the Convention.

Annex 14 to the Convention – *Aerodromes, Volume 1*, Section 6.2.4 provides SARPs for the obstacle lighting and marking of WTGs, which is copied below:

6.2.4 Wind turbines

6.2.4.1 A wind turbine shall be marked and/or lighted if it is determined to be an obstacle.

Note 1. – Additional lighting or markings may be provided where in the opinion of the State such lighting or markings are deemed necessary.

Note 2. – See 4.3.1 and 4.3.2

Markings

6.2.4.2 Recommendation. – The rotor blades, nacelle and upper 2/3 of the supporting mast of wind turbines should be painted white, unless otherwise indicated by an aeronautical study.

Lighting

6.2.4.3 Recommendation. – When lighting is deemed necessary, in the case of a wind farm, i.e. a group of two or more wind turbines, the wind farm should be regarded as an extensive object and the lights should be installed:

- a) to identify the perimeter of the wind farm;*
- b) respecting the maximum spacing, in accordance with 6.2.3.15, between the lights along the perimeter, unless a dedicated assessment shows that a greater spacing can be used;*
- c) so that, where flashing lights are used, they flash simultaneously throughout the wind farm;*
- d) so that, within a wind farm, any wind turbines of significantly higher elevation are also identified wherever they are located; and*
- e) at locations prescribed in a), b) and d), respecting the following criteria:*

i) for wind turbines of less than 150 m in overall height (hub height plus vertical blade height), medium-intensity lighting on the nacelle should be provided;

ii) for wind turbines from 150 m to 315 m in overall height, in addition to the medium-intensity light installed on the nacelle, a second light serving as an alternate should be provided in case of failure of the operating light. The lights should be installed to assure that the output of either light is not blocked by the other; and

iii) in addition, for wind turbines from 150 m to 315 m in overall height, an intermediate level at half the nacelle height of at least three low-intensity Type E lights, as specified in 6.2.1.3, should be provided. If an aeronautical study shows that low-intensity Type E lights are not suitable, low-intensity Type A or B lights may be used.

Note. — The above 6.2.4.3 e) does not address wind turbines of more than 315 m of overall height. For such wind turbines, additional marking and lighting may be required as determined by an aeronautical study.

6.2.4.4 Recommendation. — The obstacle lights should be installed on the nacelle in such a manner as to provide an unobstructed view for aircraft approaching from any direction.

6.2.4.5 Recommendation. — Where lighting is deemed necessary for a single wind turbine or short line of wind turbines, the installation should be in accordance with 6.2.4.3 e) or as determined by an aeronautical study.

As referenced in Section 6.2.4.3(e)(iii), Section 6.2.1.3 is copied below:

6.2.1.3 The number and arrangement of low-, medium- or high-intensity obstacle lights at each level to be marked shall be such that the object is indicated from every angle in azimuth. Where a light is shielded in any direction by another part of the object, or by an adjacent object, additional lights shall be provided on that adjacent object or the part of the object that is shielding the light, in such a way as to retain the general definition of the object to be lighted. If the shielded light does not contribute to the definition of the object to be lighted, it may be omitted.

As referenced in Section 6.2.4.3(b), Section 6.2.3.15 is copied below:

6.2.3.15 Where lights are applied to display the general definition of an extensive object or a group of closely spaced objects, and

a) low-intensity lights are used, they shall be spaced at longitudinal intervals not exceeding 45 m; and

b) medium-intensity lights are used, they shall be spaced at longitudinal intervals not exceeding 900 m.

Section 4.3 Objects outside the OLS states the following:

4.3.1 Recommendation.— Arrangements should be made to enable the appropriate authority to be consulted concerning proposed construction beyond the limits of the obstacle limitation surfaces that extend above a height established by that authority, in order to permit an aeronautical study of the effect of such construction on the operation of aeroplanes.

4.3.2 Recommendation. — In areas beyond the limits of the obstacle limitation surfaces, at least those objects which extend to a height of 150 m or more above ground elevation should be regarded

as obstacles, unless a special aeronautical study indicates that they do not constitute a hazard to aeroplanes.

Note. – This study may have regard to the nature of operations concerned and may distinguish between day and night operations.

ICAO Doc 9774 Manual on Certification of Airports defines an aeronautical study as:

An aeronautical study is a study of an aeronautical problem to identify potential solutions and select a solution that is acceptable without degrading safety.

Light characteristics

If obstacle lighting is required, installed lights should be designed according to the criteria set out in the applicable regulatory material and taking CASA's recommendations into consideration in the case that CASA has reviewed this risk assessment and provided recommendations.

The characteristics of the obstacle lights should be in accordance with the applicable standards in Part 139 MOS 2019.

The characteristics of low and medium intensity obstacle lights specified in Part 139 MOS 2019, Chapter 9, are provided below.

Part 139 MOS 2019 Chapter 9 Division 4 – Obstacle Lighting section 9.32 outlines Characteristics of Low Intensity Obstacle Lights.

1. *Low-intensity obstacle lights must have the following:*
 - a. *fixed lights showing red;*
 - b. *a horizontal beam spread that results in 360-degree coverage around the obstacle;*
 - c. *a minimum intensity of 100 candela (cd);*
 - d. *a vertical beam spread (to 50% of peak intensity) of 10 degrees;*
 - e. *a vertical distribution with 50 cd minimum at +6 degrees and +10 degrees above the horizontal;*
 - f. *not less than 10 cd at all elevation angles between –3 degrees and +90 degrees above the horizontal.*

Note: The intensity requirement in paragraph (c) may be met using a double-bodied light fitting. CASA recommends that double-bodied light fittings, if used, should be orientated so that they show the maximum illuminated surface towards the predominant, or more critical, direction of aircraft approach.

2. *To indicate the following:*
 - a. *taxiway obstacles;*
 - b. *unservicable areas of the movement area; low-intensity obstacle lights must have a peak intensity of at least 10 cd.*

Part 139 MOS 2019 Chapter 9 Division 4 – Obstacle Lighting section 9.33 outlines Characteristics of Medium Intensity Obstacle Lights.

1. *Medium-intensity obstacle lights must:*

- a. *be visible in all directions in azimuth; and*
 - b. *if flashing – have a flash frequency of between 20 and 60 flashes per minute.*
2. *The peak effective intensity of medium-intensity obstacle lights must be 2 000 ± 25% cd with a vertical distribution as follows:*
- a. *for vertical beam spread – a minimum of 3 degrees;*
 - b. *at -1-degree elevation – a minimum of 50% of the lower tolerance value of the peak intensity;*
 - c. *at 0 degrees elevation – a minimum of 100% of the lower tolerance value of the peak intensity.*
3. *For subsection (2), vertical beam spread means the angle between 2 directions in a plane for which the intensity is equal to 50% of the lower tolerance value of the peak intensity.*
4. *If, instead of obstacle marking, a flashing white light is used during the day to indicate temporary obstacles in the vicinity of an aerodrome, the peak effective intensity of the light must be increased to 20 000 ± 25% cd when the background luminance is 50 cd/m² or greater.*

Visual impact of night lighting

Annex 14 Section 6.2.4 and Part 139 MOS 2019 Chapter 9.31 (8)(9) are specifically intended for WTGs and recommends that medium intensity lighting is installed.

Generally accepted considerations regarding minimisation of visual impact are provided below for consideration in this aeronautical study:

- To minimise the visual impact on the environment, some shielding of the obstacle lights is permitted, provided it does not compromise their operational effectiveness;
- Shielding may be provided to restrict the downward component of light to either, or both, of the following:
 - such that no more than 5% of the nominal intensity is emitted at or below 5 degrees below horizontal; and
 - such that no light is emitted at or below 10 degrees below horizontal;
- If a light would be shielded in any direction by an adjacent object or structure, the light so shielded may be omitted, provided that such additional lights are used as are necessary to retain the general definition of the object or structure.
- If flashing obstacle lighting is required, all obstacle lights on a wind farm should be synchronised so that they flash simultaneously; and
- A relatively small area on the back of each blade near the rotor hub may be treated with a different colour or surface treatment, to reduce reflection from the rotor blades of light from the obstacle lights, without compromising the daytime visibility of the overall WTG.

Marking of WTGs

ICAO Annex 14 Vol 1 Section 6.2.4.2 recommends that the rotor blades, nacelle and upper 2/3 of the supporting mast of the WTGs should be painted a shade of white, unless otherwise indicated by an aeronautical study.

It is generally accepted that a shade of white colour will provide sufficient contrast with the surrounding environment to maintain an acceptable level of safety while lowering visual impact to the neighbouring residents.

Overhead transmission lines

Overhead transmission lines and/or supporting poles that are located where they could adversely affect aerial application operations should be identified in consultation with local aerial application operators and marked in accordance with Part 139 MOS 2019 Chapter 8 Division 10 section 8.110 (7) and section 8.110 (8):

8.110 Marking of hazardous obstacles

(7) Hazardous obstacles in the form of wires or cables must be marked using 3-dimensional coloured objects attached to the wire or cables. Note: Spheres and pyramids are examples of 3-dimensional objects.

(8) The objects mentioned in subsection (7) must:

- (a) be approximately equivalent in size to a cube with 600 mm sides; and*
- (b) be spaced 30 m apart along the length of the wire or cable.*

ANNEXURE 4 – RISK FRAMEWORK

A risk management framework is comprised of likelihood and consequence descriptors, a matrix used to derive a level of risk, and actions required of management according to the level of risk.

The risk assessment framework used by Aviation Projects has been developed in consideration of ISO 31000:2018 *Risk management—Guidelines* and the guidance provided by CASA in its Safety Management System (SMS) for Aviation guidance material, which is aligned with the guidance provided by the International Civil Aviation Organization (ICAO) in Doc 9589 *Safety Management Manual*, Third Edition, 2013. Doc 9589 is intended to provide States (including Australia) with guidance on the development and implementation of a State Safety Programme (SSP), in accordance with the International SARPs, and is therefore adopted as the primary reference for aviation safety risk management in the context of the subject assessment.

Section 2.1 of the ICAO Doc 9589 *The concept of safety* defines safety as follows [author’s underlining]:

2.1.1 Within the context of aviation, safety is “the state in which the possibility of harm to persons or of property damage is reduced to, and maintained at or below, an acceptable level through a continuing process of hazard identification and safety risk management.”

Likelihood

Likelihood is defined in ISO 31000:2018 as the chance of something happening. Likelihood descriptors used in this report are as indicated in Table 1.

Table 1 Likelihood Descriptors

<i>No</i>	<i>Descriptor</i>	<i>Description</i>
1	Rare	It is almost inconceivable that this event will occur
2	Unlikely	The event is very unlikely to occur (not known to have occurred)
3	Possible	The event is unlikely to occur, but possible (has occurred rarely)
4	Likely	The event is likely to occur sometimes (has occurred infrequently)
5	Almost certain	The event is likely to occur many times (has occurred frequently)

Consequence

Consequence is defined as the outcome of an event affecting objectives, which in this case is the safe and efficient operation of aircraft, and the visual amenity and enjoyment of local residents.

Consequence descriptors used in this report are as indicated in Table 2.

Table 2 Consequence Descriptors

No	Descriptor	People Safety	Property/Equipment	Effect on Crew	Environment
1	Insignificant	Minor injury – first aid treatment	Superficial damage	Nuisance	No effects or effects below level of perception
2	Minor	Significant injury – outpatient treatment	Moderate repairable damage – property still performs intended functions	Operations limitation imposed. Emergency procedures used.	Minimal site impact – easily controlled. Effects raised as local issues, unlikely to influence decision making. May enhance design and mitigation measures.
3	Moderate	Serious injury – hospitalisation	Major repairable damage – property performs intended functions with some short-term rectifications	Significant reduction in safety margins. Reduced capability of aircraft/crew to cope with conditions. High workload/stress on crew. Critical incident stress on crew.	Moderate site impact, minimal local impact, and important consideration at local or regional level, possible long-term cumulative effect. Not likely to be decision making issues. Design and mitigation measures may ameliorate some consequences.
4	Major	Permanent injury	Major damage rendering property ineffective in achieving design functions without major repairs	Large reduction in safety margins. Crew workload increased to point of performance decrement. Serious injury to small number of occupants. Intense critical incident stress.	High site impact, moderate local impact, important consideration at state level. Minor long-term cumulative effect. Design and mitigation measures unlikely to remove all effects.
5	Catastrophic	Multiple Fatalities	Damaged beyond repair	Conditions preventing continued safe flight and landing. Multiple deaths with loss of aircraft	Catastrophic site impact, high local impact, national importance. Serious long-term cumulative effect. Mitigation measures unlikely to remove effects.

Risk matrix

The risk matrix, which correlates likelihood and consequence to determine a level of risk, used in this report is shown in Table 3.

Table 3 Risk Matrix

		<i>CONSEQUENCE</i>				
		<i>INSIGNIFICANT</i> 1	<i>MINOR</i> 2	<i>MODERATE</i> 3	<i>MAJOR</i> 4	<i>CATASTROPHIC</i>
<i>LIKELIHOOD</i>	<i>ALMOST CERTAIN</i> 5	6	7	8	9	10
	<i>LIKELY</i> 4	5	6	7	8	9
	<i>POSSIBLE</i> 3	4	5	6	7	8
	<i>UNLIKELY</i> 2	3	4	5	6	7
	<i>RARE</i> 1	2	3	4	5	6

Actions required

Actions required according to the derived level of risk are shown in Table 4.

Table 4 Actions Required

8-10	Unacceptable Risk	Immediate action required by either treating or avoiding risk. Refer to executive management.
5-7	Tolerable Risk	Treatment action possibly required to achieve As Low As Reasonably Practicable (ALARP) - conduct cost/benefit analysis. Relevant manager to consider for appropriate action.
0-4/5	Broadly Acceptable Risk	Managed by routine procedures, and can be accepted with no action.



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2024

IHC

Independent Heritage Consultants

**Palmer Wind Farm Granite Boulders Geological Site
Heritage Impact Assessment**

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Report Description	Heritage Impact Assessment
Issue Date	February 2024
Author(s)	Guadalupe Cincunegui, Steve Damhuis
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Client	Tilt Renewables Australia Pty Ltd
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Citation	IHC 2024. Palmer Wind Farm Granite Boulders Geological Site. Heritage Impact Assessment. Report prepared for Tilt Renewables Australia Pty Ltd, Adelaide.

Abbreviations

Term	Meaning
DEW	Department for Environment and Water
DEWNR	Department for Environment, Water and Natural Resources
EPBCA	Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)
HIA	Heritage Impact Assessment
HIS	Heritage Impact Statement
HPA	Heritage Places Act 1993 (South Australia)
ICOMOS	International Council on Monuments and Sites
IHC	Independent Heritage Consultants
PDIA	Planning, Development and Infrastructure Act 2016 (South Australia).

Table of Contents

1	INTRODUCTION	4
1.1	Heritage Impact Assessment	4
1.2	Methodology	4
2	BACKGROUND	6
2.1	State Heritage Register	6
3	LEGISLATION	7
3.1	Statutory Frameworks	7
3.1.1	Heritage Places Act 1993	7
3.1.2	Planning, Development and Infrastructure Act 2016	8
3.2	Non-statutory Framework	8
3.2.1	The Burra Charter (1979) - Amended 2013	8
4	HERITAGE SIGNIFICANCE	9
4.1	Established Significance	9
4.1.1	Granite Boulders Area Geological Site	9
5	PROPOSED WORKS	10
5.1	Description of Proposed works	10
5.2	Evaluation of proposed impacts on general site significance	11
5.3	Works Program Evaluation	1
6	SUMMARY AND CONCLUSION	1
7	REFERENCES	2

List of Tables

Table 1. State heritage item details	6
Table 2. Proposed works	10
Table 3. Impacts for the proposed works	11
Table 4. Specific impacts and proposed mitigation	1

List of Maps

Map 1. Proposed works in relation to State heritage site	5
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1 INTRODUCTION

Tilt Renewables Australia Pty Ltd (Tilt Renewables) was granted development plan consent in 2018 in respect of a new wind farm near Palmer, South Australia (Palmer Wind Farm). Tilt Renewables is seeking to vary the Palmer Wind Farm Approved Project to reduce the number of wind turbine generators and reduce the overall wind farm footprint. Independent Heritage Consultants (IHC) has been engaged by Tilt Renewables to prepare a Heritage Impact Assessment (HIA) for the proposed reduced project area to inform the assessment variation application as shown in Map 1.

The proposed works will take place adjacent to and partially within the curtilage of a single state heritage item, the Palmer Granite Boulders Geological Site (SHR 13197 as shown in Map 1). While the approved and proposed varied project area has been developed to minimise and avoid impacts to all heritage sites, some minor construction impacts are likely within the northern curtilage of the heritage site.

The State Heritage listed Granite Boulders Area Geological Site is a part of the Palmer Granite Area. The Palmer Granite Area is 100 m west of Palmer and extends approximately 4 km south and 500 m north of Randell Road, which intersects the project area (Map 1).

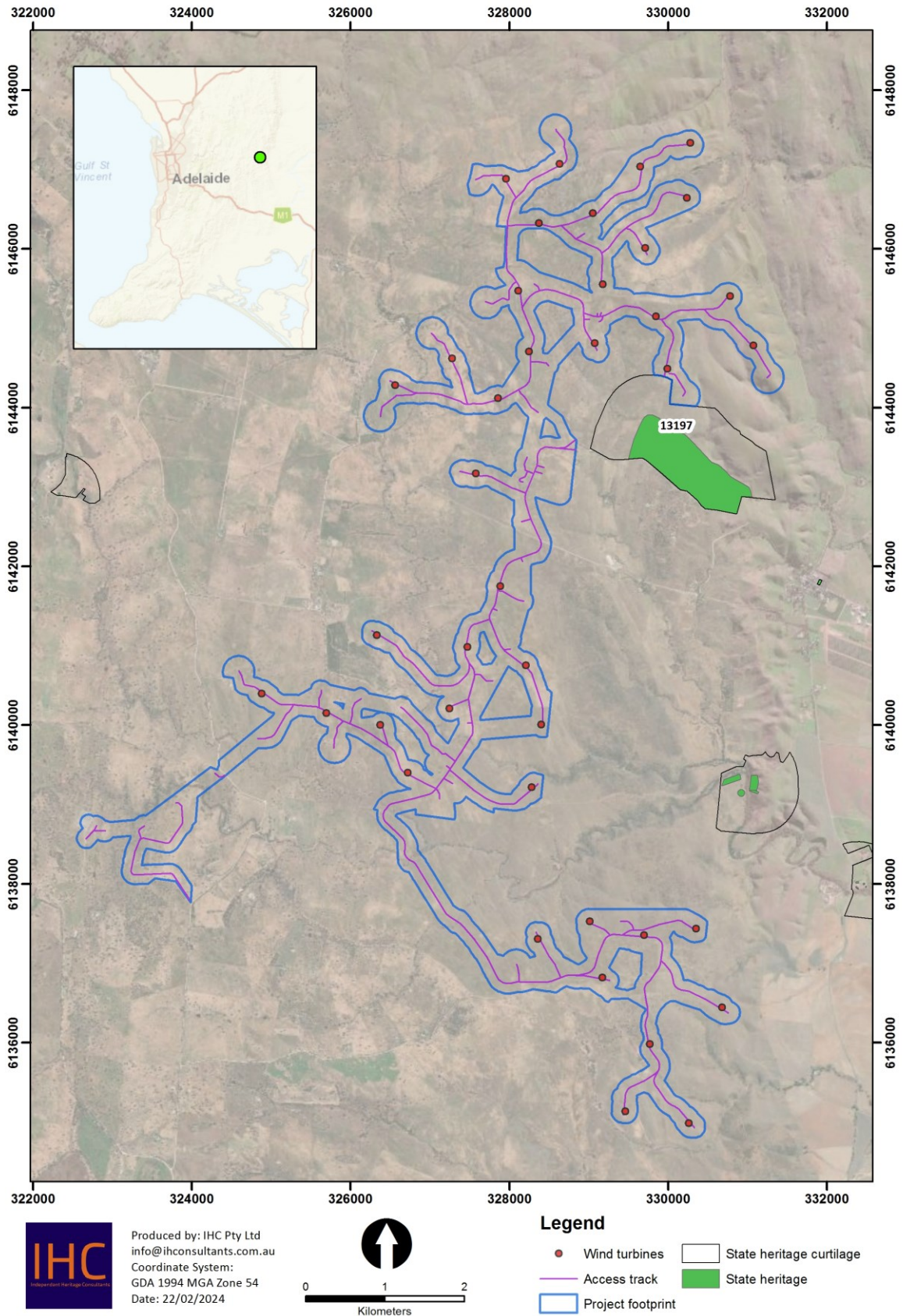
This HIA assesses the impacts of the proposed works on SHR 13197 and provides details of the measures that will be taken to mitigate these impacts.

1.1 Heritage Impact Assessment

A HIA identifies and evaluates the potential impacts of development on the heritage values of a heritage place. It outlines how the significance of a heritage place has been taken into account when formulating proposed works and provides a summary of any impacts on the heritage significance.

1.2 Methodology

The methodology used in this HIA is consistent with guidelines published by the Heritage Branch of the South Australian Department for Environment and Water (DEWNR 2013). The HIA has also been prepared in accordance with the principles contained in the most recent edition of the Burra Charter: The Australian ICOMOS Charter for Places of Cultural Significance.



Map 1. Proposed works in relation to State heritage site

2 BACKGROUND

2.1 State Heritage Register

The Granite Island Boulders Geological Site (SHR 13197) is located adjacent to the Adelaide – Mannum Road in Palmer.

Tilt Renewables is looking to build a wind farm in Palmer to the north and west of the heritage site. Construction will include ground establishment works, installation of turbines, overhead transmission line, access tracks and other infrastructure associated with the construction and management of a wind farm. While works are not proposed within the curtilage of SHR 13197, they will be taking place adjacent to the curtilage of the site (as shown in Map 1 and Table 1).

In 2014, the Development Application for the original Palmer Wind Farm development was referred to the Minister for Sustainability, Environment and Conservation in accordance with the Development Regulations 2008 – as development that directly affects a State heritage place or, in the opinion of the relevant authority, materially affects the context within which the State heritage place is situated. The South Australian State Heritage Unit assessed the proposed development in its impact on the Granite Boulders Area Geological Site and determined the following;

- The proposed Palmer Wind Farm and ancillary development will not affect the significant fabric of the State Heritage Place, as the works are located a considerable distance away.
- The setting of the Granite Boulders Area Geological site is considered to be limited by its landscape and allotment boundary. The proposed works, including substation, operations, maintenance, transmission lines and construction facilities, are located on land adjacent to the Geological Site. The nearest turbine is 750 m distance from the heritage place and therefore will not have any adverse impact on the setting of the State heritage place.

Table 1. State heritage item details

Heritage Number	Address	Description	Part/Parcel	Heritage
13197	Adelaide – Mannum Road, near Palmer	Granite Boulders Area Geological Site	CT 6230/76 D120933 A201,CT 6230/75 D120933 A200	State Heritage Place

3 LEGISLATION

3.1 Statutory Frameworks

Two layers of statutory framework define heritage significance or value, guide proposed works and ultimately decide on appropriate development in and around state heritage places in South Australia. These are the South Australian Heritage Places Act and the Planning, Development and Infrastructure Act.

3.1.1 Heritage Places Act 1993

The Heritage Places Act 1993 stated purpose is to “make provision for the identification, recording and conservation of places and objects of non-Aboriginal heritage significance; to establish the South Australian Heritage Council; and for other purposes”.

The stated objectives of the Act are:

- a. to recognise the importance of South Australia’s heritage places and related objects in understanding the course of the state’s history; including its natural history; and
- b. to provide for the identification and documentation of places and related objects of state heritage significance; and
- c. to provide for an promote the conservation of places and related objects of state heritage significance; and
- d. to promote an understanding and appreciation of the state’s heritage; and
- e. to encourage the sustainable use and adaptation of heritage places in a manner consistent with high standards of conservation practice, the retention of their heritage significance, and relevant development policies.

Significance in the Act is defined by specified criteria. A place is considered of heritage significance if it satisfies one or more of the following criteria:

- a. it demonstrates important aspects of the evolution or pattern of the state’s history; or
- b. it has rare, uncommon or endangered qualities that are of cultural significance; or
- c. it may yield information that will contribute to an understanding of the state’s history, including its natural history; or
- d. it is an outstanding representative of a particular class of places of cultural significance; or
- e. it demonstrates a high degree of creative, aesthetic or technical accomplishment or is an outstanding representative of particular construction techniques or design characteristics; or
- f. it has strong cultural or spiritual associations for the community or a group within it; or
- g. it has special association with the life or work of a person or organisation of an event of historical importance

An object is considered to be of heritage significance if;

- a) it is an archaeological artefact, or any other form of artefact that satisfies 1 or more of the criteria set out in subsection (1); or
- b) it is a geological, paleontological or speleological specimen that satisfies 1 or more of the criteria set out in subsection (1); or
- c) it is an object that is intrinsically related to the heritage significance of a State Heritage Place or a State Heritage Area

An understanding of significance is recognised as being fundamental to the assessment and management of a state heritage place (Burra Charter 2013). However, prior to the gazetting of the South Australian Heritage Places Act 1993, the criteria for listing a place were not necessarily assessed or recorded and so some state heritage places have no assessed significance.

3.1.2 Planning, Development and Infrastructure Act 2016

The Planning, Development and Infrastructure Act 2016 (PDIA) is the principal legislation to facilitate the planning and development in South Australia. The Planning and Land Use Services of the Attorney General's Department currently manage the PDIA. Section 67 of the PDIA affords protection to places designated as places of local heritage within Part 11 of the Planning and Design Code.

Where works are to take place on land parcels containing state heritage items, and that work could materially affect the heritage value of the place, this constitutes development as defined by the PDIA requiring preparation of a heritage impact assessment to mitigate impact and a development application prior to works commencing. Where works are to take place on land parcels containing local heritage items, and the work could materially affect the heritage value of the place, this constitutes development as defined by the PDIA and prior to works consultation with Council may be required. Where work is likely to impact archaeological deposits, a permit is still required from the South Australian Heritage Council.

3.2 Non-statutory Framework

These are documents, which may be used to inform the conservation and management of a significant site, but are non-statutory, that is, not legally binding by current legislation. One such document is *The Burra Charter, the Australia ICOMOS Charter for Places of Cultural Significance 2013*.

3.2.1 The Burra Charter (1979) - Amended 2013

The Australia ICOMOS Charter for the Conservation of Places of Cultural Significance is known as The Burra Charter. The Burra Charter was first adopted in Burra in 1979. It identifies the standard for best practice in the conservation of heritage places in Australia and state heritage organisations incorporate the principles and logic of this charter into guidelines and other conservation planning documents.

The Burra Charter is important as it outlines the requirements for assessing cultural heritage significance. It is not a legal requirement to adopt the Burra Charter guidelines, however these requirements are reflected in the significance assessment criteria included in section 16 of the South Australian Heritage Places Act 1993.

4 HERITAGE SIGNIFICANCE

4.1 Established Significance

A significance assessment is an integral part of the identification and ongoing management of heritage place. In order to assess whether the proposed development may have a negative, neutral or positive impact on the significance of a heritage item, it is necessary to first ascertain their significance. The significance of SHR 13197 is outlined below;

4.1.1 Granite Boulders Area Geological Site

The Granite Boulders Area Geological Site (State Heritage ID 13197) was registered as a State Heritage Site in 1993 (DEW 2023) after initially being identified and nominated for the State Heritage list by the Mount Pleasant Heritage Survey (Angas and Turnbull 1987). An assessment of site significance is included in the report and has been considered in light of the relevant significance assessment criteria (Section 16 of the Heritage Places Act 1993).

The survey report (Angas and Turnbull 1987) assess the significance of the site as the following:

“granites with tor weathering, located about 2 kilometres west of Palmer. These exposed granites exhibit exfoliation of surface-hardened layers, cavernous weathering and the development of the granulated products of disintegration. The area of granite covers an area of 50 square kilometres. The area has been dated at 490 million years by rubidium-strontium isotopic methods. Many of the tors have been defaced by graffiti and therefore require cleaning ... the tor development is better and more extensive than in most areas of South Australia and is comparable to the “Devils Marbles” in the Northern Territory”

The Granite Boulders Area Geological Site provides important information on the development of the eastern escarpment of the Mt. Lofty Ranges (Pluckhahn 1993) and in the study of the still active Palmer Fault Zones (Pluckhahn 1993). As one of the better exposed Lower Palaeozoic granites with country rock contacts in South Australia, the Granite Boulders Geological Site lends itself to further research using modern techniques of the type that has been carried out by older methods in the past. The site is currently exposed and subject to vandalism (graffiti) and water erosion.

Visually, the site is impressive in the natural landscape, with larger pink and orange granitic tors ranging in size up to 4 m high. This aesthetic significance is recognised in the site being listed as both a geological monument, landscape area - natural landscape, as well as a geological site (DEW 2023).

5 PROPOSED WORKS

5.1 Description of Proposed works

Tilt Renewables is in the process of varying the layout of the approved Palmer Wind Farm in Palmer South Australia and some work and infrastructure associated with the wind farm will be located adjacent to State Heritage ID 13197.

The proposed works will have no direct impacts for State Heritage ID 13197. There are no proposed modifications or direct impacts to the state heritage item itself and all work areas will be rehabilitated once works are complete. Map 1 of this report shows the project corridor and anticipated impact locations in relation to the heritage item. Table 2 outlines the description and details of the proposed works within the vicinity of SHR 13197.

Table 2. Proposed works adjacent to heritage site

Description of Proposed works	Details
Vegetation Clearance	Limited to grass and topsoil removal, with works planned to limit the removal of vegetation. Tilt propose to rehabilitate any disturbed vegetation post-construction.
Finishing works (line marking, guard rail, signage)	No change - confined to road corridor
Major earthworks (excavation of soils)	Confined to adjacent land – no works within the State Heritage Site.
Minor earthworks (top soil clearing)	Confined to adjacent land – no works within the State Heritage Site.
Major Demolition (structures relating to the heritage structure)	None.
Minor Demolition (structures adjacent to but not relating to the heritage structure)	None
Fencing work	Construction of temporary and permanent fences including post hole excavation
Construction of wind farm and ancillary development	Confined to land nearby – but not directly adjacent to or within the State Heritage Site.

5.2 Evaluation of proposed impacts on general site significance

The following table (Table 3) is an overview of the breakdown of project impacts expected on the cultural significance of the State Heritage ID 13197 as assessed by IHC.

Table 3. Impacts for the proposed works

Impact Type	Impact
Major negative impacts: classified as works that substantially affect the state significance values of the site.	None
Moderate negative impacts: classified as the loss of local significance values or minor impacts on aspects of state significance.	None
Minor negative values; loss of some significance value or where mitigation retrieves some value of significance; loss of items not significant but which buffers or contributes to significance values.	Temporary construction infrastructure will be present during works (excavator machinery and trucks). This will temporarily cause minor visual impacts in the area. Management to these impacts are included in Table 3 below.
Minor positive impacts (enhances access, understanding of, or values of significance)	Improved drainage infrastructure in this area will mitigate some of the soil erosion problems, previously occurring within the State Heritage Site.
Major positive impacts (enhances access, understanding or conservation of fabrics or values of significance)	None

5.3 Works Program Evaluation

Table 4 below considers the specific works/impacts, impact evaluation and impact mitigation of the proposed works on State Heritage ID 13197.

Table 4. Specific impacts and proposed mitigation

State Heritage Item	Proposed Works/Impacts	Impact Evaluation Criteria	Impact Mitigation Measures
ID11030	<p>No proposed direct impacts to ID11030.</p> <p>All proposed Impacts will be adjacent to ID11030.</p>	<p>How has the impact of the new work on the heritage significance of the existing landscape been minimised?</p> <p>How does the work impact on views to and from adjacent heritage items?</p> <p>How will works impact the heritage values of the site?</p>	<ul style="list-style-type: none"> • Works have been engineered to avoid and reduce impacts on SHR 13197. This includes minimising the required footprint. • Construction activities will be limited to the approved works areas – all outside the curtilage of the SHR 13197. Fencing and signage will be used to limit access during construction. • No land acquisition required within the curtilage of the state heritage listing (Map 2). • Design and construction planning has been designed to reduce construction impacts to areas immediately adjacent to SHR 11030. This includes; <ul style="list-style-type: none"> ○ Reducing/steepening batters ○ Removing/retaining and/or completely avoiding preserved geological formations ○ Diverting access roads ○ Re-use of boulders in areas adjacent during rehabilitation

			<ul style="list-style-type: none">• No impact on views to and from adjacent SHR 13197. Works will be contained to private land, existing road reserve and adjacent to the road reserve.• Temporary works areas will be rehabilitated following completion of works.• All traffic/vehicle access to the area during works will be managed by the construction environmental management plan and traffic management plan and limited to existing and formed access tracks/roads.• Project inductions will include information about the state heritage site and management during construction.• The surrounding areas will be rehabilitated on completion of works.
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6 SUMMARY AND CONCLUSION

IHC has been engaged by Tilt Renewables to prepare this HIA to inform the assessment of its variation application in respect of the approved Palmer Wind Farm project. The project consists of the design and construction of a wind farm on land adjacent to the State Heritage Listed Granite Boulders Geological Site (SHR 13197) on the Adelaide-Mannum Road in Palmer. There are no proposed modifications or direct impacts to State Heritage ID 13197. Works will be managed to avoid indirect impacts and all work areas will be rehabilitated once works are complete.

This evaluation concludes that the proposed works will have minor temporary construction impacts on the cultural values of State Heritage ID 13197 (visual) , but these will not materially affect the heritage value or significance of the site in the longer term. The closest turbine is located approximately 100m from the northern curtilage of the site and 750 metres from the item itself. The proposed works have been designed and developed so as to be appropriate to the setting and minimise impacts on the state heritage item.

In 2014, the Development Application for the original Palmer Wind Farm development was referred to the Minister for Sustainability, Environment and Conservation in accordance with the Development Regulations 2008 – as development that directly affects a State heritage place or, in the opinion of the relevant authority, materially affects the context within which the State heritage place is situated. The South Australian State Heritage Unit assessed the proposed development in its impact on the Granite Boulders Area Geological Site and determined the following;

- The proposed Palmer Wind Farm and ancillary development will not affect the significant fabric of the State Heritage Place, as the works are located a considerable distance away.
- The setting of the Granite Boulders Area Geological site is considered to be limited by its landscape and allotment boundary. The proposed works, including substation, operations, maintenance, transmission lines and construction facilities, are located on land adjacent to the Geological Site. The nearest turbine is 750 m distance from the heritage place and therefore will not have any adverse impact on the setting of the State heritage place.

In summary, the proposed works have been designed and developed so as to be appropriate to the setting and minimise project impacts to the geological formation that constitutes the listing. This evaluation concludes that the proposed works will have minor impacts on the cultural values of the Granite Boulders Geological site. Increased access to and rehabilitation of the adjacent areas are likely to enhance the importance of the place to the community.

7 REFERENCES

Legislation

Heritage Places Act 1993 (South Australia).

Planning, Development and Infrastructure Act 2016 (South Australia)

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Heritage Assessment Summary

Project Title:	Palmer Wind Farm
Locations:	Varied Project Area
Client:	Tilt Renewables
Date:	Final January 2024
Associated Report:	<p>IHC 2023. Palmer Wind Farm. Heritage Gap Analysis and Heritage Desktop Assessment. Report prepared for Tilt Renewables Pty Ltd, Adelaide, South Australia.</p> <p>IHC 2024. Palmer Wind Farm. Heritage Impact Assessment Granite Boulders Area Geological Site. Report prepared for Tilt Renewables Pty Ltd, Adelaide, South Australia.</p> <p>IHC 2024. Palmer Wind Farm varied project area site verification and archaeological inspection report. Prepared for Tilt Renewables Pty Ltd, Adelaide, South Australia</p>



Independent Heritage Consultants (IHC) has been engaged by Tilt Renewables Pty Ltd to undertake a gap analysis and heritage desktop assessment for the Palmer Wind Farm Project.

The following document presents a summary of the findings of this assessment and recommended management measures for the varied Palmer Wind Farm Project.

Historic Heritage

The historic heritage desktop assessment has identified that there is a single State heritage site within the varied project area, the Granite Boulders Area Geological Site (SHR 13198) (IHC 2023). All historic heritage and archaeological features, whether listed or not, are protected and must be managed in line with the requirements of the *Heritage Places Act 1994 (HPA)* and the *Planning, Development and Infrastructure Act 2016, (PDIA)*.

Any works for the wind farm within the curtilage of the identified SHR 13198 must be managed in line with the HPA and the PDIA. IHC has prepared a Heritage Impact Statement for works in relation to this State Heritage place (IHC 2023c).

The archaeological inspection did not identify any new historic heritage/archaeological sites of significance within the varied project area (IHC 2023b). However, in the event that works encounter the remains of undocumented built heritage and archaeological features of heritage significance, these should be managed under the requirements of s.27 of the HPA.

Although not mandated by the HPA, a number of management options have been recommended to mitigate the assessed heritage risk. These include; implementation of a site discovery procedure, site inductions and archaeologists on call to identify potential discoveries.

Tilt has also confirmed in their statement of commitments, that any impacts on dry stone walls will be avoided where possible. If impacts can not be avoided, these impacts will be mitigated in consultation

with the Dry Stone Wall Association and these measures are reflected in the Construction Environment Management Plan (CEMP).

Aboriginal Heritage

The gap analysis and heritage assessment has identified that there are no AGD-AAR registered sites within the varied project area. The gap analysis indicated that the approved original wind farm area was subject to detailed archaeological and ethnographic surveys (2009-2014) by Australian Cultural Heritage Management (ACHM) and Peramangk representatives (via MACAI). Peramangk was identified by AGD-AAR as having heritage interests in the Palmer region.

As part of these surveys ACHM recorded over 300 potential archaeological sites within the original wind farm footprint. No ethnographic sites were recorded at this time.

IHC has conducted a detailed gap analysis, overlaying the ACHM site data and approved project area with the varied project area. The analysis has identified that 48 of the sites recorded by ACHM fall within the varied project area (IHC 2023).

IHC was engaged by Tilt to carry out a site verification and archaeological inspection of the varied project area. This inspection identified no new Aboriginal heritage sites within the current footprint. All of the recorded ACHM sites within the varied project area were inspected and none were found to be Aboriginal archaeological sites (IHC 2024).

As the varied project area falls within the original area surveyed and consulted on by ACHM and Peramangk representatives and will not impact any ethnographic sites, no further ethnographic/anthropological surveys have been undertaken or are required.

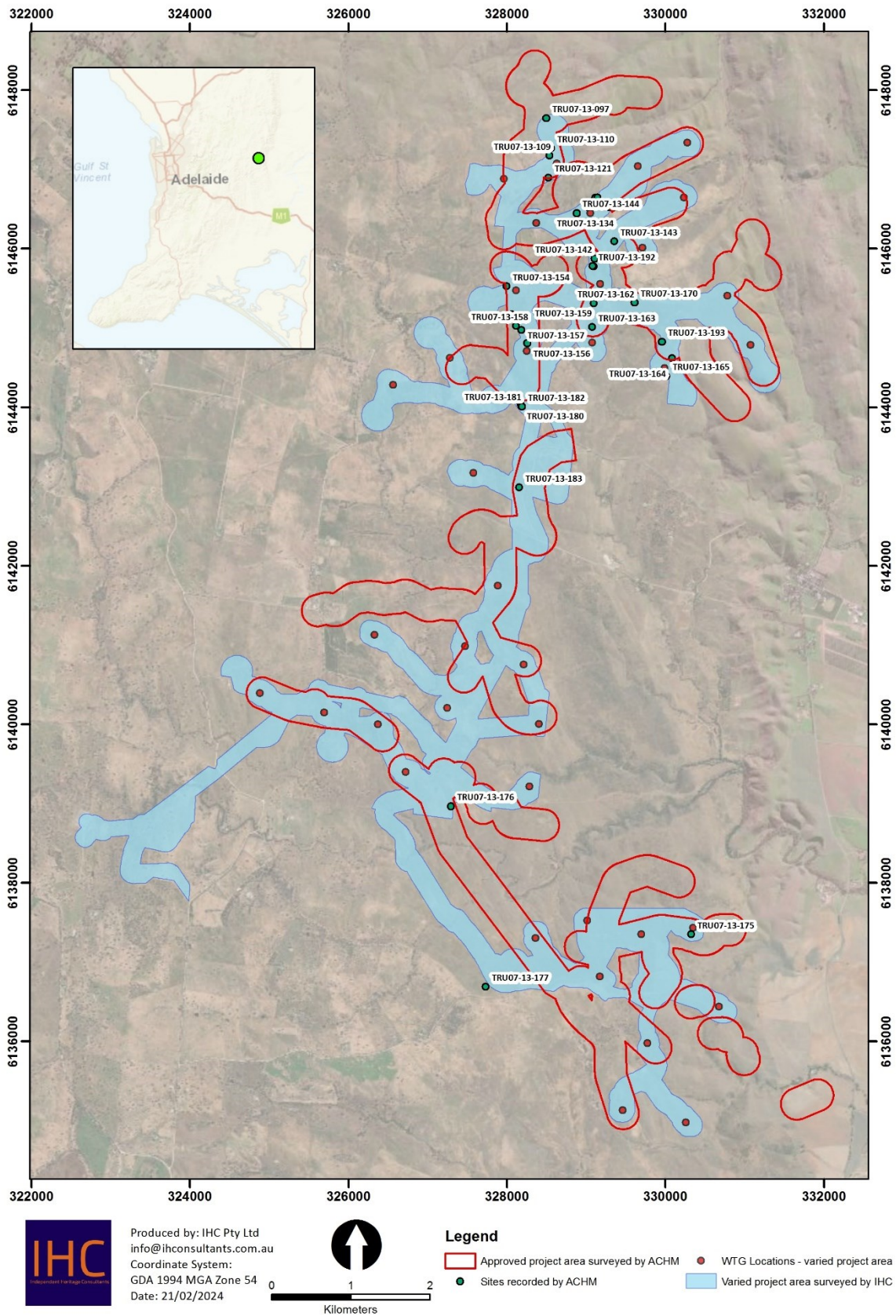
The archaeological inspection did not identify any new Aboriginal archaeological sites within the varied project area. However, all Aboriginal heritage sites are protected under the AHA, whether reported/registered or undocumented. Therefore, if a previously unknown Aboriginal heritage site is discovered during works and cannot be avoided, Ministerial authorisation under section 23 of the *Aboriginal Heritage Act 1988* is required.

Although not mandated by the AHA, a number of management options have been recommended to mitigate the assessed heritage risk. These include; implementation of an Aboriginal site discovery procedure, site inductions and archaeologists on call to identify potential discoveries. In addition, IHC has recommended that Tilt engage Peramangk monitors for earthworks into natural soils adjacent to Barker, Dairy, Harrison and Talbot Creeks.

Native Title

The varied project area is not subject to a native title claim or Federal Court determination. As the project land is held under freehold tenure and there are no native title claims, the notification processes under the *Native Title Act 1993* are not applicable.

One small section of land in the south-east corner falls within the First Peoples of the River Murray and Mallee Region #2 native title claim area. There are no planned works within or adjacent to these areas, with the closest infrastructure located 1.5km away. As there are no works proposed on this land, the notification process under the *Native Title Act 1993* are not applicable.



Map 1: varied project areas inspected by IHC in relation to ACHM Survey areas



Palmer Wind Farm Variation Application

Electromagnetic Interference Assessment

Tilt Renewables Australia Pty Ltd

09 February 2024

→ The Power of Commitment



Project name		Palmer Wind Farm - Technical Assessments					
Document title		Palmer Wind Farm Variation Application Electromagnetic Interference Assessment					
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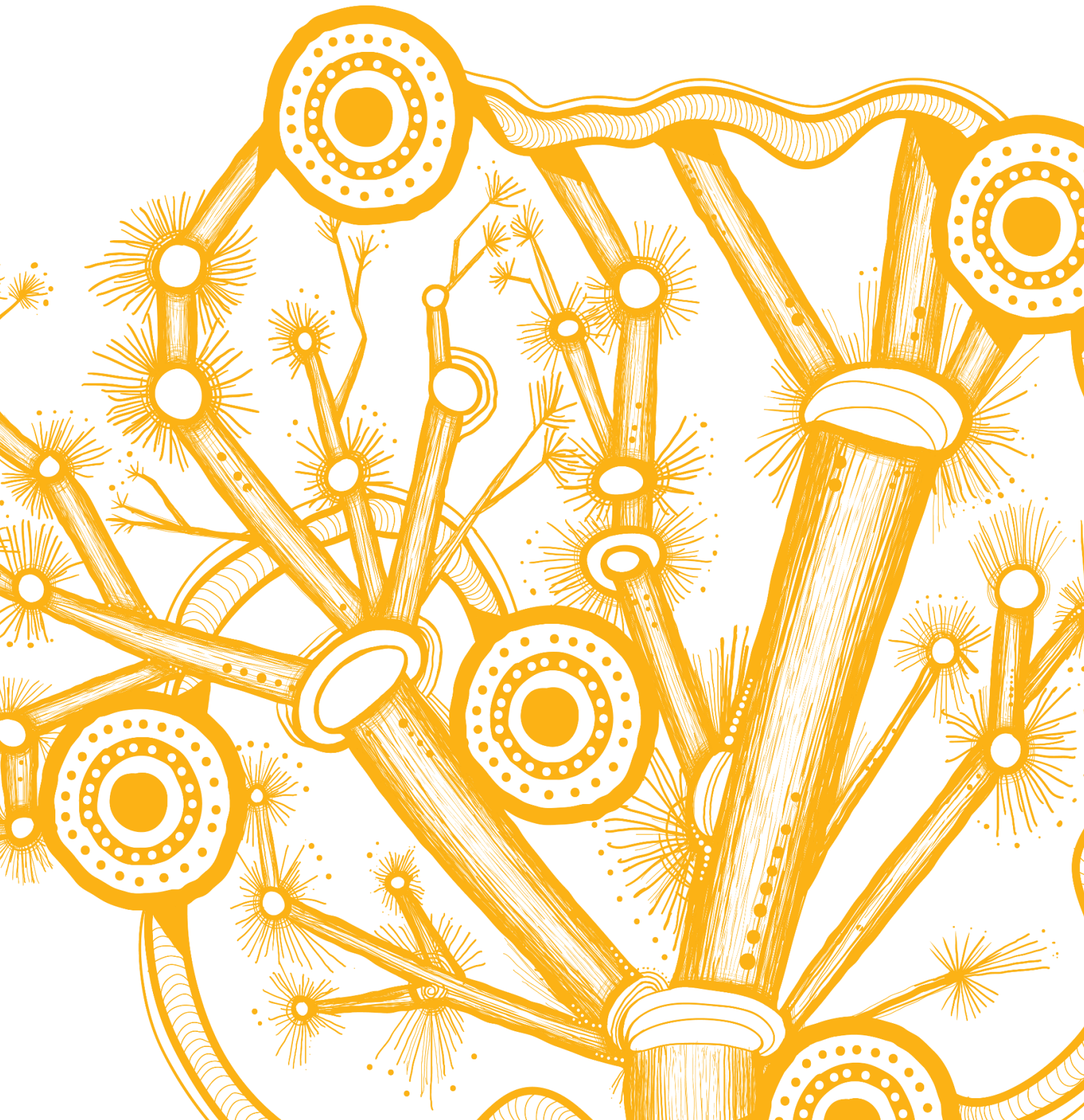
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Acknowledgement of Country

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



Contents

1.	Introduction	1
1.1	Purpose of this report	1
1.2	Project description	1
1.3	Scope and limitations	2
1.4	Abbreviations	2
1.5	References	3
2.	Electromagnetic interference theory	4
2.1	Radiation of electromagnetic energy	4
2.2	Diffraction	4
2.3	Reflection	6
2.4	Scattering	8
2.5	Near field effects	8
3.	Guidelines and Codes	9
4.	Analysis of development impact	10
4.1	Methodology	10
4.2	Radio system search	10
4.3	Client data	10
4.4	Radio technology review	10
5.	Radio technology assessment	12
5.1	Fixed radio systems	12
5.2	Land Mobile Radio Systems	14
5.3	AM / FM narrowcast and broadcast	15
5.4	Digital television broadcast	16
5.5	Mobile telephone and broadband internet broadcast	17
5.6	Aircraft communications systems	19
5.7	Meteorological radar	19
5.8	Defence radio systems	21
5.9	Trigonometric systems	21
5.10	Amateur radio systems	21
5.11	Maritime radio systems	21
5.12	Earth Stations	21
5.13	Scientific radio systems	22
5.14	Radiodetermination station	22
5.15	50Hz transmission lines	22
6.	Summary and Mitigation Strategies	23
6.1	Mitigation Strategies	23
6.2	Construction approach	25

Table index

Table 1	Definitions	2
Table 2	References	3
Table 3	Summary of Mitigation Strategies and recommendations	23

Figure index

Figure 1	Project Area Location showing Varied Project layout	1
Figure 2	Fresnel zone over the radio path	4
Figure 3	Fresnel zone clearance criteria	5
Figure 4	Fresnel zone calculation	5
Figure 5	Fresnel Zones	6
Figure 6	Reflection of radio signals by wind turbine infrastructure	7
Figure 7	Scattering of radio signals by wind turbine infrastructure	8
Figure 8	Fixed point-to-point radio links in wind farm vicinity (Varied Project)	12
Figure 9	Fresnel exclusion zones of fixed point-to-point radio links in Varied Project Area vicinity	13
Figure 10	Land Mobile Radio transmitters in Varied Project Area vicinity	14
Figure 11	AM/FM narrowcast and broadcast transmitters in Varied Project Area vicinity	15
Figure 12	Adelaide (Mt Lofty / Crafers) television transmitter signal scatter zones	16
Figure 13	NBN Co fixed wireless coverage and client locations (Varied Project layout)	18
Figure 14	BoM weather watch radar	20
Figure 15	Satellite earth stations in Varied Project Area vicinity	22

Appendices

Appendix A	Turbine locations
Appendix B	Radio sites in vicinity of wind farm ACMA details
Appendix C	Reference figures
Appendix D	Consultation letters

1. Introduction

1.1 Purpose of this report

The purpose of this report is to assess the potential electromagnetic interference and subsequent impacts caused by the indicative wind turbine layout for the variation to the approved Palmer Wind Farm. This report is intended to support the variation to approved layout and to present mitigation measures to eliminate or minimise impact to existing radio systems from the Varied Project.

1.2 Project description

The Project Area is located in the eastern Mount Lofty Ranges, South Australia, approximately 50 km east of the Adelaide CBD. Tilt Renewables has development plan consent for the Palmer Wind Farm Project, comprising of 103 wind turbines with a maximum tip height of 165m. Tilt Renewables is seeking approval to vary the Project to reduce the number of turbines to 40 and to increase the maximum tip height to 220m. The project will be across an area of approximately 6095ha in the Mid Murray Council LGA. The predicted power generation capacity is 288MW, which will be enough to provide power to 144,000 South Australian homes.

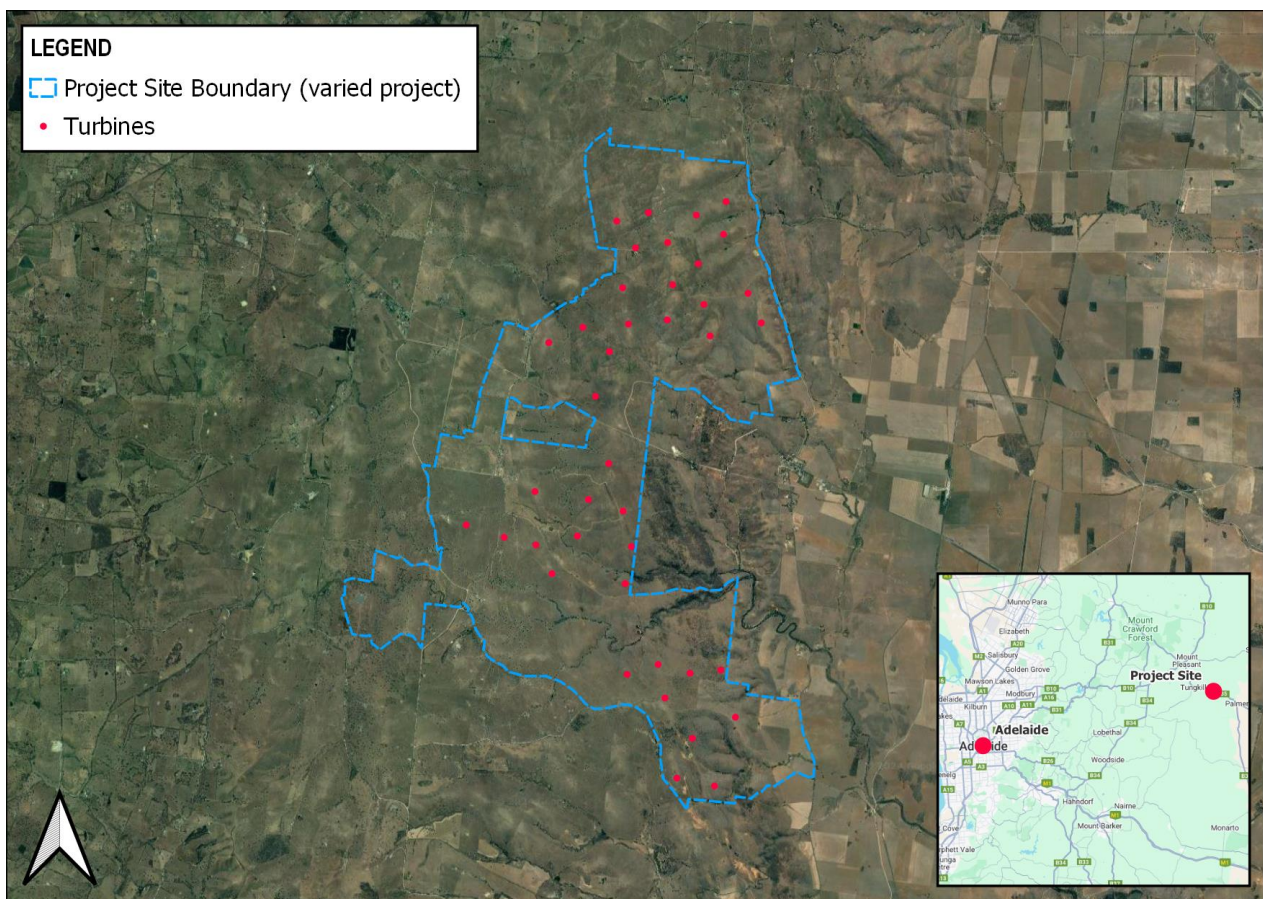


Figure 1 Project Area Location showing Varied Project layout

1.3 Scope and limitations

This report has been prepared by GHD for Tilt Renewables Australia Pty Ltd and may only be used and relied on by Tilt Renewables Australia Pty Ltd for the purpose agreed between GHD and Tilt Renewables Australia Pty Ltd as set out in section 1.1 of this report.

GHD otherwise disclaims responsibility to any person other than Tilt Renewables Australia Pty Ltd arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report (refer section(s) 4.3 of this report). GHD disclaims liability arising from any of the assumptions being incorrect.

Accessibility of documents

If this report is required to be accessible in any other format, this can be provided by GHD upon request and at an additional cost if necessary.

GHD has prepared this report on the basis of information provided by Tilt Renewables Australia Pty Ltd and others who provided information to GHD (including Government authorities)], which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

1.4 Abbreviations

The following abbreviations have been used in this report:

Table 1 Definitions

Abbreviation	Definition
ACMA	Australian Communications and Media Authority
AM	Amplitude Modulation
BoM	Bureau of Meteorology
FM	Frequency Modulation
GHz	Gigahertz (10 ⁹)
GNSS	Global Navigation Satellite System
kHz	Kilohertz (10 ³)
LGA	Local Government Area
LMR	Land Mobile Radio
MHz	Megahertz (10 ⁶)
MW	Megawatt (10 ⁶)
PTP	Point-to-Point
UHF	Ultra-High Frequency
VAST	Viewer Access Satellite Television
VHF	Very-High Frequency
WTG	Wind Turbine Generator

1.5 References

Table 2 *References*

Ref No	Reference
1	Visiwave™, http://www.vias.org/wirelessnetw/wndw_04_08b.html
2	Javad Ahmadi, The effects of Fresnel Zone in communication theory based on radio waves, Bulletin de la Société Royale des Sciences de Liège, Vol. 85, 2016, p. 729 - 734
3	D. F. Bacon, A Proposed Method for Establishing an Exclusion Zone around a Terrestrial Fixed Link outside of which a Wind Turbine will cause Negligible Degradation of the Radio Link, Radiocommunications Agency UK Report Ver 1.1, 28 Oct 2002
4	Draft National Wind Farm Development Guidelines, Environment Protection and Heritage Council of Australia and New Zealand, EPHC July 2010

2. Electromagnetic interference theory

Electromagnetic fields are a combination of electric fields associated with a voltage source and magnetic fields associated with current flowing through a conductor. These fields increase in strength with voltage and current.

Radio system interference may occur when a wind turbine is located in such a way as to induce an unwanted disturbance to radio waves propagated between a signal source and signal receiver. The interference may occur by way of radiation of electromagnetic energy by the turbine within the operating band of the radio system, diffraction, or partial reflection of the radio system signal by the turbine tower and rotor.

The following sections briefly describe the various types of interference that may impact existing operational telecommunications services in the vicinity of the wind farm development area to provide context to the specific findings identified in section 4 of this report.

2.1 Radiation of electromagnetic energy

Electromagnetic interference potentially occurs when the wind turbine electrical infrastructure radiates energy with a frequency within the operating frequency of a radio communications system.

Turbines supplied within Australia are required to be compliant with electromagnetic compatibility as defined in relevant Australian Standards. As a result of complying with these standards, the electromagnetic interference due to radiation is negligible.

Windfarm infrastructure may cause interference to radio signals due to the emission of electromagnetic fields. These electric fields typically propagate over very short distances (tens of metres) and are limited to “near-field” effects.

2.2 Diffraction

Diffraction occurs when the wind turbine infrastructure is positioned such that the signal of a radio communications system is partially or temporarily blocked causing a reduction in the signal power at the radio signal receiver.

For point-to-point radio systems it is understood that the radio signal travels on a path between the signal source and signal receiver defined by an ellipsoid area known as the Fresnel zone.

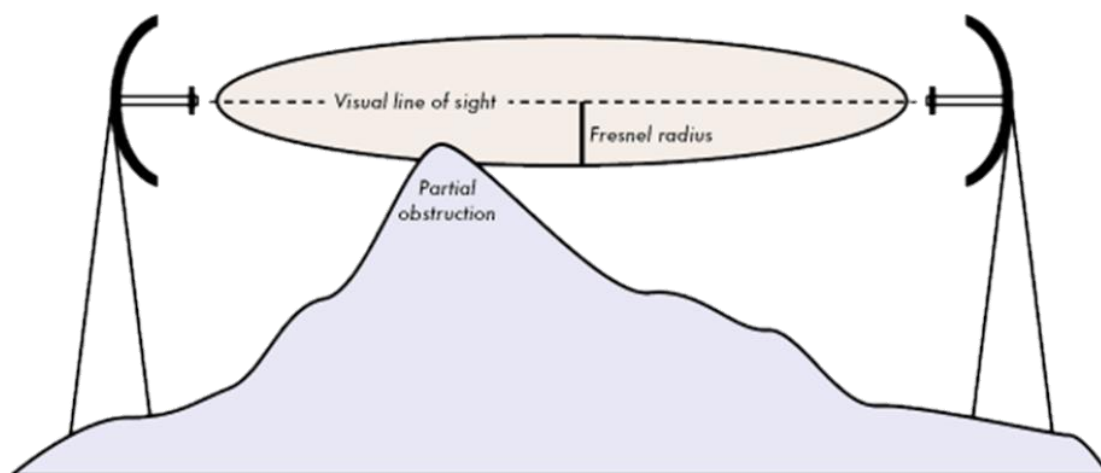


Figure 2 Fresnel zone over the radio path¹

The Fresnel zone is defined as the locus between two points, such as a radio transmitter and receiver, where the indirect ray path length from the point T to point R is multiple of the half-wavelength distance of the radio signal. Refer to Figure 2 and Figure 3 for further details.

¹ Source: Visiwave™, http://www.vias.org/wirelessnetw/wndw_04_08b.html

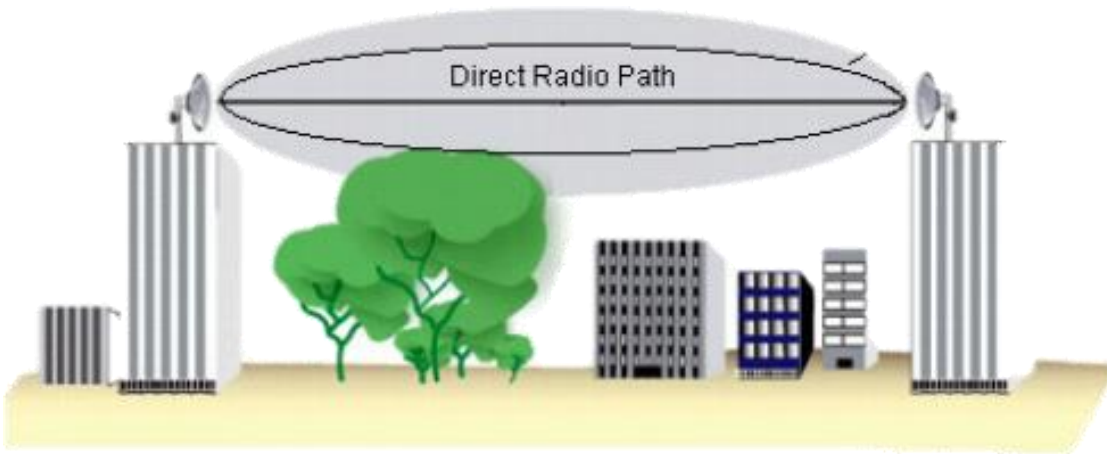


Figure 3 Fresnel zone clearance criteria²

In the presence of an obstruction between the signal source and the signal receiver, it is generally accepted that an obstructed path provided with 60% clearance of the first Fresnel zone will operate without degradations to the communications system.

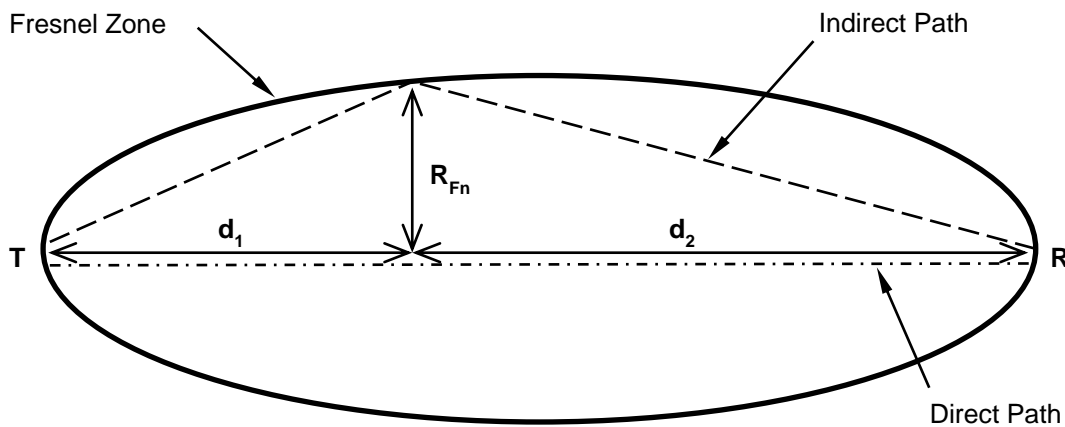


Figure 4 Fresnel zone calculation³

The Fresnel zone is defined by the formula:

$$R_{Fn} = \sqrt{\frac{n\lambda d_1 d_2}{d_1 + d_2}}$$

R_{Fn} = the nth Fresnel Zone Radius in metres

n = the nth Fresnel zone

λ = the wavelength of the transmitted signal in metres

d_1 = the distance from T in metres

d_2 = the distance from R in metres

F1 may be used to describe the first Fresnel zone between two points. F1 may also be described as the 100% Fresnel zone. In this case, F2 is the second Fresnel zone or the 200% Fresnel zone.

² Javad Ahmadi, The effects of Fresnel Zone in communication theory based on radio waves, Bulletin de la Société Royale des Sciences de Liège, Vol. 85, 2016, p. 729 - 734

³ D. F. Bacon, A Proposed Method for Establishing an Exclusion Zone around a Terrestrial Fixed Link outside of which a Wind Turbine will cause Negligible Degradation of the Radio Link, Radiocommunications Agency UK Report Ver 1.1, 28 Oct 2002

According to D F Bacon [Ref 3] it is recommended to design the geographic wind turbine layout such that all infrastructure including turbine blades are located outside the second Fresnel zone of all point-to-point radio systems.

The second Fresnel zone defines the region where an object such as a wind turbine may cause a reflected signal to be transmitted to the receiver at a half wavelength (180°) out of phase with the direct ray causing maximum interference potential. The figure below shows the first, second and third fresnel zones.

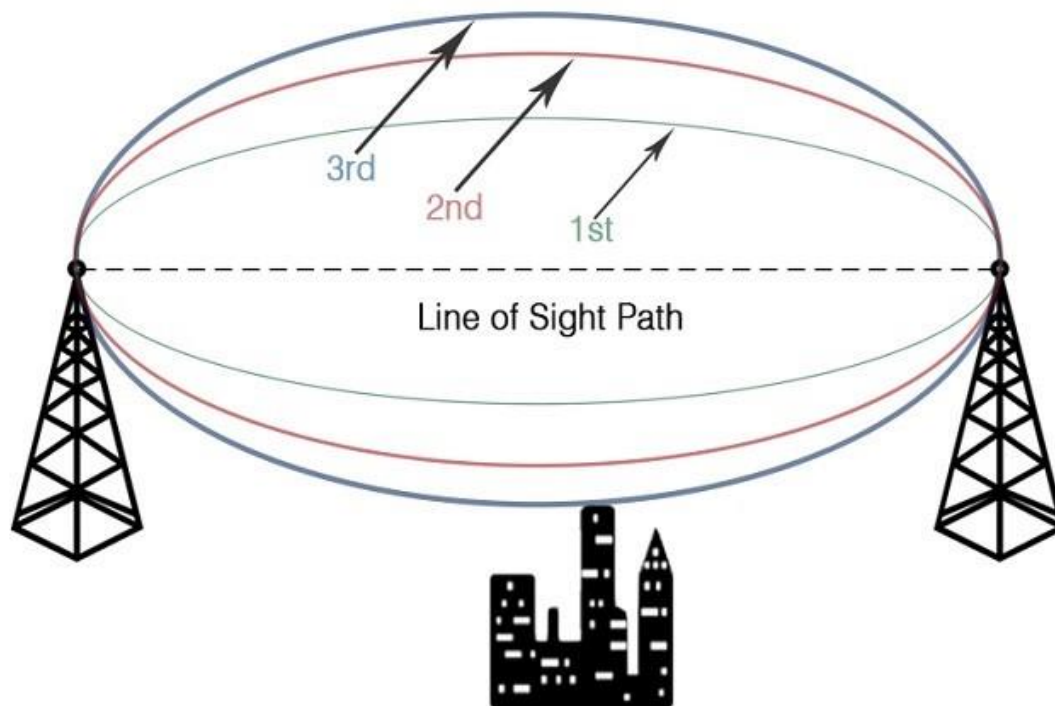


Figure 5 Fresnel Zones

The drawings included in Appendix C – Figure 1 shows the plot of ray-lines (direct line of sight) for point-to-point radio links and Appendix C – Figure 2 plots the second Fresnel zone (WTG exclusion zones) for point-to-point radio links.

2.3 Reflection

Reflection occurs when the wind turbine infrastructure is positioned such that the incident ray of a radio communication system is partially or temporarily reflected from its normal path of propagation. The complex geometrical design of the wind turbine causes the reflected signals to be dispersed or 'scattered' over a wide angle. These reflections have the potential to generate destructive interference to the radio signal resulting in signal power reduction or unwanted duplication of the radio signal as seen in Figure 4.

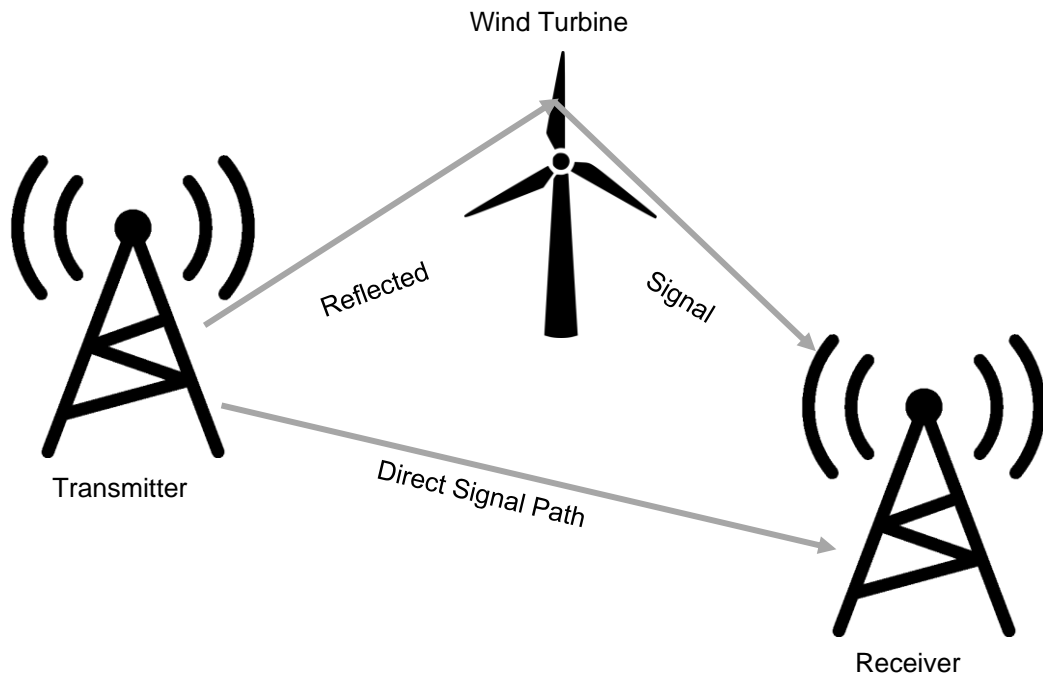


Figure 6 Reflection of radio signals by wind turbine infrastructure

At the boundary of the second Fresnel zone, any reflected wave will be 180° out of phase with the direct signal, which can lead to cancellation effects at the receiver. As such, any turbine located along (and near) the second fresnel zone boundary has the potential to significantly degrade a radio link.

2.4 Scattering

Wind turbines have been observed to cause interference by scattering the incident signal. Scattering is described as either 'forward' or 'back' and is depicted in Figure 5 below.

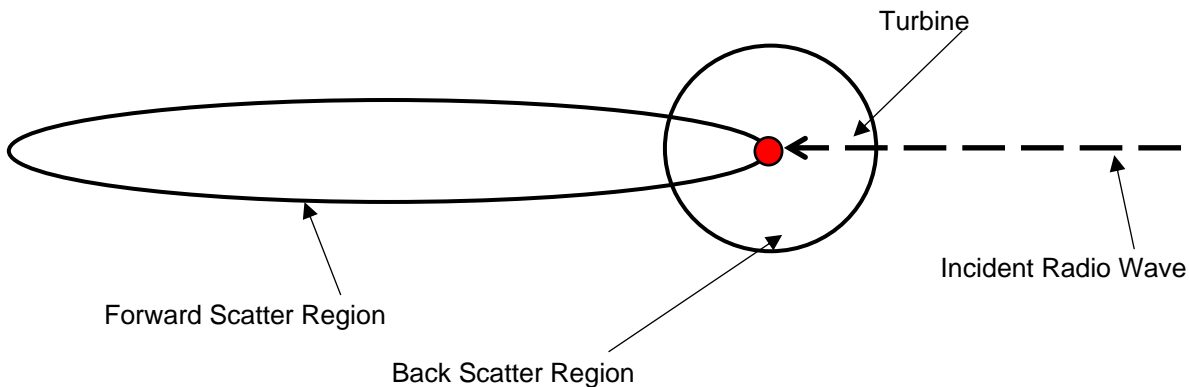


Figure 7 Scattering of radio signals by wind turbine infrastructure

The forward scatter region is significant and can extend as far as 5 km forward from the wind turbine. Where the receiver is in direct line of sight of a turbine, but shielded from a direct signal from the transmission tower, the forward scatter region may extend beyond 5 km. The back scattering region created by the incident signal is generally less than 1 km from the turbine.

2.5 Near field effects

Wind turbine infrastructure located close to a radio communication system, such as within the near field of the radiating antenna, can detrimentally affect the normal radiation pattern of the antenna, causing unwanted signal power reductions to the radio system service area. The result is an alteration of the antenna's impedance.

Typical near-field exclusion zone radii are:

- 2 metres for low band VHF paging systems (i.e., under 50 MHz)
- 20 metres for UHF, LMR and cellular sites (i.e., up to 2.5 GHz)
- 720 metres for point-to-point microwave radio links (in the direction of the link)

Existing transmitters and microwave point-to-point links in the vicinity of the Varied Project have been analysed to aid in turbine micro-siting activities to mitigate the near field effects so that turbines should not be placed in paths of known microwave links. Future transmitter installations should be built outside the exclusion zones noted above. In the case of future PTP microwave links, antennas can be installed within 720 meters of a turbine, but the alignment of the link must be engineered to not point at a turbine.

3. Guidelines and Codes

In South Australia, the Planning, Development, and Infrastructure Act of 2016 establishes the framework for land use regulation, but it lacks specific guidelines for evaluating the electromagnetic effects of wind farm projects.

During this assessment, the *Draft National Wind Farm Development Guidelines*⁴ was considered. This document provides methodologies for assessing the impacts of proposed wind farm developments. Section F of the Draft National Wind Farm Development Guidelines, titled "Electromagnetic Interference," outlines the issues addressed in this assessment of electromagnetic interference (EMI) and references relevant Australian Standards and publications related to EMI resulting from wind farm developments in Australia.

⁴ Draft National Wind Farm Development Guidelines, Environment Protection and Heritage Council of Australia and New Zealand, EPHC July 2010

4. Analysis of development impact

4.1 Methodology

GHD has undertaken this electromagnetic interference assessment to determine which areas of the Varied Project Area are unsuitable for the installation of turbines as well as to consider the impacts on wide-area services in the region. Information on radio sites and services in the proximity of the proposed Palmer Wind Farm Variation Application have been obtained from the ACMA Radio Communications Licence Database, covering an area of approximately 50 km radius from the centre of the provided Project Area. This distance is sufficient to capture any potential point-to-point links traversing the development area.

4.2 Radio system search

In August 2023, a search was conducted on the Australian Communications and Media Authority (ACMA) radio communications database to identify all licensed radio systems, operating on the frequency above 30 MHz, within 50 km radius from the centre of the Varied Project Area. Additional radio frequency information was accessed from The Australian Mobile Telecommunications Association's and the Radio Frequency National Site Archive. This search was conducted in accordance with the methodology stated in Section F of the Draft National Wind Farm Development Guidelines.

The results of the ACMA radio communications data extraction were reviewed and presented in graphical format depicting the radio site locations and ray-lines of the radio systems within the vicinity of the Varied Project Area. The map was refined to only show those radio sites and services with the potential impact for radio-interference caused by the Varied Project Area.

This method does not determine the impact on users of class licence services, as these services are operated on shared frequencies, can be used by member of public, and are not listed within the ACMA database.

4.3 Client data

The 'working layout' of the Varied Project was provided to GHD in October 2023 that shows the indicative layout of the 40 WTG (Appendix A) and their dimensions; rotor diameter of up to 180m, hub height of up to 130m and overall tip height of up to 220m.

4.4 Radio technology review

The following radio systems are considered in this assessment:

- Fixed point-to-point radio systems (Appendix C - Figure 1 & 2)
- Land Mobile Radio Systems (Appendix C - Figure 3)
- AM/FM Radio Narrowcast and Broadcast (Appendix C - Figure 4)
- Digital Television Broadcast (Appendix C - Figure 5)
- Mobile Telephone and Broadband Internet Broadcast (Appendix C – Figure 6, 14 – 19)
- Aircraft Communications Systems (Appendix C - Figure 7)
- Meteorological Radar (Appendix C - Figure 8)
- Defence Radio Systems
- Trigonometrical Systems
- Amateur Radio Systems (Appendix C - Figure 9)
- Maritime Radio Systems (Appendix C - Figure 10)
- Earth Stations (Appendix C - Figure 11)
- Scientific Radio Systems (Appendix C - Figure 12)
- Radiodetermination Station (Appendix C - Figure 13)

Radio services below 30 MHz, including AM Radio Broadcast services, were excluded from this assessment as the propagation characteristics of the radio wave does not rely on direct-ray transmission characteristic between the transmitting and receiving antennas e.g., AM radio broadcast services, operating within the Medium Frequency band of 300 kHz – 3 MHz, relies on ground wave (surface wave) propagation.

5. Radio technology assessment

5.1 Fixed radio systems

Wind turbines can heavily impact point-to-point radio systems, but the mitigation method is uncomplicated. To avoid the wind turbines downgrading or impacting the service, when determining final wind turbine locations, the turbines should not block the 200% Fresnel zone (second Fresnel Zone) exclusion zones of the radio links.

During the construction of the project, these zones should not be entered when lifting turbines into place. In the event that entering these zones is unavoidable, the link operator should be consulted prior to construction, allowing the link operator to anticipate the potential temporary service degradation and take steps to minimise or negate the impact on the communications link.

The point-to-point radio systems within 50 km radius of the centre of the Varied Project Area are shown in Figure 8.

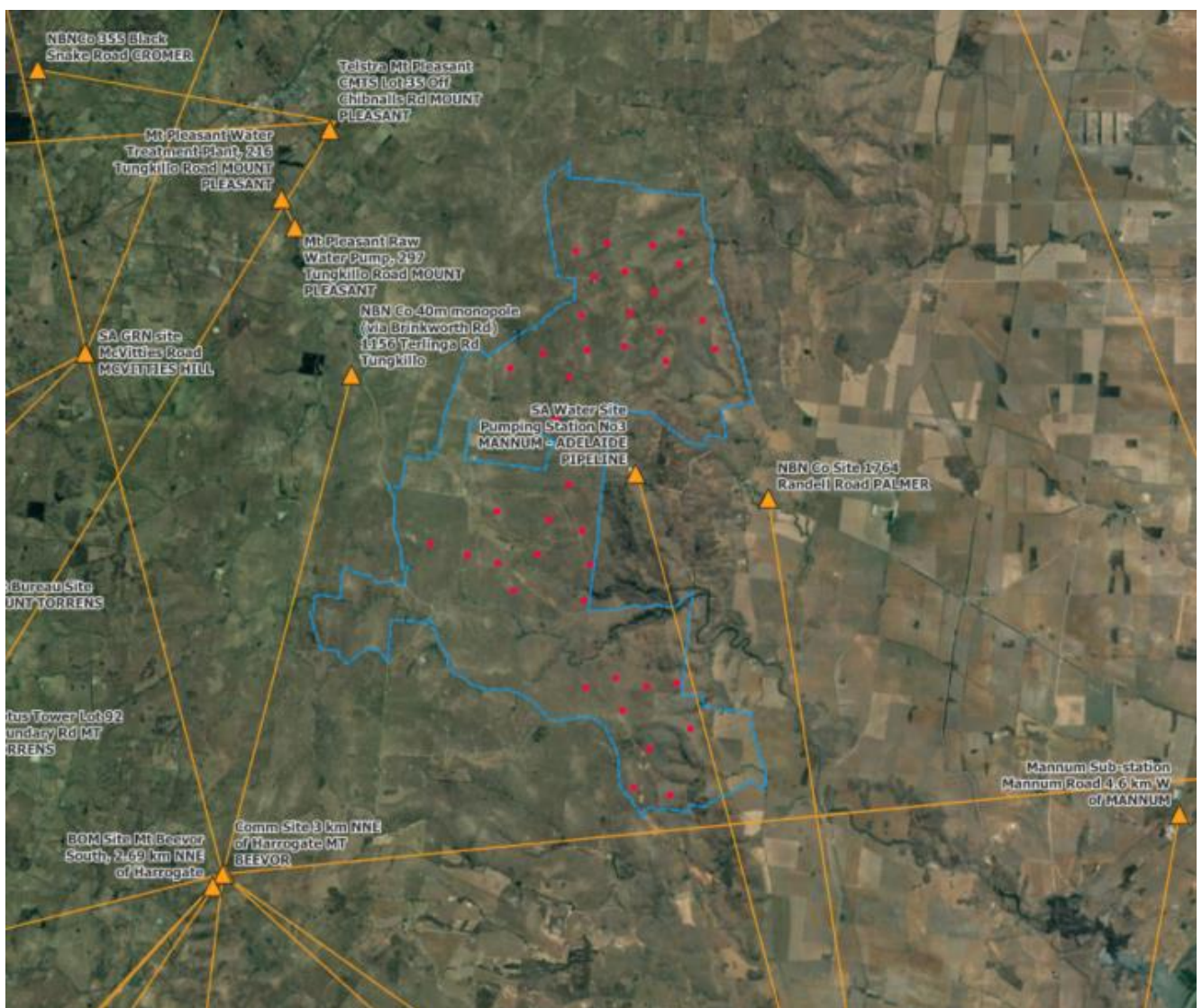


Figure 8 Fixed point-to-point radio links in wind farm vicinity (Varied Project)

Figure 9 shows the second Fresnel exclusion zones in the Varied Project Area. None of the WTG in the Varied Project layout sit within a point-to-point radio link second Fresnel exclusion zone, however the blade tip extents of two WTG, C27 and C32, are ~150m and ~120m respectively, away from link 1958469/1.

This link is operated by South Australian Water Corporation (SA Water) servicing the Pumping Station No3 Mannum – Adelaide Pipeline. SA Water has indicated that they have no ‘in-house’ experts that can analyse the potential impacts of the Varied Project, however GHD’s preliminary analysis is that the UHF radio link will be unaffected by the Varied Project due to the proximity of WTG in relation to the exclusion zone. Refer to Appendix D for more detail.

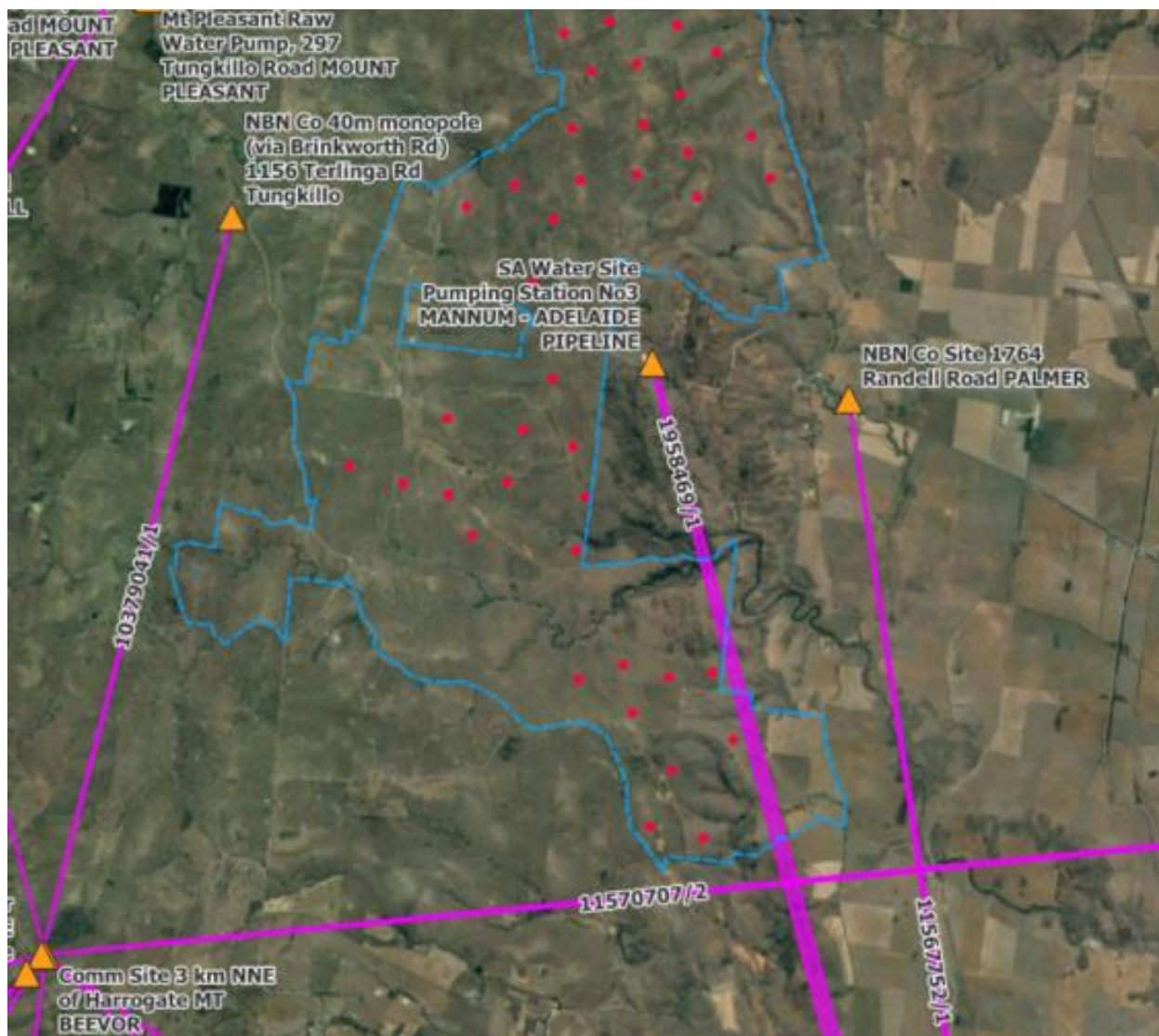


Figure 9 Fresnel exclusion zones of fixed point-to-point radio links in Varied Project Area vicinity

Other point-to-point radio link owners have been consulted with such as ElectraNet and NBN who have confirmed that there will be no impact to existing point-to-point links.

5.2 Land Mobile Radio Systems

A land mobile radio system (LMRS) is a person-to-person voice communication system with the transmitter and receiver in one unit. It can be stationary (base station units), mobile (installed in vehicles), or portable (handheld two-way radios). In Australia, most land mobile radio systems operate in the VHF Mid Band (70-87.5 MHz), VHF High Band (148-174 MHz), and the UHF 400 MHz band⁵. As the wavelengths at these frequencies are large, the radio signals are generally unaffected by wind turbines.

Most land mobile radio systems are used exclusively for public safety organisations such as police, firefighters, and other emergency response organisations. The systems are quite resilient as they usually operate on specific reserved frequencies.

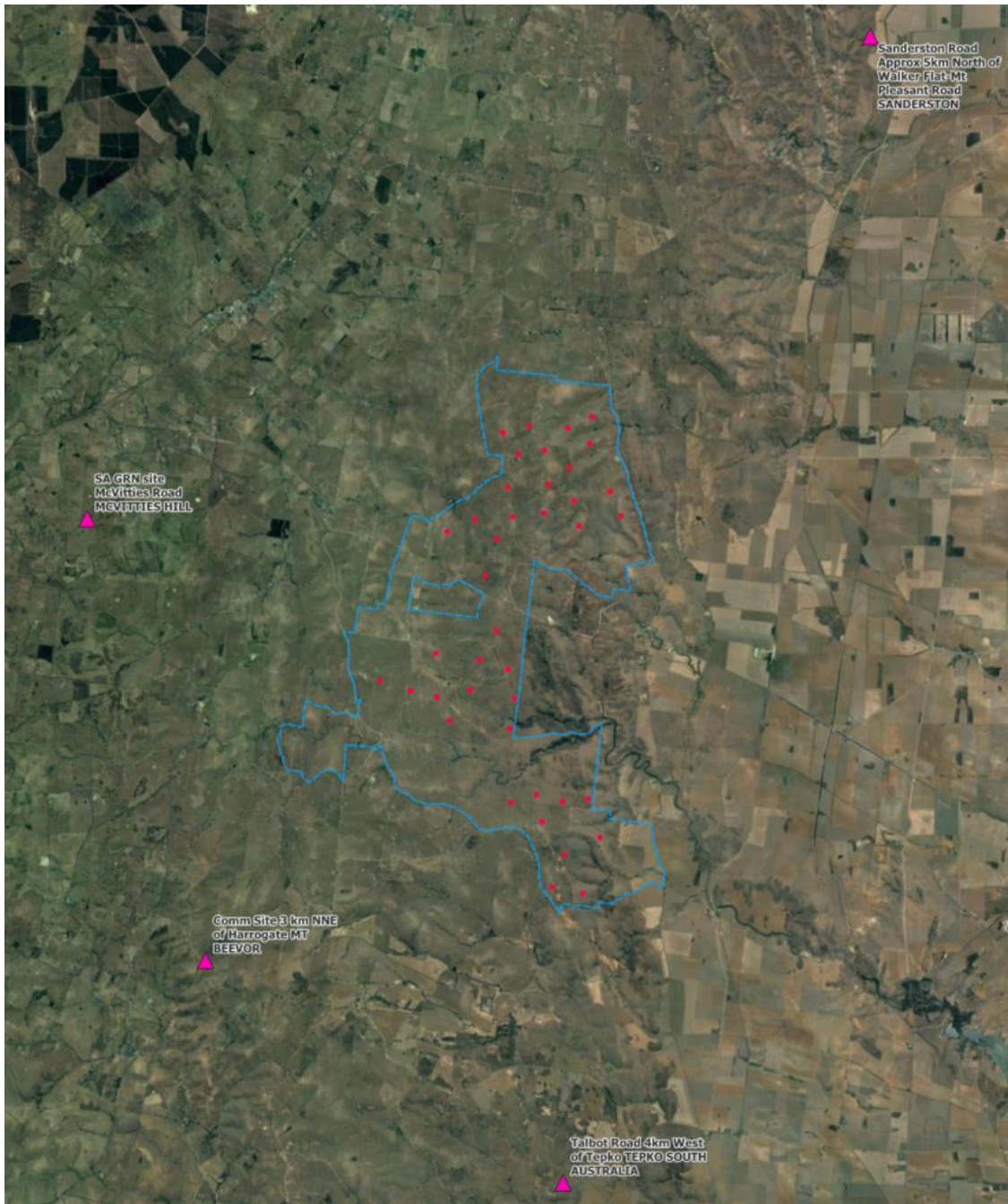


Figure 10 Land Mobile Radio transmitters in Varied Project Area vicinity

⁵ <https://www.acma.gov.au/technical-details-land-mobile-licences> Technical details for land mobile licences | Accredited persons | ACMA

The land mobile radio systems within 50 km radius of the Varied Project Area are shown on Appendix C – Figure 3 and are listed on Appendix B – Table 2. There are no LMR transmitters located within 20 km of the Varied Project turbine layout.

GHD does not foresee any electromagnetic interference impact that would degrade LMR signals as a result of the Varied Project.

5.3 AM / FM narrowcast and broadcast

Overseas and local experience indicates that radio reception is unlikely to be affected by operating wind farms. AM signals are not affected due to their low frequency resulting in a wavelength large enough relative to the turbine to not be affected by it. The majority of FM services transmitting in the vicinity of the wind farm are narrowcast services not focused on servicing the wind turbine area.

Broadcast FM services have smaller wavelengths than AM services and can be affected by turbines directly in the path of the receptor. There may be a minor impact / signal degradation for FM broadcast services for receivers in the immediate vicinity of the wind farm.

AM / FM narrowcast and broadcast sites within 50 km radius of the Varied Project Area are shown on Figure 11 and are listed on Appendix B – Table 3.

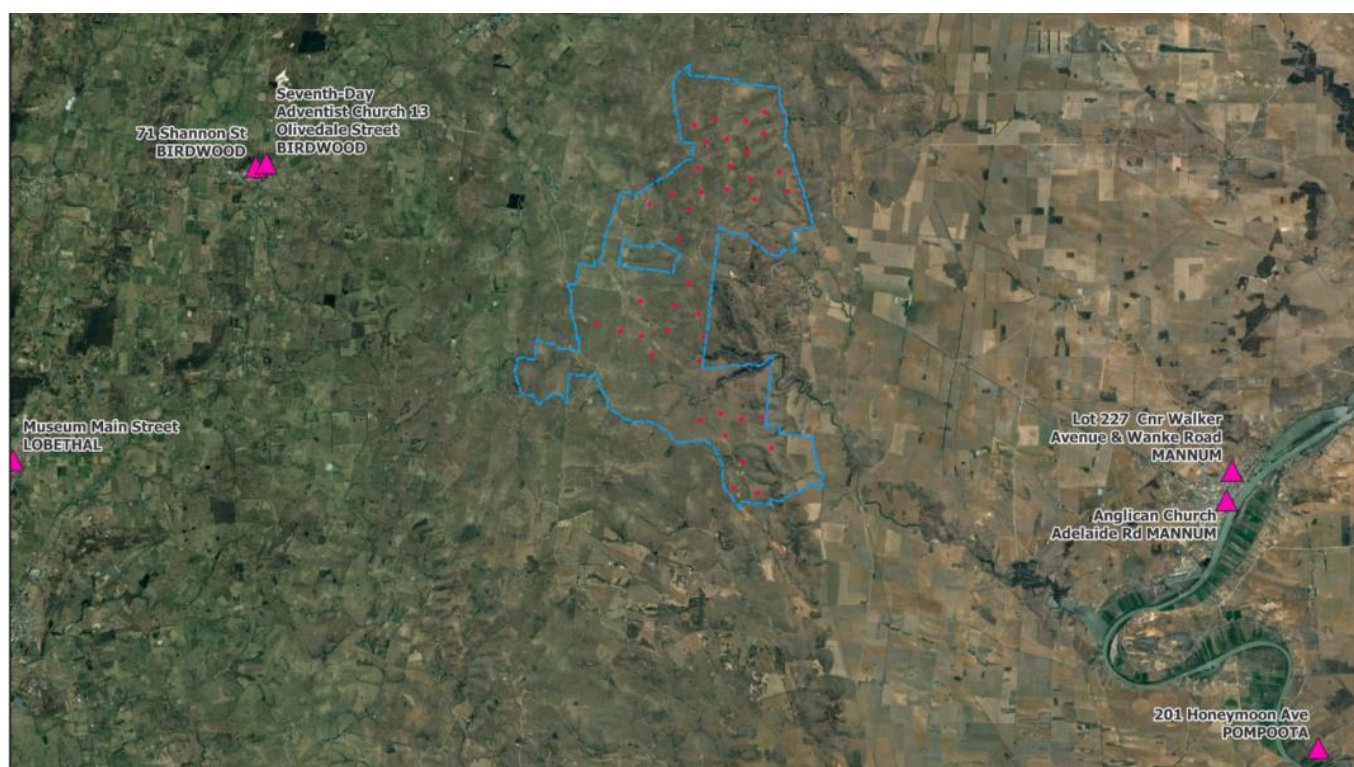


Figure 11 AM/FM narrowcast and broadcast transmitters in Varied Project Area vicinity

For any existing or approved dwellings as at the date of development approval that are within 3 km of any turbine, Tilt Renewables should undertake a pre- and post-construction assessment of the radio reception strength. We recommend this also extends to a drive of main roads in this radius. Refer to section 6.1 for more detail.

GHD does not foresee any electromagnetic interference impact that would degrade AM/FM narrowcast or broadcast signals as a result of the Varied Project.

5.4 Digital television broadcast

Wind farms have the potential to cause signal degradation to TV reception due to signal scattering, diffraction and near-field effects.

Digital television is not susceptible to visible “ghosting” degradation as was experienced from analogue broadcasts; any impact of reflections from the turbines would be a minor reduction of coverage at the limit of the service area. However, the signal can be degraded when the receivers are already at the border of the television reception zone or when the receiver is located within approximately 2 km of the wind farm, in the range affected by scattering of signals off the turbines. The most significant effect occurs when the receivers are near the wind farm and in the line of sight of the turbines but not in the line of sight of the television transmitter.

The zone of potential interference for a wind farm on digital television broadcast is the resultant total of the individual turbines’ effects. The International Telecommunications Union Recommendation ITU-R BT.1893⁶ states that impacts beyond 10 km from a wind farm are unlikely.

Television signal coverage is provided by transmitters at Adelaide (Crafers), which is approximately 45km from the centre of the Varied Project Area. The signal scattering effect from the wind turbines to radio signals from the Adelaide (Crafers) TV transmitter is shown in Figure 12.

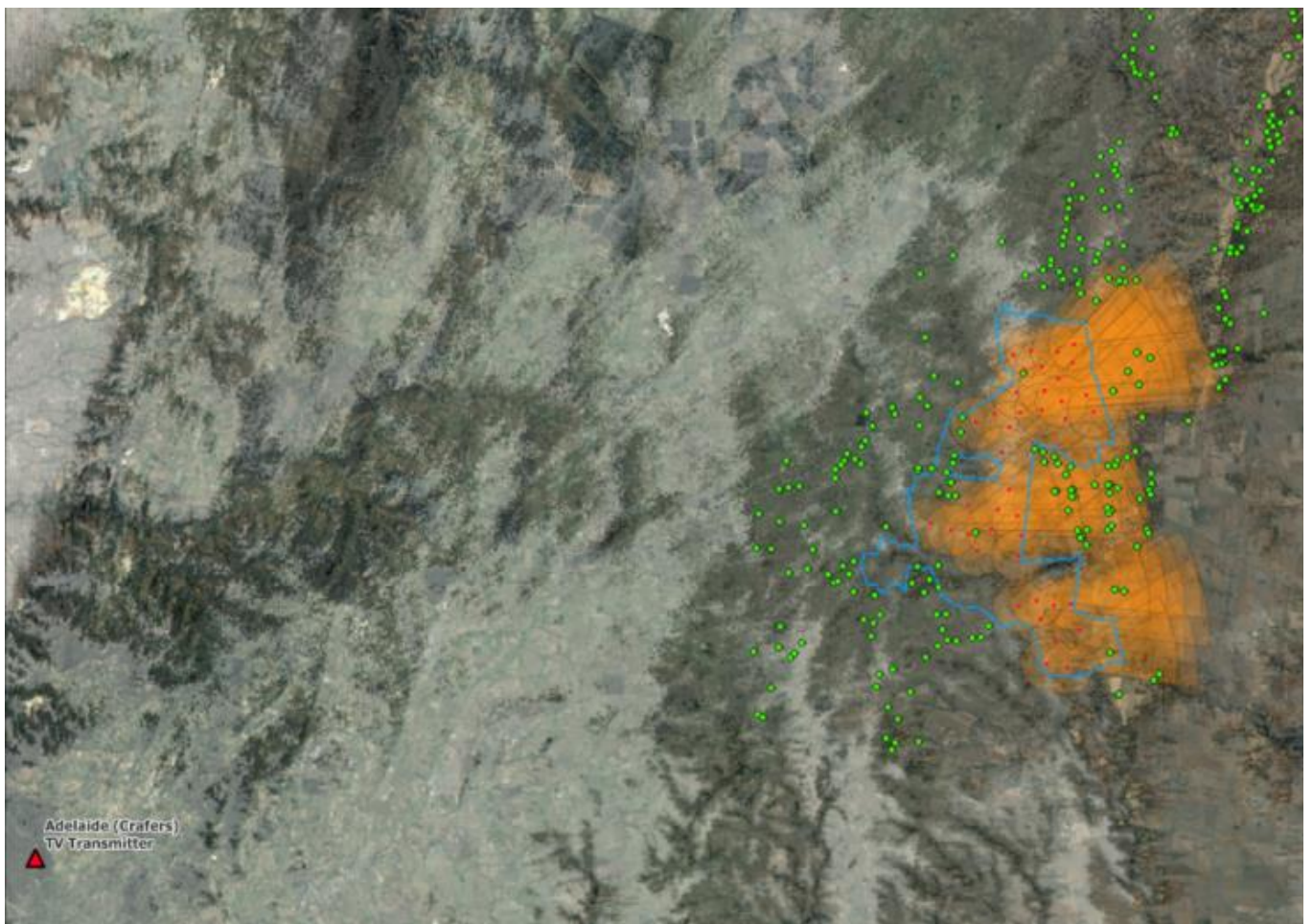


Figure 12 Adelaide (Mt Lofty / Crafers) television transmitter signal scatter zones

Television reception at dwellings located in the scattering zones may be adversely affected by the Varied Project. The orange shaded areas shown in Figure 12 indicate the areas where TV signal scattering could occur, if the

⁶ International Telecommunications Union Recommendation ITU-R BT.1893, Assessment of impairment caused to digital television reception by a wind turbine

dwellings shown in green have existing TV signal coverage as shown by the black and white overlay. The dwellings which may be impacted are either directly in the wind farm turbine area, or north-east of the wind farm.

The identified dwellings in the impact area will need service investigation to determine whether they are receiving digital television signal from the Terrestrial Digital Television System or Viewer Access Satellite Television System (VAST). If the dwellings are using VAST, there should be no impact to these dwellings. If dwellings are receiving TV signals from the Crafers/Mt Lofty transmitter, then it is recommended that a pre-construction TV signal survey is conducted at each location. This measurement can serve as a baseline to compare against a post-construction survey should signal degradation is perceived after the construction of the Varied Project.

5.5 Mobile telephone and broadband internet broadcast

Cellular mobile phone technologies provide robust communications in areas of significant obstruction via multipath communications between customer equipment and the network base station sites. The four carrier networks (Telstra, Optus, Vodafone and NBN fixed wireless) have transmitter sites covering the main population areas around the greater wind farm area.

Appendix C – Figure 6 shows Public Telecommunications Service (PTS) transmitters in the project vicinity.

Appendix C – Figure 14 shows the NBN fixed wireless coverage in the project vicinity.

Appendix C – Figure 15 shows the Optus 3G coverage in the project vicinity.

Appendix C – Figure 16 shows the Optus 4G coverage in the project vicinity.

Appendix C – Figure 17 shows the Telstra 3G coverage in the project vicinity.

Appendix C – Figure 18 shows the Telstra 4G coverage in the project vicinity.

Appendix C – Figure 19 shows the Vodaphone 3G and 4G coverage in the project vicinity.

GHD foresees that the Varied Project's effect on mobile telephone and broadband internet broadcast will be minimal.

Interference to NBN fixed wireless coverage is anticipated to be none based on consultation with NBNC. Whilst there is NBN Fixed Wireless coverage within the Varied Project Area, as shown in Figure 13, NBN Co has confirmed that none of the varied proposed turbine locations pose any risk of introducing a physical obstruction to the existing RF Path Profiles or boresight paths of existing NBN microwave links. Refer to Appendix D for further details.

Consultation with Optus has indicated that there will be no impact to Optus services as there are no existing sites or plans for new sites. Refer to Appendix D for further details.

Consultation with Telstra has indicated that there are no expected impacts to Telstra's Mobile network due to the Varied Project.

GHD has sought consultation from Vodaphone. As of January 2024, there has been no objection to the proposed wind farm development. GHD's preliminary analysis has shown that there will be nil to negligible impact to Vodaphone telecommunication assets.

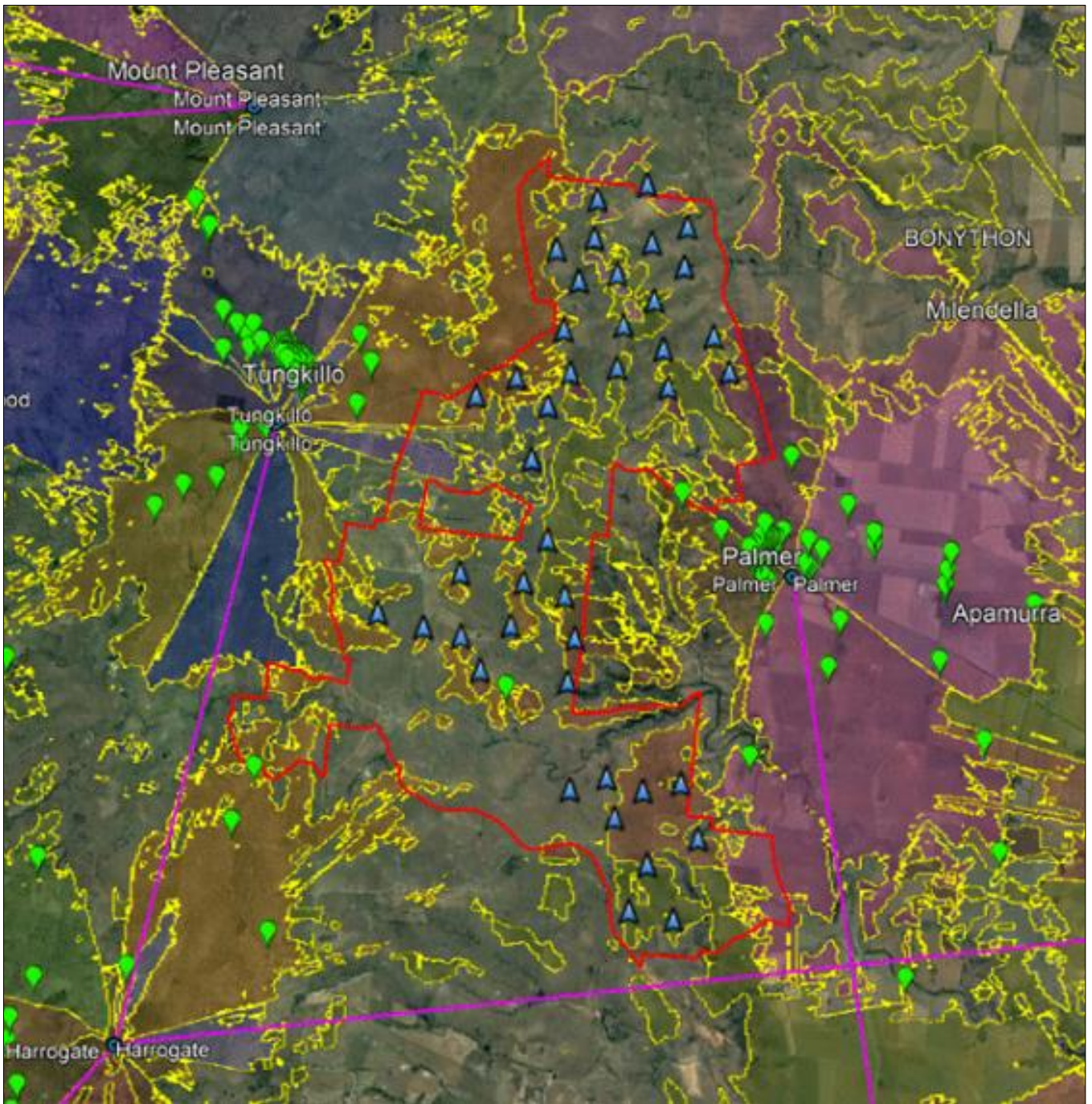


Figure 13 NBN Co fixed wireless coverage and client locations (Varied Project layout)⁷

⁷ Stakeholder consultation with NBN Co. took place in September 2023. Since this consultation, further design refinements have occurred including a reduction in the number of WTGs and the land within the Project Area. GHD has determined that NBN's analysis and response is still valid against the final turbine layout and Project design.

5.6 Aircraft communications systems

Wind farms have the potential to disturb navigational signals, which can distort the accuracy of the aircraft positioning systems and introduce 'false targets'.

There are numerous aircraft communications systems within 50 km radius of the Varied Project Area. The nearest aircraft communication system to the project site is the 'Telstra site 6 km NE of Williamstown TRIAL HILL', which is approximately 26km from the centre of the Varied Project Area. This is shown in Appendix C – Figure 7 and listed on Appendix B – Table 6.

GHD foresees that the Varied Project's effect on navigation signals will be nil to negligible.

5.7 Meteorological radar

The meteorological radar is a critical radio infrastructure operated by the Bureau of Meteorology (BoM). It provides data to be computationally analysed and give a precise prediction on the wind speeds and weather conditions in sight of the radar. The radar typically has capability to indicate the weather at 250 km or more. The meteorological radar is also called the weather watch radar.

There are no meteorological radars within 50 km radius of the Varied Project Area, however, the closest radar, Adelaide (Buckland Park) is ~65km away. The Varied Project's potential impact to the radar is shown on Figure 14.

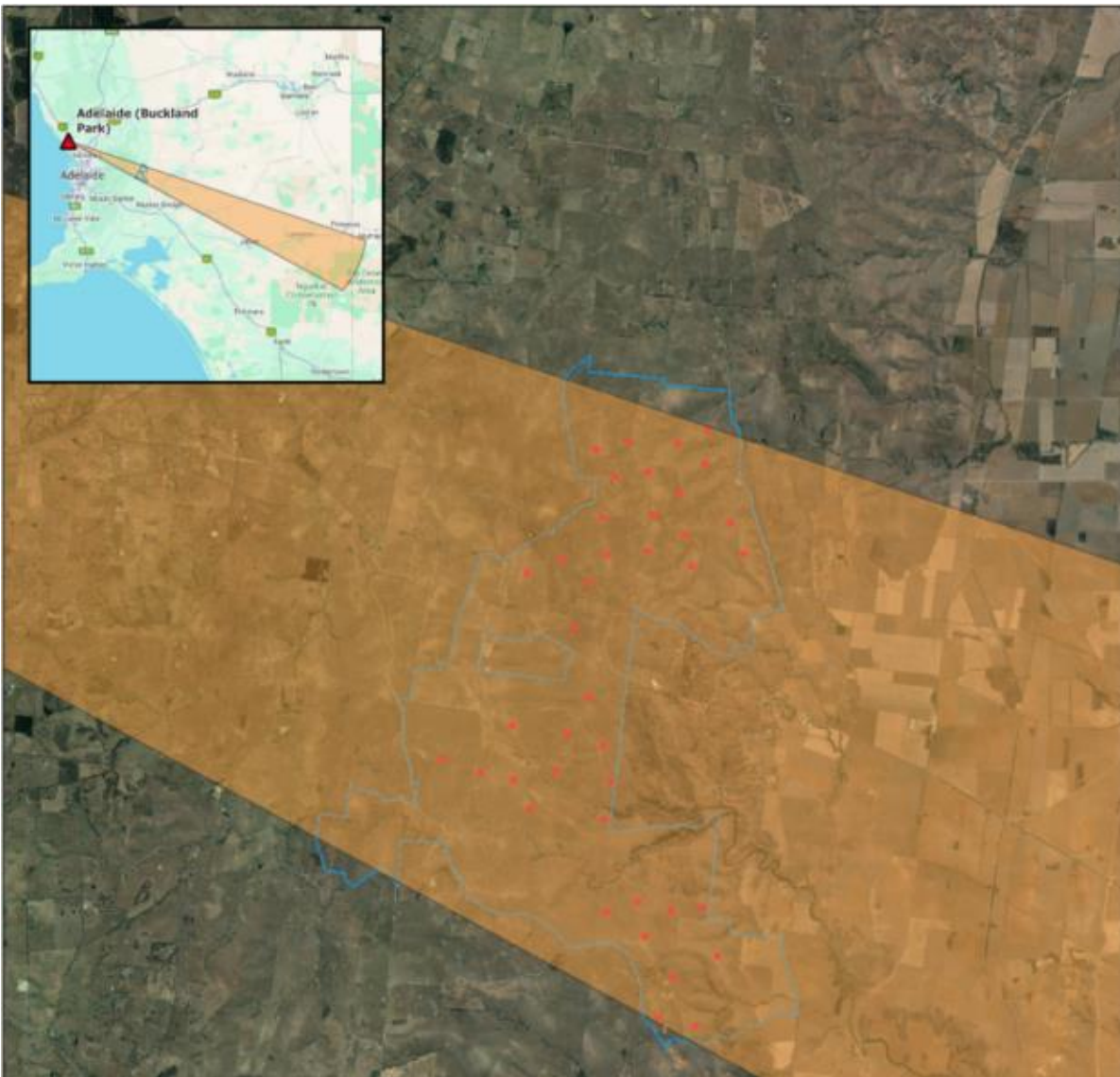


Figure 14 BoM weather watch radar

Feedback from BoM has indicated that the Varied Project is high risk to the Bureau's radiocommunication assets, including its weather radar network, and recommended options that can mitigate these risks.

Advice received 21 December 2023 from BoM indicates that:

- Mannum would likely lose weather radar coverage from the Adelaide radar.
- Thunderstorms and severe weather events from the east of the Mannum township are rare. When this occurs, this area can also be monitored by the Mt. Gambier and Rainbow radars.
- The most impacted service is expected to be rainfall estimation, which feeds into flood forecasting.
- BoM recommend the installation of rain gauges and automatic weather stations to both the East and West of the wind farm to compensate for predicted lost data. Quantity and locations are to be determined.
- BoM is eager to continue the conversation and work with Tilt Renewables to minimise and manage the impacts of the Varied Palmer Wind Farm Project on the regional radar service.

Tilt Renewables is currently liaising with BoM to confirm the appropriate mitigation strategies that will be deployed. Refer to Appendix D for further details.

5.8 Defence radio systems

Defence radio systems are not required to be recorded in the ACMA radio communications database and therefore direct consultation with the Department of Defence is required to determine the impact of the wind farm on the Defence's operations around the wind farm area.

Typically, the Defence Spectrum Office (DSO), raises the following concerns to Defence HF transmissions and wind farm development projects:

Defence use HF in both a fixed and itinerant nature on their ranges and bases. They can use this equipment anywhere in country, but typical high tempo use of the itinerant variation could be at Defence range boundaries.

As the wind farm conforms to AS/NZS 61000.6.4:2012⁸, the wind farm will reduce, as much as is practicable, the emission of HF noise from the turbines, substation(s) and electronic control equipment.

GHD has sought consultation with the Land Planning and Regulation Directorate, Estate Planning Branch, and Security and Estate Group at the Department of Defence. As of January 2024, there has been no objection to the proposed wind farm development by Defence. GHD's preliminary analysis has shown that there will be nil to negligible impact to ACMA registered Defence telecommunication transmitters.

5.9 Trigonometric systems

Trigonometrical systems operate across Australia and are operated and maintained by Geoscience Australia. The GNSS networks of approximately 100 Continuously Operating Reference Stations (CORS) across the Australian region and the South Pacific, including: Australian Regional GNSS Network (ARGN), South Pacific Regional GNSS Network (SPRGN), and AuScope Network.

GHD foresees that the Varied Project's effect on trigonometric systems will be nil as there are no assets in the vicinity. Consultations with Geosciences Australia have not identified any impact to trigonometric systems by the Varied Project (Appendix D).

5.10 Amateur radio systems

Amateur radio can consist of transmitters ranging from HF to UHF spectrum in specific bands reserved for citizen use by licenced individuals. Fixed amateur stations are registered on the ACMA database however the specific frequencies of the transmissions can vary depending on the type of communications being used at the time.

The amateur radio systems within 50 km radius of the Varied Project are shown in on Appendix C – Figure 9 and are listed on Appendix B – Table 7.

GHD foresees that the Varied Project's effect on amateur radio systems will be nil to negligible.

5.11 Maritime radio systems

The Varied Project location is sited inland to the VHF and HF maritime transmitter locations.

The maritime radio systems within 50 km radius of the Varied Project Area are shown in on Appendix C – Figure 10 and are listed on Appendix B – Table 8.

GHD does not foresee any electromagnetic interference impact that would degrade maritime radio systems.

5.12 Earth Stations

Earth stations are radio transmission systems which transmit and receive signals between the ground (Earth) and communication satellites in orbit. Earth station antennas face north in the southern hemisphere for communication with geostationary satellites and can face any direction for communication to low/medium earth orbit satellites.

⁸ AS/NZS 61000.6.4:2012, Electromagnetic compatibility (EMC) Generic standards - Emission standard for industrial environments, Standards Australia, 2012

The Earth stations within 50 km radius of the Varied Project Area are shown in Appendix C – Figure 11 and are listed on Appendix B – Table 9.

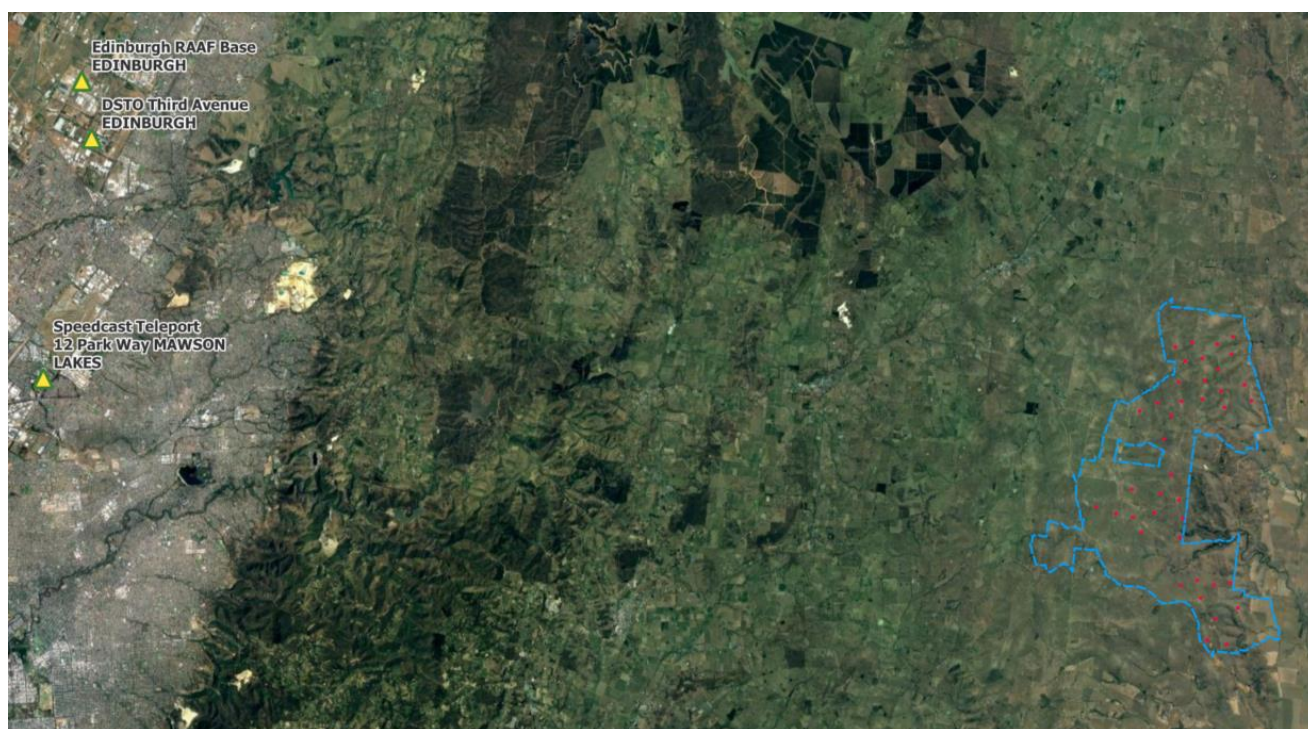


Figure 15 Satellite earth stations in Varied Project Area vicinity

GHD foresees that the Varied Project's effect on earth stations will be nil to negligible.

5.13 Scientific radio systems

Scientific Radio Systems are reserved for research, teaching, demonstration, trialling new technologies or for repair and maintenance purposes. Scientific Radio Systems are registered on the ACMA database, however the specific frequencies can vary depending on the use case and/or license.

The scientific radio systems within 50 km radius of the Varied Project Area are shown in on Appendix C – Figure 12 and are listed on Appendix B – Table 10.

GHD foresees that the Varied Project's effect on scientific radio systems will be nil to negligible.

5.14 Radiodetermination station

Radiodetermination stations are radio transmission systems which are used determine location, velocity, or other characteristics of an object. These systems are commonly used in various fields such as aviation, maritime navigation, military applications etc.

The Radiodetermination stations within 50 km radius of the Varied Project Area are shown in Appendix C – Figure 13 and are listed on Appendix B – Table 11.

GHD foresees that the Varied Project's effect on Radiodetermination stations will be nil to negligible.

5.15 50Hz transmission lines

The main sources of electromagnetic fields associated with wind farms are the substations and transmission lines. The transmission line and substation will be equivalent to others in the electricity transmission network, with comparable electromagnetic field levels.

Designing the electrical infrastructure to Australian Standards will ensure safe levels of electromagnetic radiation are achieved.

6. Summary and Mitigation Strategies

The Varied Project layout is a reduced quantity of turbines compared to the previous assessment in 2018. The impact of the Varied Project to radio and communication infrastructure is reduced compared to the previous assessment in 2018.

GHD has performed an analysis of ACMA register telecommunications assets and has identified no wind turbines that sit within a point-to-point radio link Fresnel exclusion zone. Other point-to-point radio link owners have been consulted with such as ElectraNet and NBN who have confirmed that there will be no impact to existing point-to-point links.

GHD foresees that the proposed windfarm will have nil to negligible effect on navigation signals, trigonometric systems, amateur radio systems, earth stations, scientific radio systems, and radiodetermination stations.

GHD foresees that the proposed wind farm development's effects on mobile telephone and broadband internet broadcast will be minimal, and interference to NBN fixed wireless coverage is anticipated to be none. Consultation with Telstra and Optus has indicated no expected impact to either network.

GHD does not foresee any electromagnetic interference impact that would degrade LMR, AM/FM narrowcast, or maritime radio systems.

Television reception at dwellings located in the Project Area and within 5 km to the north-east of the windfarm may be impacted by the proposed windfarm development. Strategies to mitigate the impact to television reception in these locations have been provided.

All types of radio communications can benefit from general mitigation through the design of the turbine and the choice of materials used in its construction.

The turbines have been spaced to mitigate the effect of creating a "virtual wall" of turbines. A virtual wall is an electromagnetic barrier between a TV transmitter and households serviced by that transmitter.

In addition, wind farm developers should utilise (wherever practicable) equipment complying with the Electromagnetic Emission Standard, AS/NZS 61000.6.4:2012 to avoid the creation of excessive RF noise at frequencies that interfere with radio communication signals. Electrical insulation and shielding should be considered in the turbine design to reduce the RF noise emitted from the electronic control systems located in the nacelle.

6.1 Mitigation Strategies

Table 3 provides a summary of the findings from section 5 inclusive of Mitigation Strategies and other recommendations.

Table 3 Summary of Mitigation Strategies and recommendations

Impact	Service Mitigation Strategy	Recommendation
Fixed Point-to-Point Radio Links		
Nil to negligible anticipated impact to services.	Nil	Not required
Land Mobile Radio Systems		
Nil to negligible anticipated impact to services.	Nil	Not required
Digital Television Broadcast		

Impact	Service Mitigation Strategy	Recommendation
<p>Minor to no impact anticipated to services.</p>	<p>The wind farm's impact on digital TV services can be quantified by recording and comparing pre-construction baseline signal measurements and post-construction signal level measurements in and around the wind farm areas by an independent radio monitoring specialist; however, the mitigation measures remain the same.</p> <p>The first mitigation strategy can be performed from the user side by realigning the receptor antenna more directly towards the existing transmitter, repositioning or replacing existing antennas to higher gain alternatives can also remedy the majority of forward scatter signal degradation effects.</p>	<p>Tilt Renewables should undertake a pre- and post-construction assessment of the television reception strength at the location of any existing or approved dwellings as at the date of development approval that are within 3 km of any turbine, or within the orange scatter zones within the relevant Figure, which should be sufficient to capture any expected issues. The assessments should be undertaken by an independent television and radio monitoring specialist and include testing at locations to be determined by the television and radio monitoring specialist to enable the average television and radio reception strength to be determined.</p> <p>If the post-construction assessment establishes an unacceptable increase in interference to reception as a result of the wind farm, as determined by the independent television and radio monitoring specialist, measures to restore the affected reception to preconstruction quality should be undertaken.</p>
<p>AM / FM Narrowcast and Broadcast</p>		
<p>Minor to no impact anticipated to services.</p>	<p>Mitigation options may include installing high-quality antennas or amplifiers at affected dwellings, increasing broadcast signal strength from the transmission tower, moving the tower to a new location further away from the turbines, or installing a signal repeater or additional tower on the opposite side of the wind farm</p>	<p>Tilt Renewables should undertake a pre- and post-construction assessment of the radio reception strength at the location of any existing or approved dwellings as at the date of development approval that are within 3 km of any turbine, and general readings along major roadways within this range. The assessments should be undertaken by an independent television and radio monitoring specialist and include testing at locations to be determined by the television and radio monitoring specialist to enable the average television and radio reception strength to be determined.</p> <p>If the post-construction assessment establishes an unacceptable increase in interference to reception as a result of the wind farm, as determined by the independent television and radio monitoring specialist, measures to restore the affected reception to pre-construction quality should be undertaken.</p>
<p>Mobile Telephone and Broadband Internet Broadcast</p>		
<p>Nil to negligible anticipated impact to services NBN Co, Telstra and Optus services. As of January 2024, there has been no objection to the proposed wind farm development by Vodaphone.</p>	<p>Nil.</p>	<p>Not required</p>
<p>Meteorological Radar</p>		

Impact	Service Mitigation Strategy	Recommendation
Potential high-risk impact to BoM radiocommunication assets including its weather watch radar services.	BoM provided clear recommendations that will mitigate this risk including the installation of rain gauges at locations to be determined by BoM. Tilt Renewables will continue to liaise with BoM to mitigate any risk and manage any residual impacts of the Varied Project on the regional radar service.	Confirm approach with BoM and proceed to understand and allocate costs for remediation.
Aircraft Communications Systems		
Nil to negligible anticipated impact to services.	Nil.	Not required
Defence Radio Systems		
Nil to negligible anticipated impact to services. As of February 2024, there has been no objection to the proposed wind farm development by Defence.	Nil.	Not required.
Trigonometric Systems		
Nil to negligible anticipated impact to services.	Nil.	Not required
Amateur Radio Systems		
Nil to negligible anticipated impact to services.	Nil.	Not required
Maritime Radio Systems		
Nil to negligible anticipated impact to services.	Nil.	Not required
Earth Stations		
Nil to negligible anticipated impact to services.	Nil.	Not required
Scientific Radio Systems		
Nil to negligible anticipated impact to services.	Nil.	Not required
Radiodetermination Stations		
Nil to negligible anticipated impact to services.	Nil.	Not required
50Hz Transmission Lines		
Negligible to minor manageable impact.	Design as per Australian Standards, ElectraNet (275 kV) standards, and SA Power Networks (33kV) standards.	Tilt Renewables should consult with ElectraNet and SA Power Networks to ensure transmission lines and substations are designed to the relevant standards.

6.2 Construction approach

OEM providers may adjust the WTG layout to incorporate the mitigation strategies from this study, other impact studies and/or to optimise energy yields. If the WTG layout is changed, it is recommended to undertake a review of the changes and update this report with the updated findings.

Appendices

Appendix A

Turbine locations

Turbine locations (Varied Project)

Turbine ID	Easting	Northing
B10	328370.628	6146323.35
B13	329075.627	6144811.511
B18	327280.627	6144619.511
B51	331075	6144785
B22	329990	6144490
B25	328248.627	6144708.499
B29	327855.627	6144117.511
B40	330278.146	6147338.15
B41	329651.628	6147037.511
B42	328631.516	6147072.819
B46	330236.051	6146643.615
B47	329051.237	6146448.007
B45	327960.628	6146881.511
B52	329710	6146010
B55	326562.627	6144282.511
B56	329175	6145555
B58	328113.628	6145471.511
B60	330782.14	6145406.694
B62	329845.8029	6145151.376
C01	327577.627	6143168.511
C03	327886.039	6141749.2
C04	327469.627	6140982.511
C05	328209.627	6140752.511
C06	327247.627	6140206.511
C08	328401.627	6140002.511
C09	324881.627	6140393.511
C10	326328.627	6141129.511
C13	326722.627	6139399.511
C14	326371.627	6140000.511
C15	325692.627	6140149.511
C17	328283.268	6139215.797
C21	330259.626	6134978.51
C24	329015.676	6137521.723
C26	329697.192	6137350.823
C27	330350.626	6137431.51
C29	328360.626	6137300.511
C30	329173.488	6136816.423
C32	330678.932	6136438.981
C34	329771.787	6135975.84

Turbine ID	Easting	Northing
C38	329459.182	6135129.025

Appendix B

**Radio sites in vicinity of wind farm ACMA
details**

Fixed Point-to-Point Transmitters with exclusion zones of concern

Radio Site A Radio Site B	Site ID	Licence No.	Licensee	Site Location A Site Location B	Operating Frequency
SA Water Site Pumping Station No3 MANNUM - ADELAIDE PIPELINE SA Water White Hill Tanks Murray Bridge	23437	1958469/1	South Australian Water Corporation	-34.84985, 139.133642 - 35.141149, 139.228169	404.225 MHz

Land Mobile Transmitters

Site Name	Site ID	Licence No.	Licensee	Location	Operating Frequency
Sanderston Road Approx 5km North of Walker Flat-Mt Pleasant Road SANDERSTON	139959	1938896/1	J.K Starkey & S.J Starkey & T.J Starkey	-34.713138, 139.223688	463.125 GHz
SA GRN site McVitties Road MCVITTIES HILL	501602	10139602/1 10139603/1 10139604/1 10139605/1 1325845/1 1509938/1 1509939/1 1509940/1 1509941/1 9937760/1 1509049/1	South Australian Government Radio Network	-34.825912, 139.001124	414.75 GHz 415 GHz 418.75 GHz 422 GHz 416.75 GHz 413.25 GHz 415.25 GHz 415.75 GHz 416.25 GHz 417.25 GHz 148.8125 GHz
Comm Site 3 km NNE of Harrogate MT BEEVOR	23530	10193340/1 10193341/1 10193342/1 10193343/1 10193344/1 10193345/1 10193346/1 10193347/1 1567630/1 387682/1 387681/3	South Australian Government Radio Network St. John Ambulance Australia Incorporated Antech Electronics	-34.929104, 139.034726	414.925 GHz 420.175 GHz 420.425 GHz 420.675 GHz 421.425 GHz 421.675 GHz 421.925 GHz 422.175 GHz 470.4 GHz 474.025 GHz 476.6125 GHz
Talbot Road 4km West of Tepko TEPKO SOUTH AUSTRALIA	9014003	1938502/1	D S and B M Talbot	-34.980975, 139.136397	471.2 GHz

Digital Television Broadcast and AM/FM Narrowcast and Broadcast

Site Name	Site ID	Licence No.	Licensee	Location	Operating Frequency
201 Honeymoon Ave POMPOOTA	142584	9862135/1	United Christian Broadcasters Australia Limited	-34.987998, 139.341895	87.8 MHz

Site Name	Site ID	Licence No.	Licensee	Location	Operating Frequency
71 Shannon St BIRDWOOD	136616	1192064/1	United Christian Broadcasters Australia Limited	-34.818039, 138.962931	87.6 MHz
Anglican Church Adelaide Rd MANNUM	305112	1138981/1	United Christian Broadcasters Australia Limited	-34.915581, 139.309224	87.6 MHz
Broadcast Site 62 Mt Crawford Road Williamstown	10014308	10606535/1	United Christian Broadcasters Australia Limited	-34.675, 138.8982	87.8 MHz
Cnr Britannia Rd & Easter St NAIRNE	304506	1138712/1	Dalebank Pty. Ltd.	-35.039238, 138.914277	87.8 MHz
cnr Lyndoch Valley and Kreig Roads LYNDPOCH	140453	1902523/1	United Christian Broadcasters Australia Limited	-34.619975, 138.89262	87.6 MHz
Lot 227 Cnr Walker Avenue & Wanke Road MANNUM	134024	11015314/2	Seventh-day Adventist Church (Australian Union Conf.) Ltd	-34.90693, 139.311111	88 MHz
Museum Main Street LOBETHAL	304507	1138713/1	David Bruce	-34.903873, 138.876341	88 MHz
Seventh-Day Adventist Church 13 Olivedale Street BIRDWOOD	137845	1138714/1	Seventh-Day Adventist Church (SA Conference) Ltd	-34.817011, 138.966717	88 MHz

Mobile Telephone and Internet Broadcast Sites

Site Name	Site ID	Licence No.	Licensee	Location	Operating Frequency
Optus Eden Valley KEYNES HILL	500901	10094269/106 1136358/1	Optus Mobile Pty Limited	-34.623324, 139.098614	2.1425 GHz 2.1475 GHz 947.6 MHz
Optus/Telstra Site Lot 1 Springton Rd WILLIAMSTOWN	500948	11870552/4 1136358/1 1136355/1	Optus Mobile Pty Limited Vodafone Australia Pty Limited	-34.666082, 138.901044	939.2 MHz 947.6 MHz 956.2 MHz
Optus Monopole off L. Staricks Road SPRINGTON	9012237	1136358/1	Optus Mobile Pty Limited	-34.702666, 139.078078	947.6 MHz
Vodafone Site 3 km ESE of Kersbrook MT GOULD	501000	1136358/1 1136355/1	Optus Mobile Pty Limited Vodafone Australia Pty Limited	-34.790412, 138.88144	947.6 MHz 956.2 MHz

Site Name	Site ID	Licence No.	Licensee	Location	Operating Frequency
Telstra Mt Pleasant CMTS Lot 35 Off Chibnalls Rd MOUNT PLEASANT	133525	1136358/1	Optus Mobile Pty Limited	-34.781797, 139.059899	947.6 MHz
SA GRN site McVitties Road MCVITTIES HILL	501602	1136358/1	Optus Mobile Pty Limited	-34.825912, 139.001124	947.6 MHz
CMTS site off Magarey Road nr Mount Torrens GOAT HILL	100984	1136355/1	Vodafone Australia Pty Limited	-34.850229, 138.977831	956.2 MHz
Optus Tower Lot 92 Boundary Rd MT TORRENS	9000710	1136358/1	Optus Mobile Pty Limited	-34.895168, 138.975362	947.6 MHz
Optus Monopole Lot 1 Ridge Road WOODSIDE	9008618	1136358/1 1136355/1	Optus Mobile Pty Limited Vodafone Australia Pty Limited	-34.947449, 138.891094	947.6 MHz 956.2 MHz
Mannum Central 4-6 Walker Avenue MANNUM	9021933	10094269/106 1136358/1	Optus Mobile Pty Limited	-34.906922, 139.310901	2.1425 GHz 947.6 MHz
Optus Site Nairne Section 5297 & others Piney Ridge Road NAIRNE	135911	11870552/4 1136358/1	Optus Mobile Pty Limited	-35.022295, 138.915939	939.2 MHz 947.6 MHz
Major Radio Site Mount Summit Road MOUNT BARKER	23483	11870552/4 1136358/1	Optus Mobile Pty Limited	-35.066685, 138.921342	939.2 MHz 947.6 MHz
Mypolonga Allotment 51 D50600 Wool Shed Road MYPOLONGA	10026003	10094269/106 11692269/7 1136358/1	Optus Mobile Pty Limited	-35.03435, 139.33975	2.1475 GHz 2.1425 GHz 939.2 MHz 939.2 MHz 947.6 MHz

Aircraft Communication Systems

Site Name	Site ID	Licence No.	Licensee	Location	Operating Frequency
ABC Building 85 North East Road COLLINSWOOD	22777	402551/1	Australian Broadcasting Corporation	-34.888076, 138.613894	128.9 MHz
Adelaide Soaring Club Gawler Aerodrome GAWLER	23062	215818/1	ADELAIDE SOARING CLUB INC	-34.60324, 138.721117	122.5 MHz 122.7 MHz 122.9 MHz
Airservices ATIS Antenna NDB Site, Parafield Airport PARAFIELD	10012065	10560818/1	Airservices Australia	-34.796594, 138.630624	120.9 MHz
Airservices Australia Site Ridge Road GREENHILL	23112	10336265/2 10336266/2 11751860/1	SITA Technologies Australia Pty Limited	-34.952235, 138.717026	131.55 MHz 136.975 MHz 134.5 MHz

Site Name	Site ID	Licence No.	Licensee	Location	Operating Frequency
Airservices VHF Tower Radar Site, Ridge Road GREENHILL	9021589	1108569/1 1949985/1 1949986/1 1949987/1	Airservices Australia	-34.952052, 138.717388	133.95 MHz 118.2 MHz 130.45 MHz 128.6 MHz
ATC Tower RAAF Base EDINBURGH	100206	1224372/1	Department of Defence	-34.710839, 138.625296	121.05 MHz
ATC Transceiver Building RAAF Base EDINBURGH	22992	493551/1 1110016/1 493550/1 1225587/1 1948680/5	Department of Defence	-34.706283, 138.630241	134.8 MHz 118.3 MHz 134.1 MHz 127.25 MHz 126.25 MHz
Control Tower PARAFIELD AIRPORT	22904	1931744/1 1931745/1 1931746/1 1931747/1	Airservices Australia	-34.790857, 138.636422	118.7 MHz 119.9 MHz 120.9 MHz 124.6 MHz
Glide Slope Edinburgh RAAF Base EDINBURGH	100209	1135359/1	Department of Defence	-34.697328, 138.61577	330.2 MHz
Hangar 54 Kittyhawk Lane PARAFIELD AIRPORT	22927	405789/2	Flight Training Adelaide Pty Ltd	-34.789231, 138.633956	129.55 MHz
Localiser Edinburgh RAAF Base EDINBURGH	100207	1135359/1	Department of Defence	-34.719875, 138.612995	110.7 MHz
Middle Marker Edinburgh RAAF Base EDINBURGH	100208	1135359/1	Department of Defence	-34.684804, 138.619339	75 MHz
Outer Marker Edinburgh RAAF Base EDINBURGH	100210	1135359/1	Department of Defence	-34.624741, 138.630217	75 MHz
RAAF Base EDINBURGH	137960	1908159/1	Department of Defence	-34.709737, 138.630721	129.175 MHz
Telstra site 6 km NE of Williamstown TRIAL HILL	24173	1191234/1 1191306/1 1191307/1 1191308/1	Airservices Australia	-34.654719, 138.953374	118.95 MHz 135.45 MHz 127.05 MHz 125.3 MHz

Meteorological Radar

Site Name	Site ID	Licence No.	Licensee	Location	Operating Frequency
Met Bureau Site cnr Shellgrit & Applebee Rds BUCKLAND PARK	306141	1329003/2 10357238/1	Bureau of Meteorology	-34.616962, 138.468366	2.86 GHz

Amateur Radio System

Site Name	Site ID	Licence No.	Licensee	Location	Operating Frequency
Barossa Amateur Radio site Rifle Range Road MT KITCHENER	152369	1140725/3 248615/2	Barossa Amateur Radio Club Inc	-34.571977, 139.005935	144.456 MHz 432.456 MHz 439.8 MHz 50.456 MHz 1.296 GHz 145.175 MHz 146.825 MHz
Major radio site via Gumeracha Road Lobethal NITSCHKE HILL	23452	11014448/2	SR Thiele	-34.882778, 138.87125	146.775 MHz
Comm Site 3 km NNE of Harrogate MT BEEVOR	23530	1509203/2	Lower Murray Amateur Radio Club	-34.929104, 139.034726	146.875 MHz
Summit Fire Track MOUNT BARKER	141043	1958039/1	TJ Harwood	-35.070985, 138.921859	146.725 MHz
Recreational area 20 Thomas Street MURRAY BRIDGE	10009021	1977508/5	John Nunan	-35.125892, 139.264287	145.4 MHz
VK5RMU 22 Uplands Drive Murray Bridge	10030879	11748980/1	Peter Fauth	-35.125134, 139.28533	438.9125 MHz

Maritime Radio Systems

Site Name	Site ID	Licence No.	Licensee	Location	Operating Frequency
Fire Watch Tower Summit MT LOFTY	23121	1929637/1	Department of Planning Transport and Infrastructure	-34.974597, 138.709155	156.8 MHz

Earth Stations

Site Name	Site ID	Licence No.	Licensee	Location	Operating Frequency
Edinburgh RAAF Base EDINBURGH	55127	10958098/1 10958105/1 10958025/1 10958028/1	Department of Defence	-34.709272, 138.636487	29.75 GHz
DSTO Third Avenue EDINBURGH	9000810	11856192/1 11856126/1		-34.730182, 138.640883	400.035 MHz 2.107 GHz
Speedcast Teleport 12 Park Way MAWSON LAKES	132326	9860617/1	Airbus Ds (Satcom Australia) Pty Ltd Speedcast Australia Pty Limited O3b Teleport Services (Australia) Pty Ltd	-34.817177, 138.619558	8.15 GHz 14.13755 GHz 14.10964 GHz 14.10013 GHz 14.12195 GHz 13.7506 GHz 13.9995 GHz 6.027295 GHz 13.998 GHz 14.4975 GHz

Site Name	Site ID	Licence No.	Licensee	Location	Operating Frequency
					14.4975 GHz 6.16108 GHz 6.29589 GHz 6.385 GHz 6.1602 GHz 6.1537 GHz 6.20203 GHz 6.204251 GHz 6.231703 GHz 6.194277 GHz 6.19 GHz 6.03215 GHz 6.069155 GHz 5.97 GHz 14.085 GHz 14.31305 GHz 14.3435 GHz 14.225 GHz 14.165 GHz 14.455 GHz 14.297 GHz 14.2871 GHz 14.29835 GHz 14.28935 GHz 6.385 GHz 6.29375 GHz 14.277 GHz 14.338 GHz 14.399 GHz 13.778 GHz 13.9 GHz 13.839 GHz

Scientific Radio Systems

Site Name	Site ID	Licence No.	Licensee	Location	Operating Frequency
Baldon Station Baldon Road TRURO SA	10032818	11900723/1	Fleet Space Technologies Pty Ltd	-34.436, 139.2167	1.995 GHz

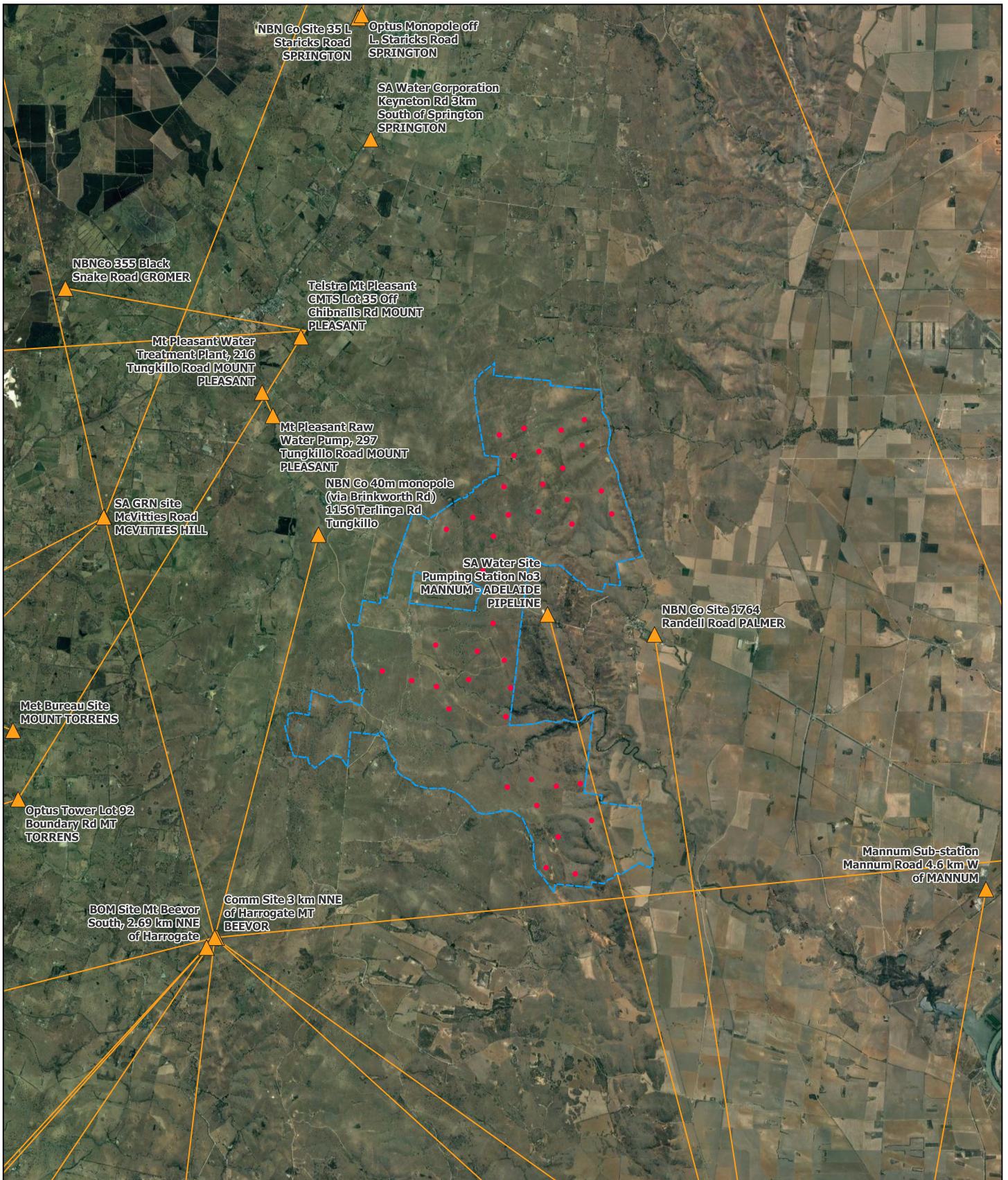
Radiodetermination Station

Site Name	Site ID	Licence No.	Licensee	Location	Operating Frequency
Airservices Australia Site Ridge Road GREENHILL	23112	421837/1	Airservices Australia	-34.952235, 138.717026	1.03 GHz
Airservices NDB Site PARAFIELD AIRPORT	9009201	421674/1	Airservices Australia	-34.796477, 138.631165	416 kHz
Airservices Radar Site Monitor Mt Bonython, Summit Rd CLELAND	9021590	421849/1	Airservices Australia	-34.966577, 138.713786	1.09 GHz

Site Name	Site ID	Licence No.	Licensee	Location	Operating Frequency
Defence NDB Site Edinburgh RAAF Base EDINBURGH	22987	493581/1	Department of Defence	-34.706959, 138.631597	311 kHz
DSTO 24 MHz Site Experiments Hut Rear of Bld 200 Adjacent to Surveillance Avenue EDINBURGH	140424	1956734/1	Department of Defence	-34.728942, 138.648977	24.375 MHz
DSTO Laser Range EDINBURGH	140230	1942847/1	Department of Defence	-34.731269, 138.652809	9.35 GHz
Edinburgh RAAF Base EDINBURGH	141573	1968405/1	Department of Defence	-34.702914, 138.631702	9.35 GHz 14.4 GHz
Edinburgh RAAF Base EDINBURGH	22990	1188182/1	Department of Defence	-34.704806, 138.612444	10.614 GHz
Glide Slope Edinburgh RAAF Base EDINBURGH	100209	10566946/1	Department of Defence	-34.697328, 138.61577	330.2 MHz 1.005 GHz
Localiser Edinburgh RAAF Base EDINBURGH	100207	10566946/1	Department of Defence	-34.719875, 138.612995	110.7 MHz
Radiodetermination Site Hillgrove Resources KANMANTOO	10034459	12056149/1	Leica Geosystems Pty Ltd	-35.092331, 139.002691	76.2 GHz
Radiodetermination Site, 3 km SW of KANMANTOO	10030119	11730879/1	Leica Geosystems Pty Ltd	-35.095852, 138.996264	17.2 GHz
Schulz Building North Terrace Campus UNIVERSITY OF ADELAIDE	130432	1924117/1	Department of Defence	-34.919241, 138.602495	9.41 GHz
Sensor Trials Facility 400m W of Coles Myer Warehouse EDINBURGH	139105	1924118/1	Department of Defence	-34.725669, 138.621575	9.41 GHz
TACAN Site RAAF EDINBURGH Heaslip Road EDINBURGH	10015718	11857415/1	Department of Defence	-34.704718, 138.612507	1.161 GHz

Appendix C

Reference figures



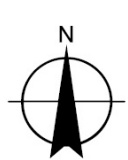
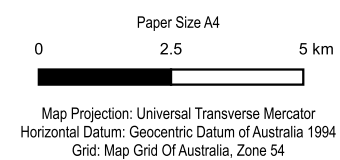
LEGEND

Project Site Boundary (varied project)

Turbines

Fixed Point-to-Point Transmitter

Radio Communications Link

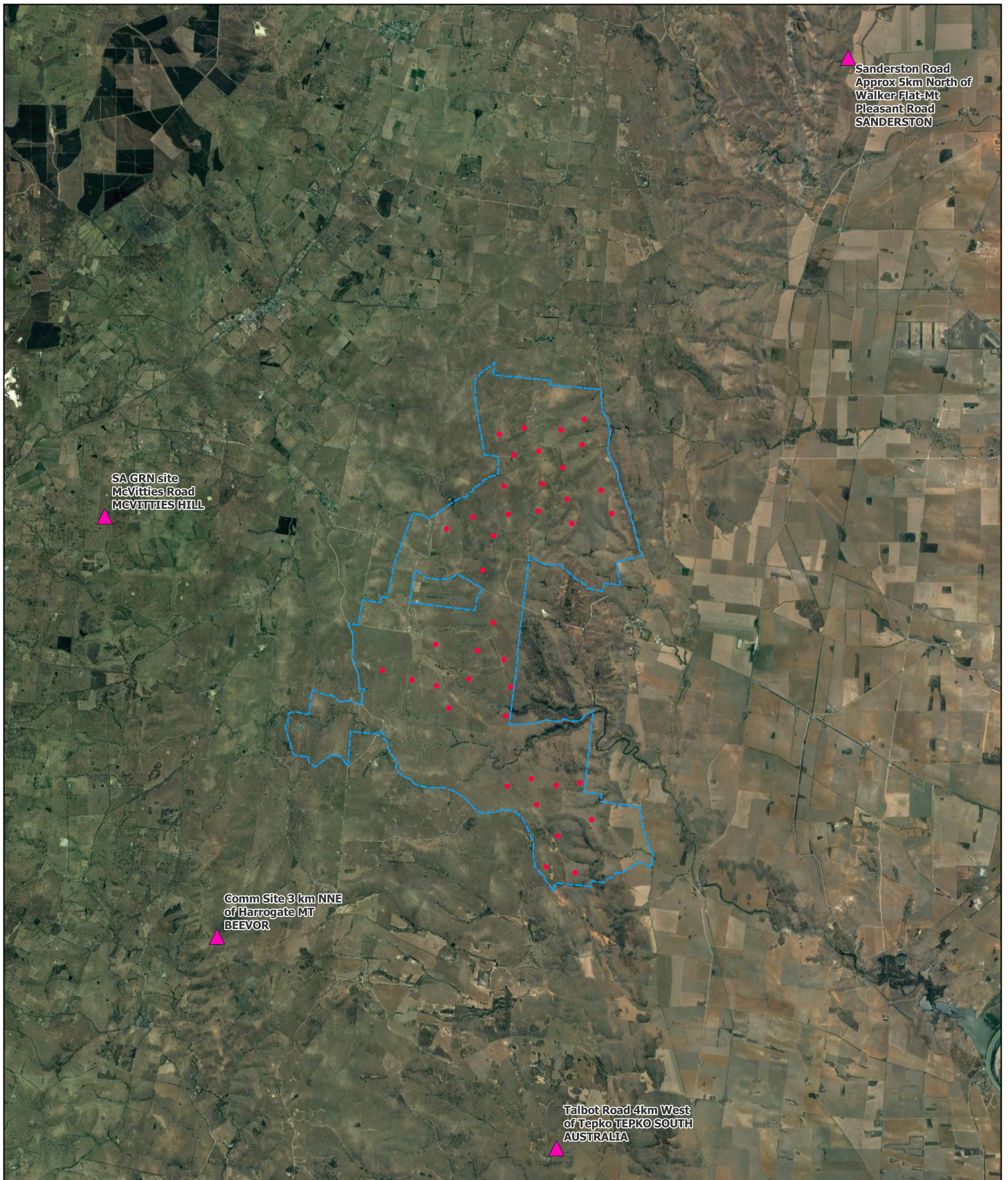


Palmer Wind Farm
Electromagnetic Interference
Assessment
**Fixed Point-to-Point Radio
Systems**

Project No. **12610992**
Revision No. **1**
Date. **31/01/2024**

FIGURE 1

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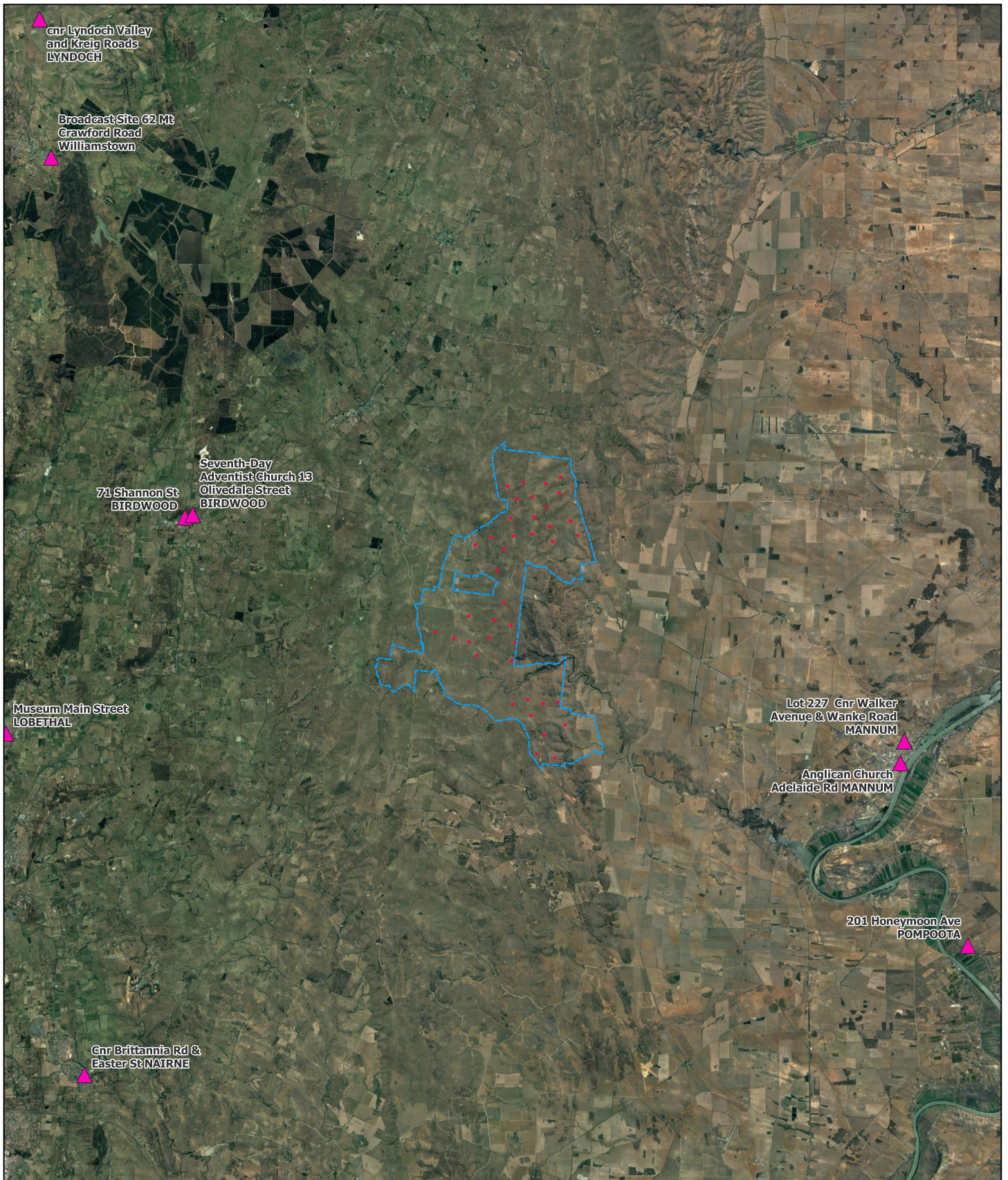
LEGEND

- Project Site Boundary (varied project)
- Turbines
- ▲ Land Mobile Transmitter

<p>Paper Size A4</p> <p>0 2.5 5 km</p> <p>Map Projection: Universal Transverse Mercator Horizontal Datum: Geocentric Datum of Australia 1994 Grid: Map Grid Of Australia, Zone 54</p>			<p>Palmer Wind Farm Electromagnetic Interference Assessment</p> <p>Land Mobile Transmitters</p>	<p>Project No. 12610992 Revision No. 1 Date. 31/01/2024</p>
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FIGURE 3

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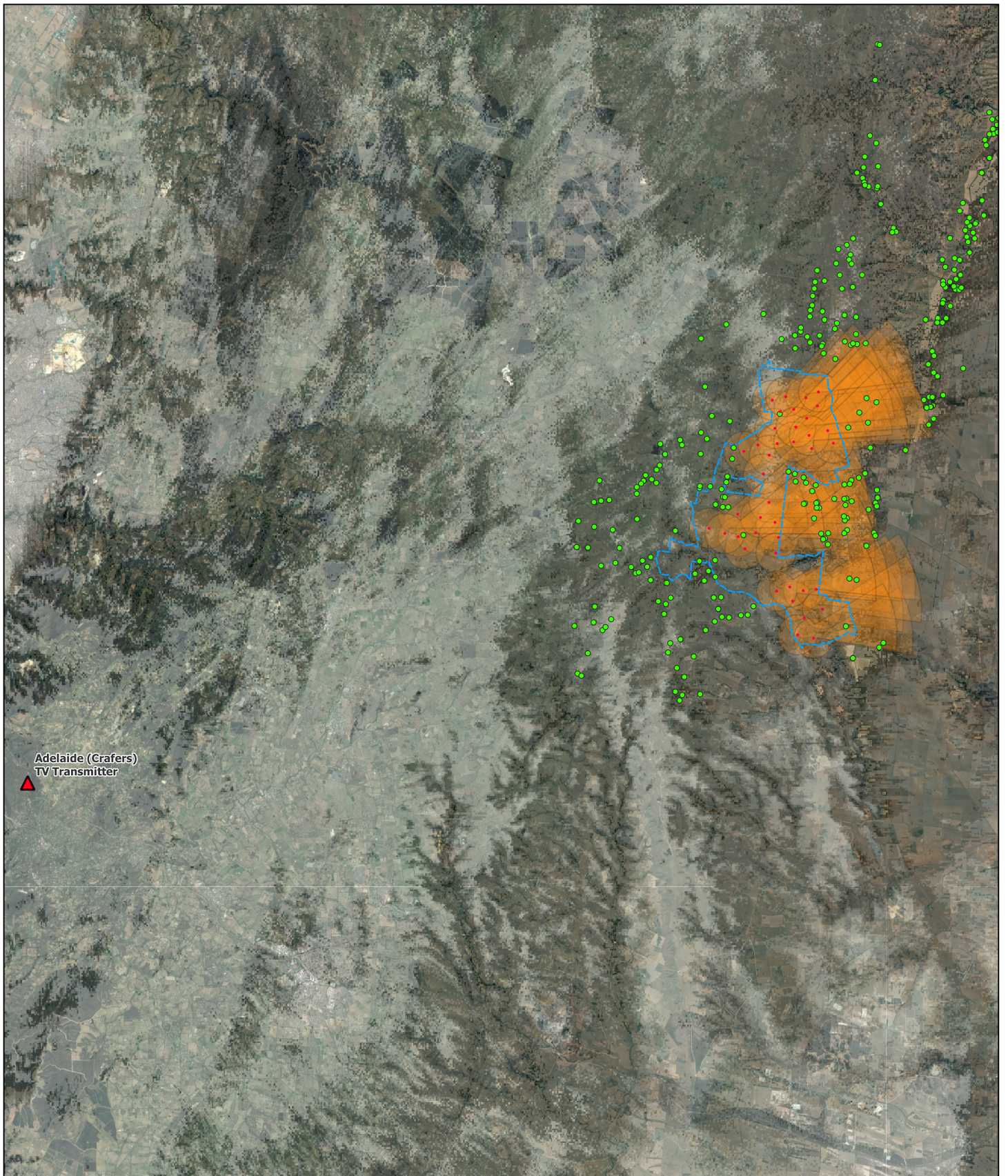
LEGEND

- Project Site Boundary (varied project)
- Turbines
- ▲ Broadcasting Transmitter

<p>Paper Size A4</p> <p>0 2.5 5 km</p> <p>Map Projection: Universal Transverse Mercator Horizontal Datum: Geocentric Datum of Australia 1994 Grid: Map Grid Of Australia, Zone 54</p>			<p>Palmer Wind Farm Electromagnetic Interference Assessment</p> <p>Broadcast Transmitters</p>	<p>Project No. 12610992 Revision No. 1 Date. 31/01/2024</p>
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FIGURE 4

\\ghdnet\ghd\AU\Adelaide\Projects\3312610992\GIS\Maps\Working\12610992-SiteMap.ggz
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LEGEND

Project Site Boundary (varied project)

• Turbines

▲ Adelaide (Crafers) TV Transmitter

Scatter Zone

• Dwellings

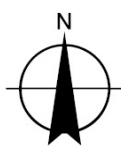
TV Transmitter Signal Coverage

Strong

Variable moderate

Unlikely to none

Paper Size A4
 0 5 10 km
 Map Projection: Universal Transverse Mercator
 Horizontal Datum: Geocentric Datum of Australia 1994
 Grid: Map Grid Of Australia, Zone 54



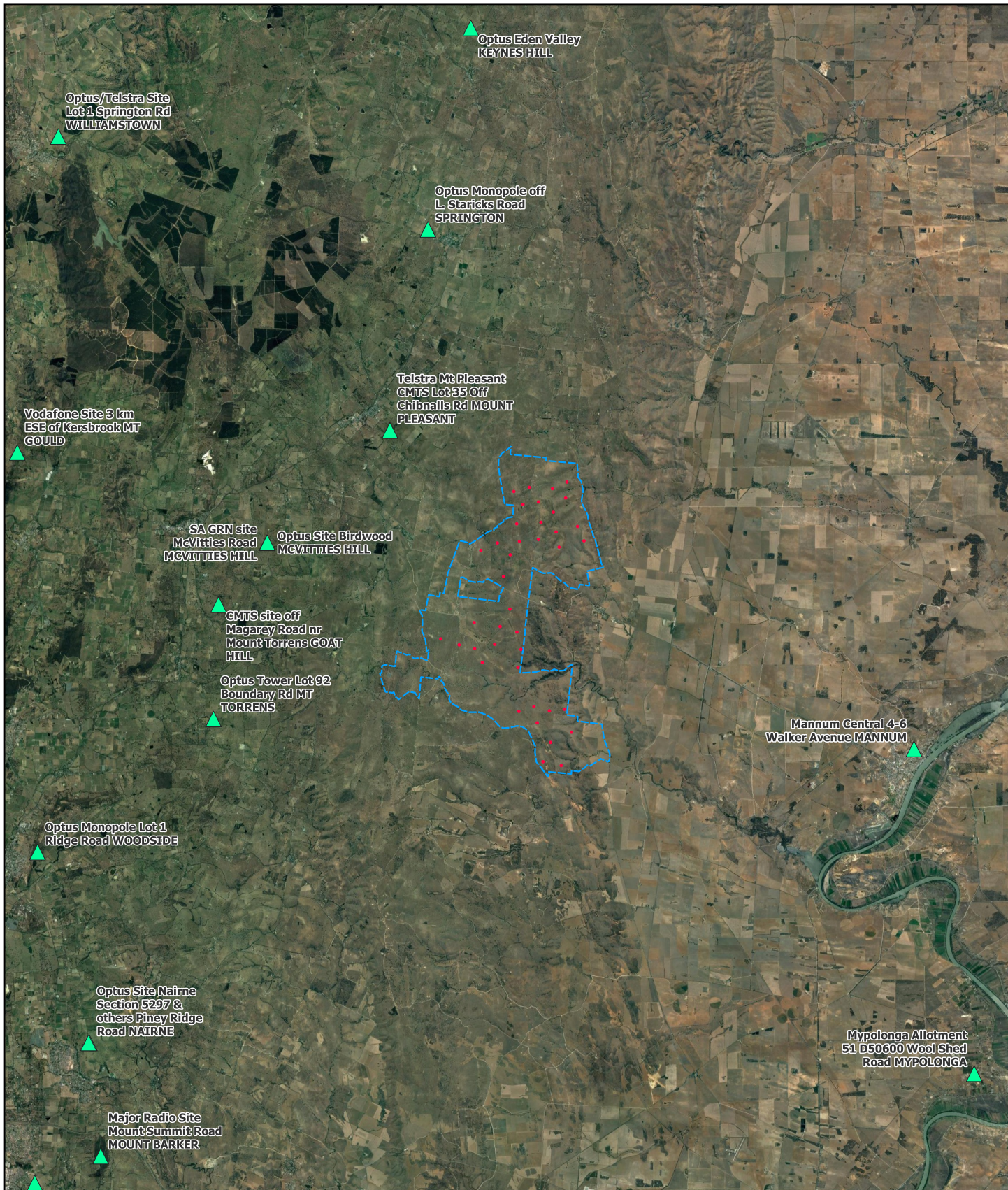
Palmer Wind Farm
 Electromagnetic Interference
 Assessment

**Adelaide (Crafers) TV
 Transmitter Scatter Zone**

Project No. 12610992
 Revision No. 1
 Date. 31/01/2024

FIGURE 5

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 Data source: Google Earth Imagery 2023. Created by: ME

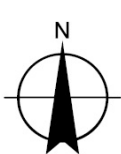
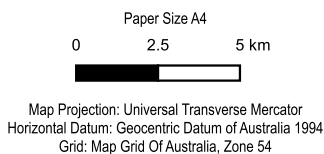


LEGEND

Project Site Boundary (varied project)

Turbines

PTS Transmitter



Palmer Wind Farm
Electromagnetic Interference
Assessment

PTS Transmitters

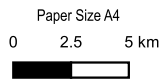
Project No. 12610992
Revision No. 1
Date. 31/01/2024

FIGURE 6

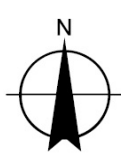


LEGEND

- Project Site Boundary (varied project)
- Turbines
- ▲ Aeronautical Transmitter



Map Projection: Universal Transverse Mercator
 Horizontal Datum: Geocentric Datum of Australia 1994
 Grid: Map Grid Of Australia, Zone 54

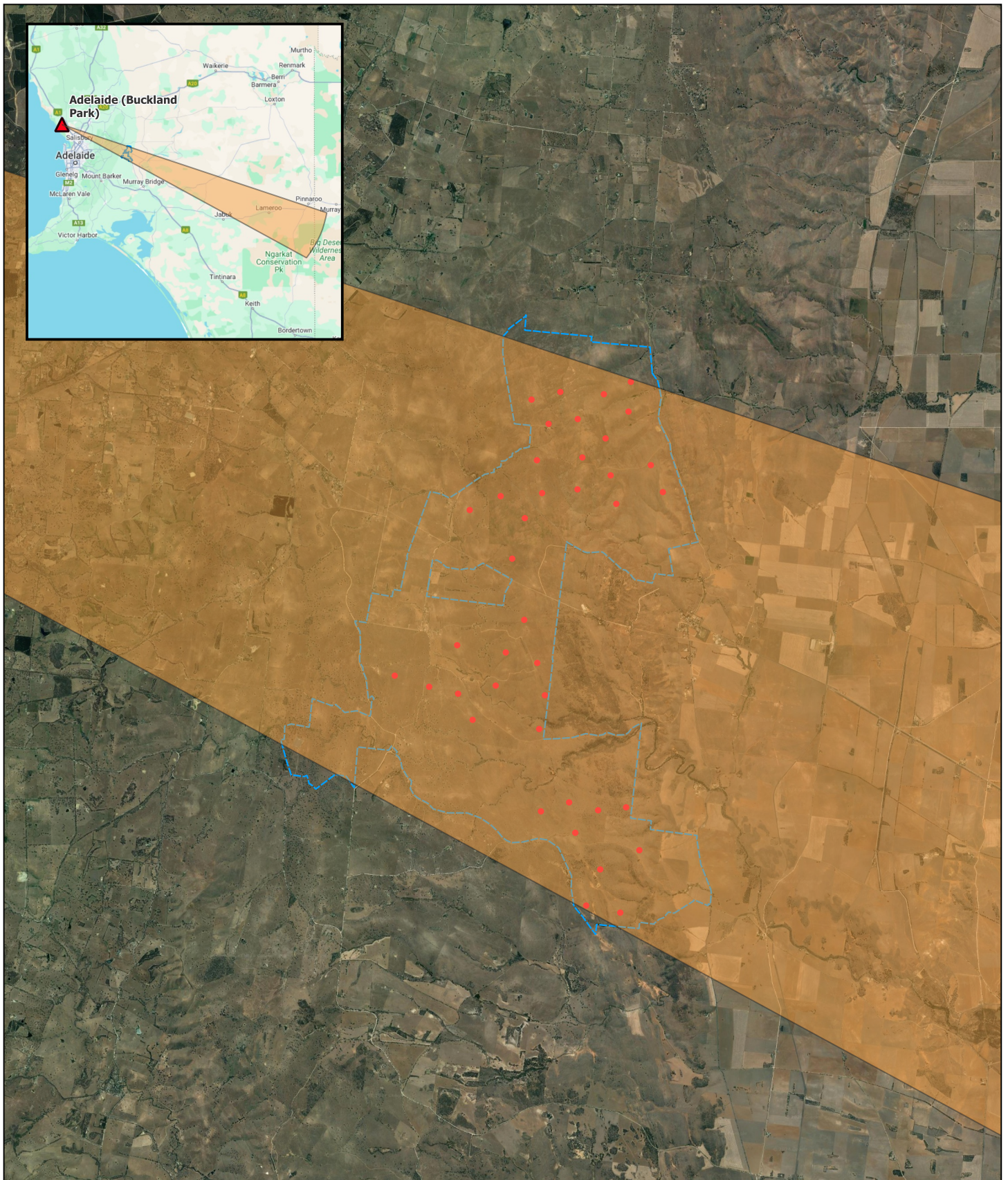


Palmer Wind Farm
 Electromagnetic Interference
 Assessment

Aeronautical Transmitters

Project No. 12610992
 Revision No. 1
 Date. 31/01/2024

FIGURE 7



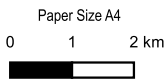
LEGEND

Project Site Boundary (varied project)

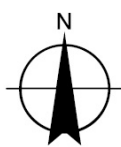
Turbines

Adelaide (Buckland Park)

Radar Cone



Map Projection: Universal Transverse Mercator
 Horizontal Datum: Geocentric Datum of Australia 1994
 Grid: Map Grid Of Australia, Zone 54



Palmer Wind Farm
 Electromagnetic Interference
 Assessment

Meteorological Radar

Project No. **12610992**
 Revision No. **1**
 Date. **31/01/2024**

FIGURE 8



LEGEND

- Project Site Boundary (varied project)
- Turbines
- ▲ Amateur Transmitter

<p>Paper Size A4</p> <p>0 5 10 km</p> <p>Map Projection: Universal Transverse Mercator Horizontal Datum: Geocentric Datum of Australia 1994 Grid: Map Grid Of Australia, Zone 54</p>			<p>Palmer Wind Farm Electromagnetic Interference Assessment</p> <p>Amateur Transmitters</p>	<p>Project No. 12610992 Revision No. 1 Date. 31/01/2024</p>
--	--	--	--	--




FIGURE 9

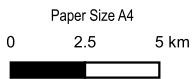
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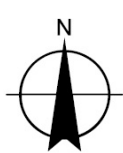
Fire Watch Tower
Summit MT LOFTY

LEGEND

-  Project Site Boundary (varied project)
-  Turbines
-  Maritime Transmitter



Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid Of Australia, Zone 54

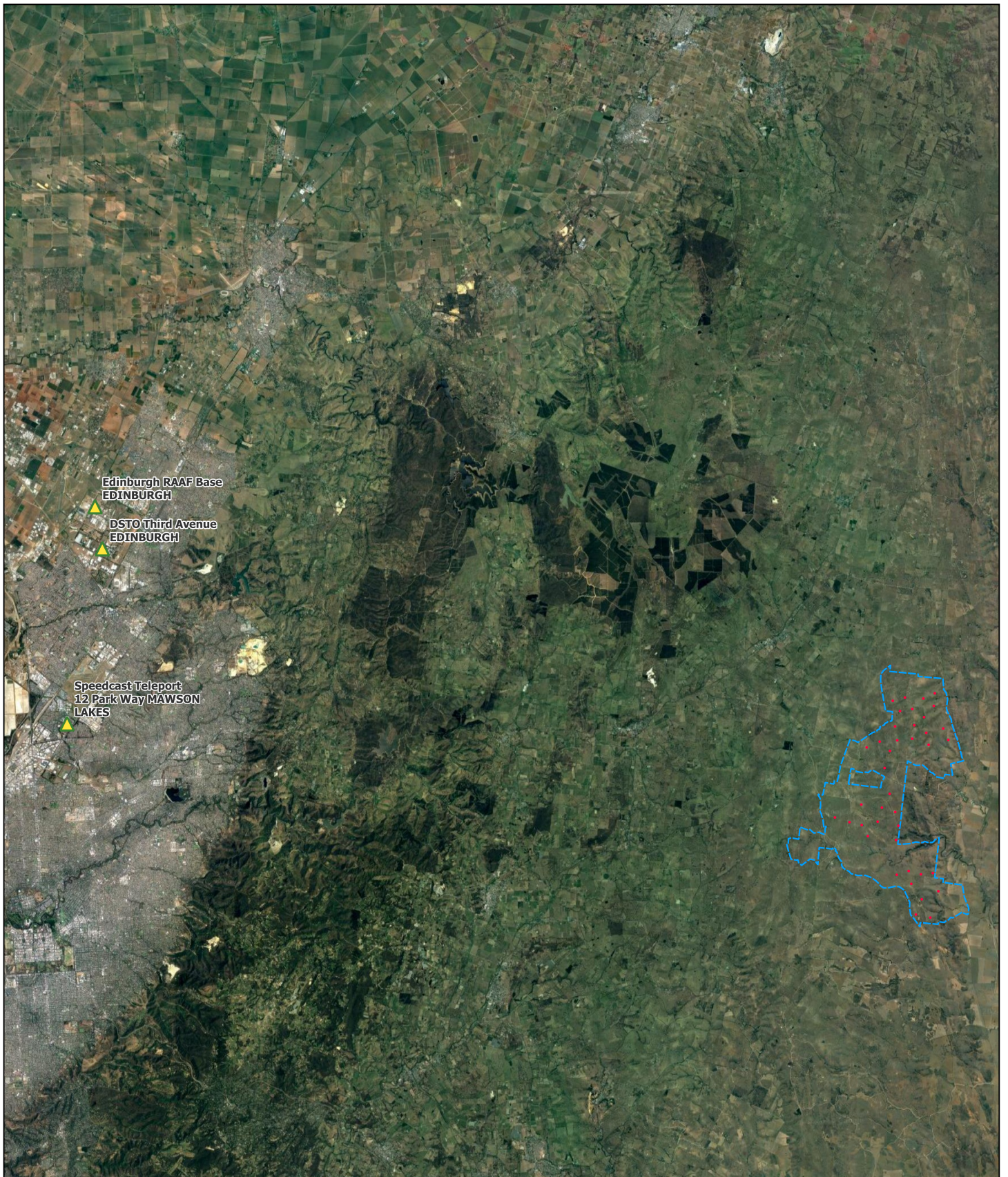


Palmer Wind Farm
Electromagnetic Interference
Assessment




Maritime Transmitters

Project No. 12610992
Revision No. 1
Date. 31/01/2024

FIGURE 10

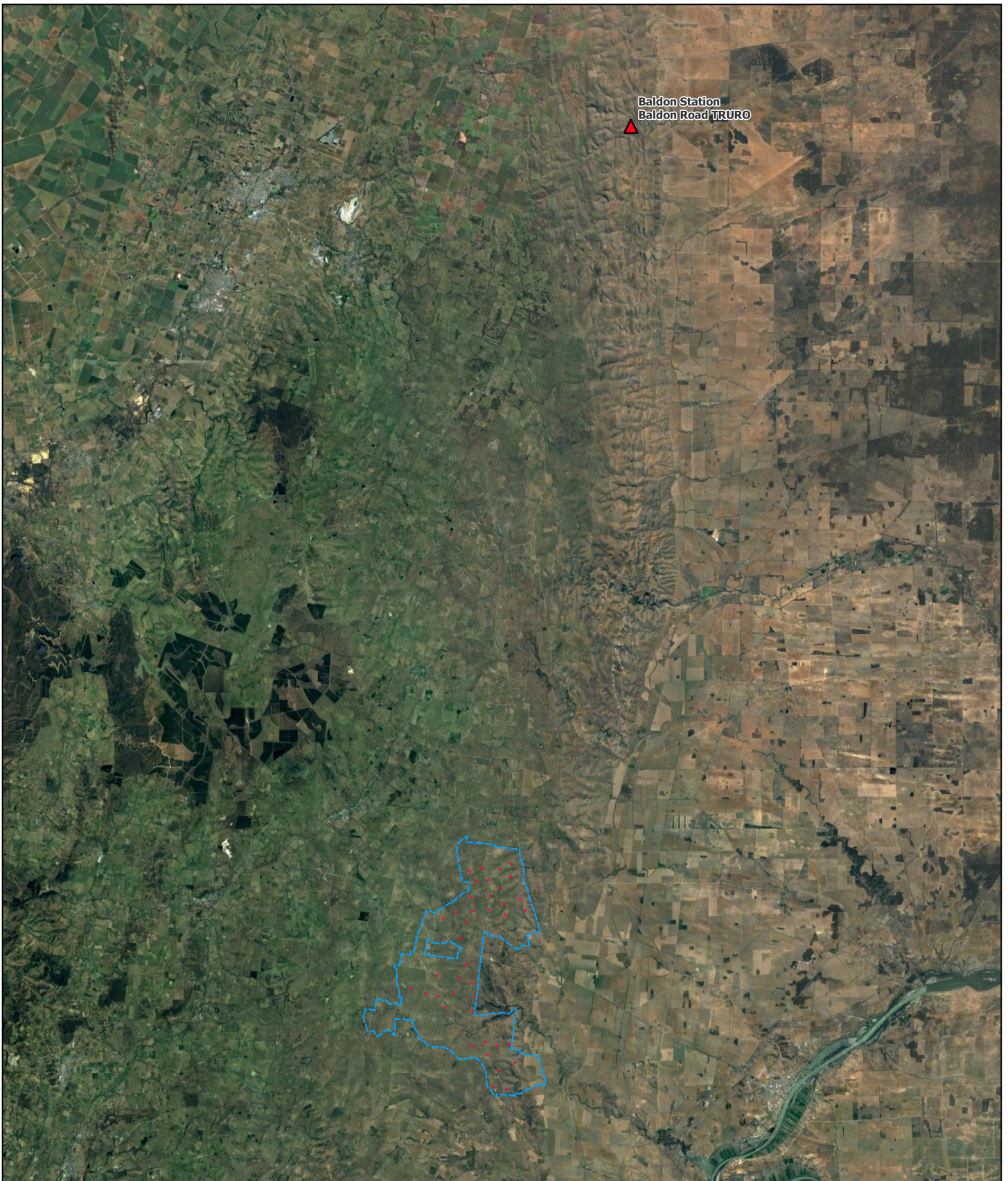


LEGEND

-  Project Site Boundary (varied project)
-  Turbines
-  Earth Station

<p>Paper Size A4</p> <p>0 5 10 km</p> <p>Map Projection: Universal Transverse Mercator Horizontal Datum: Geocentric Datum of Australia 1994 Grid: Map Grid Of Australia, Zone 54</p>		 	<p>Palmer Wind Farm Electromagnetic Interference Assessment</p> <p>Earth Stations</p>	<p>Project No. 12610992 Revision No. 1 Date. 31/01/2024</p> <p style="text-align: right;">FIGURE 11</p>
--	---	--	--	--

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LEGEND

- Project Site Boundary (varied project)
- Turbines
- ▲ Scientific Transmitters

<p>Paper Size A4</p> <p>0 5 10 km</p> <p>Map Projection: Universal Transverse Mercator Horizontal Datum: Geocentric Datum of Australia 1994 Grid: Map Grid Of Australia, Zone 54</p>			<p>Palmer Wind Farm Electromagnetic Interference Assessment</p> <p>Scientific Transmitters</p>	<p>Project No. 12610992 Revision No. 1 Date. 31/01/2024</p>
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FIGURE 12

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Data source: Google Earth Imagery 2023. Created by: ME



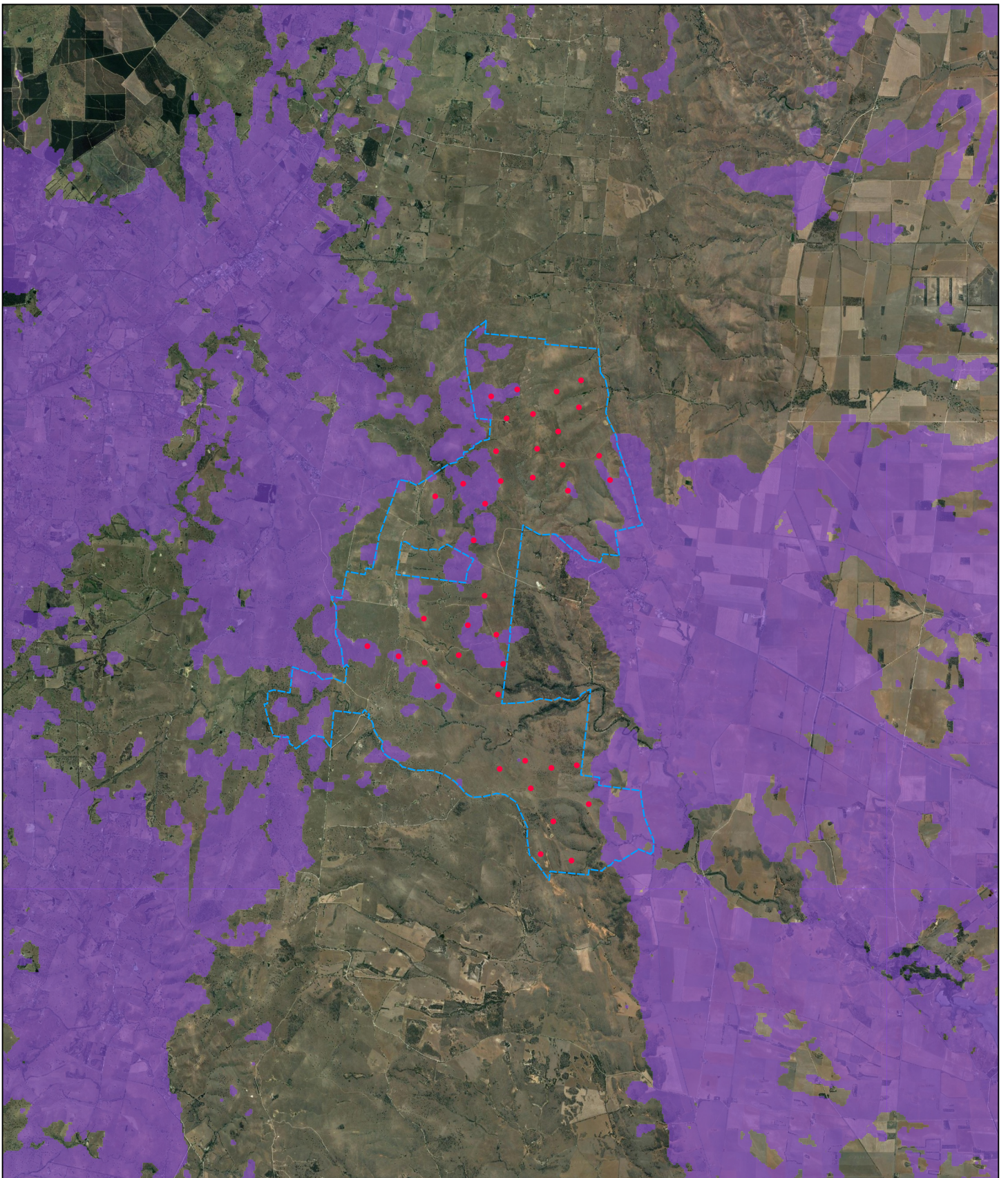
LEGEND

- Project Site Boundary (varied project)
- Turbines
- ▲ Radiodetermination




<p>Paper Size A4</p> <p>0 5 10 km</p> <p>Map Projection: Universal Transverse Mercator Horizontal Datum: Geocentric Datum of Australia 1994 Grid: Map Grid Of Australia, Zone 54</p>		 	<p>Palmer Wind Farm Electromagnetic Interference Assessment</p> <p>Radiodetermination Stations</p>	<p>Project No. 12610992 Revision No. 1 Date. 31/01/2024</p>
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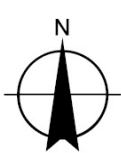
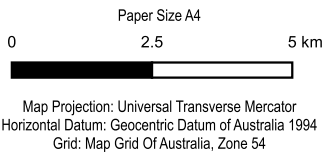
FIGURE 13

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Data source: Google Earth Imagery 2023. Created by: ME



LEGEND

-  Project Site Boundary (varied project)
-  Turbines
-  NBN Fixed Wireless



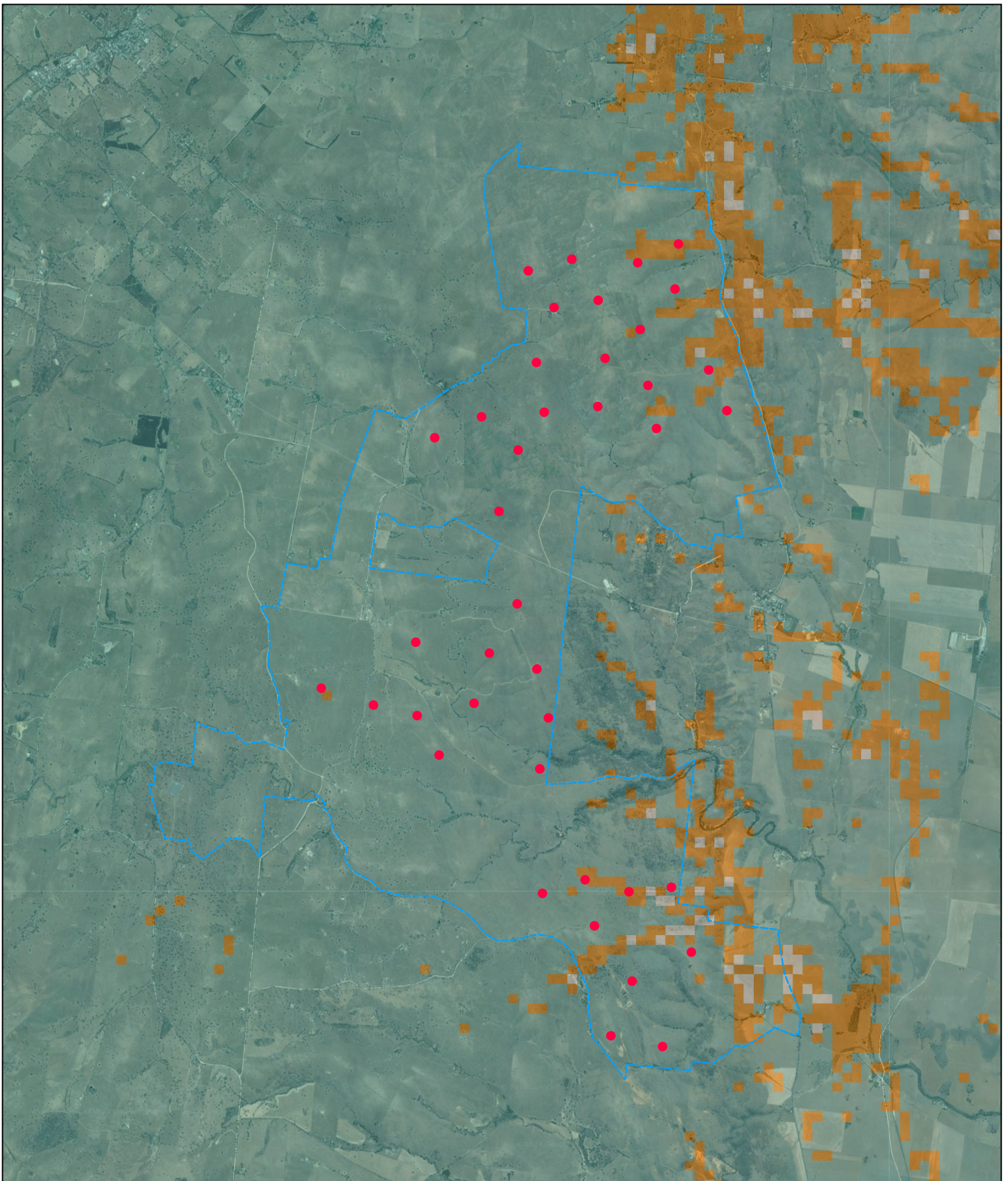
Palmer Wind Farm
Electromagnetic Interference
Assessment

NBN Spectrum Coverage

Project No. **12610992**
Revision No. **1**
Date. **31/01/2024**

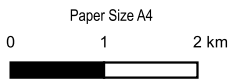
FIGURE 14

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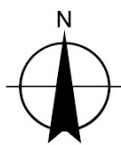


LEGEND

- Project Site Boundary (varied project)
- Turbines
- Optus 3G (with external antenna)
- Optus 3G (without external antenna)



Map Projection: Universal Transverse Mercator
 Horizontal Datum: Geocentric Datum of Australia 1994
 Grid: Map Grid Of Australia, Zone 54

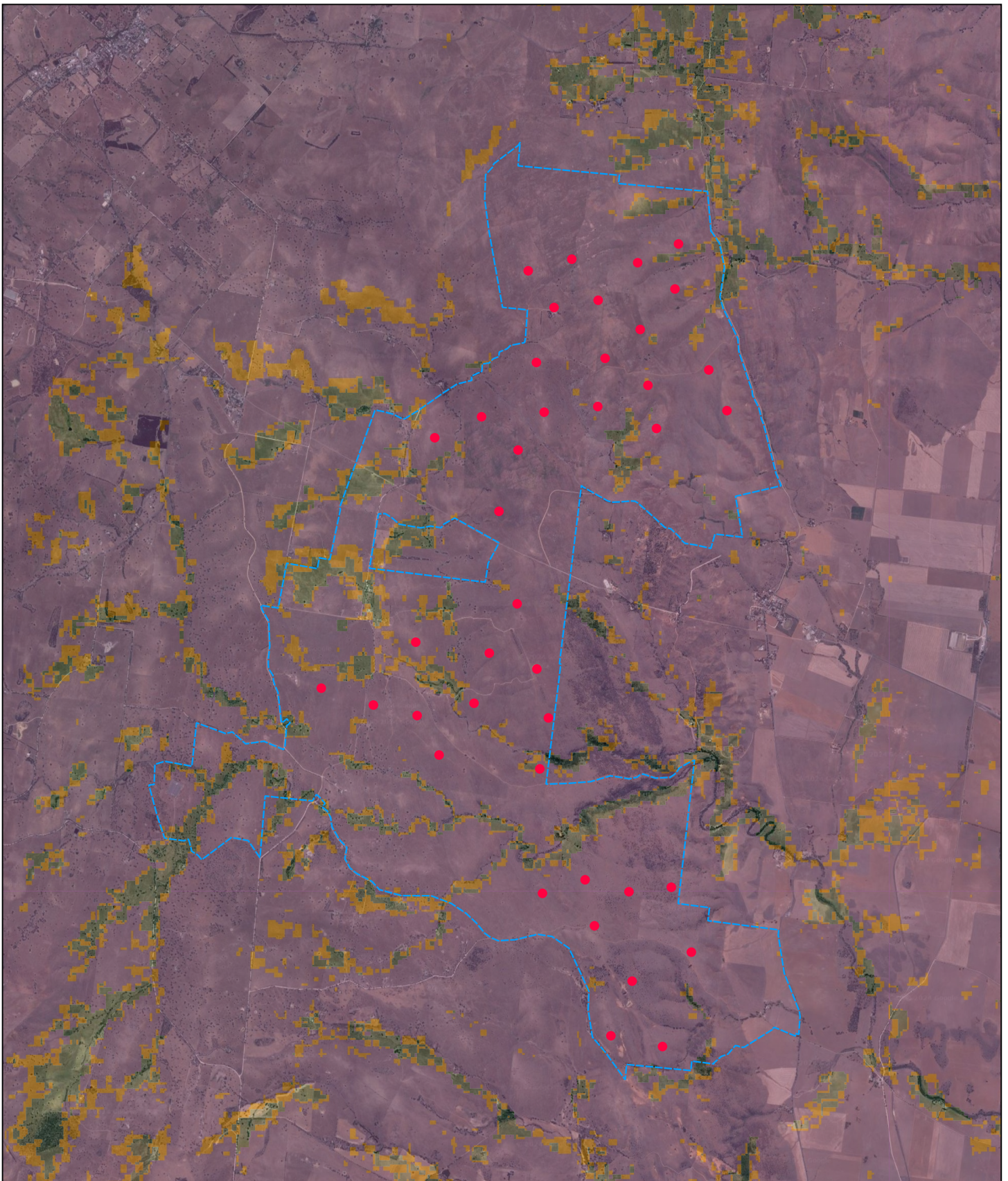


Palmer Wind Farm
 Electromagnetic Interference
 Assessment

Optus 3G Spectrum Coverage

Project No. 12610992
 Revision No. 1
 Date. 31/01/2024

FIGURE 15



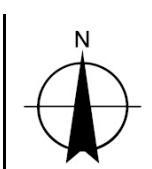
LEGEND

- Project Site Boundary (varied project)
- Turbines
- Optus 4G (with external antenna)
- Optus 4G (without external antenna)

Paper Size A4

0 1 2 km

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid Of Australia, Zone 54



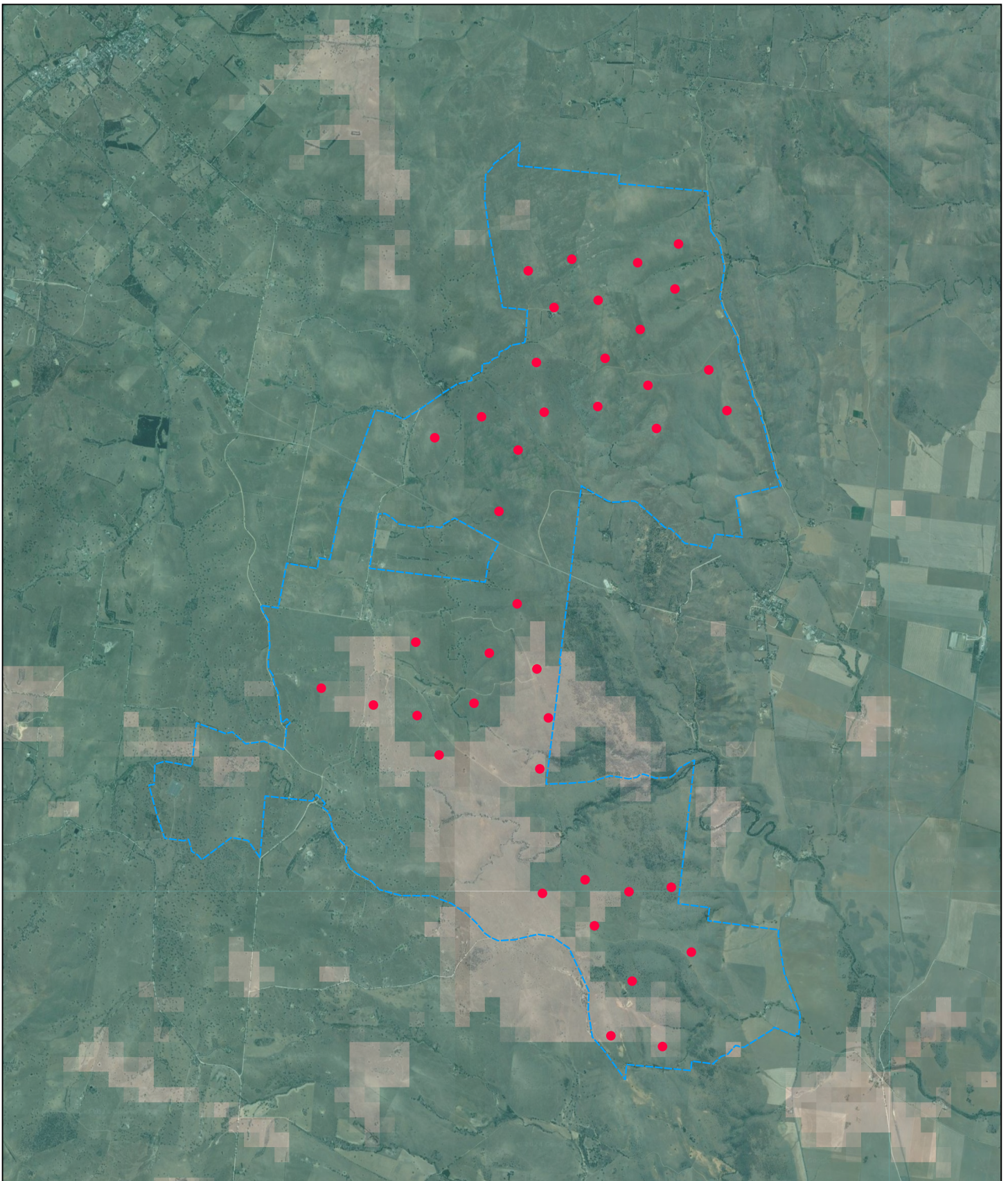
Palmer Wind Farm
Electromagnetic Interference
Assessment

Optus 4G Spectrum Coverage


Project No. 12610992
Revision No. 1
Date. 31/01/2024


FIGURE 16

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Data source: Google Earth Imagery 2023. Created by: ME



LEGEND

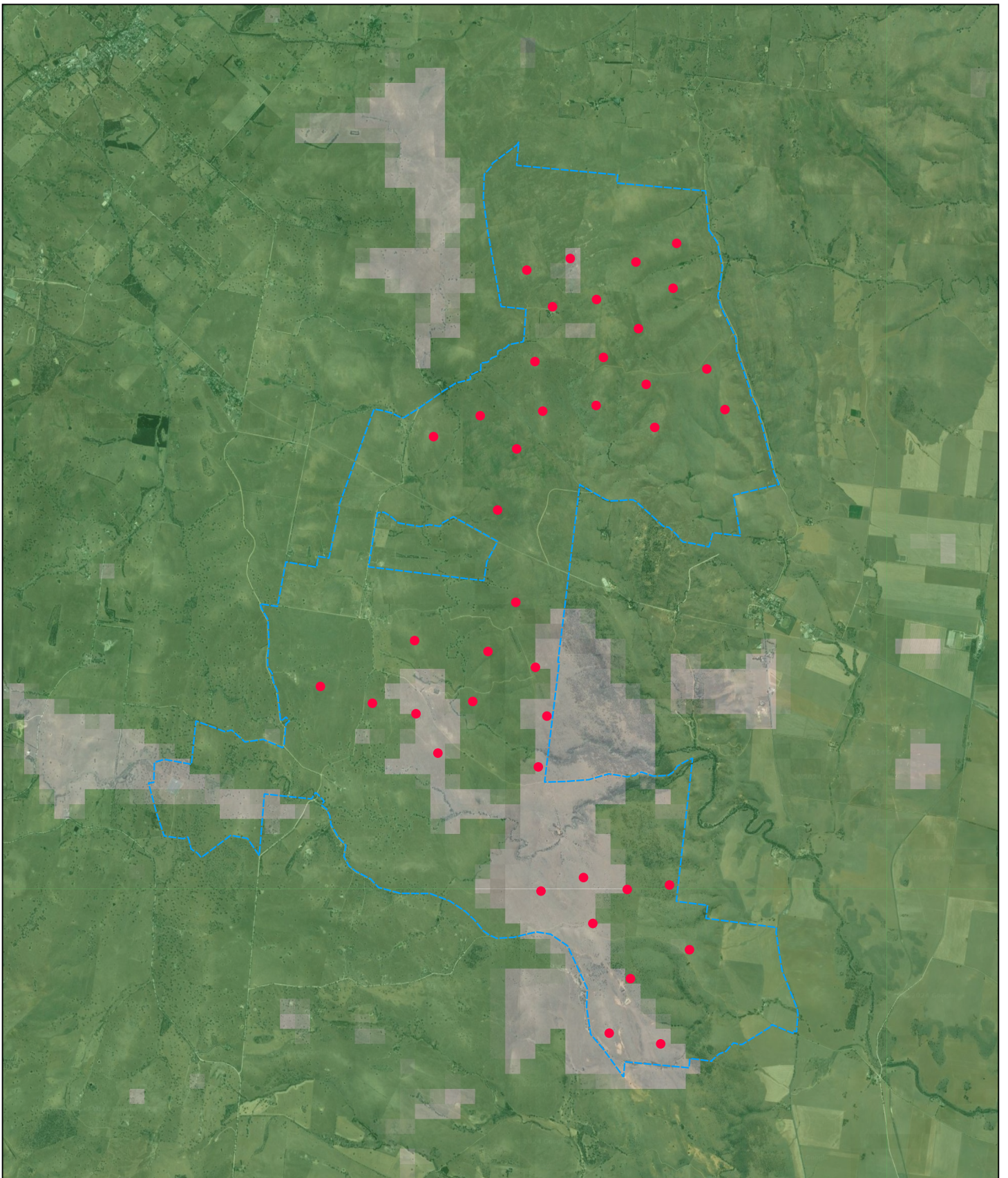
 Project Site Boundary (varied project)

 Turbines


 Telstra 3G


<p>Paper Size A4</p> <p>0 1 2 km</p>  <p>Map Projection: Universal Transverse Mercator Horizontal Datum: Geocentric Datum of Australia 1994 Grid: Map Grid Of Australia, Zone 54</p>		 	<p>Palmer Wind Farm Electromagnetic Interference Assessment</p> <p>Telstra 3G Spectrum Coverage</p>	<p>Project No. 12610992 Revision No. 1 Date. 31/01/2024</p> <p>FIGURE 17</p>
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 Data source: Google Earth Imagery 2023. Created by: ME



LEGEND

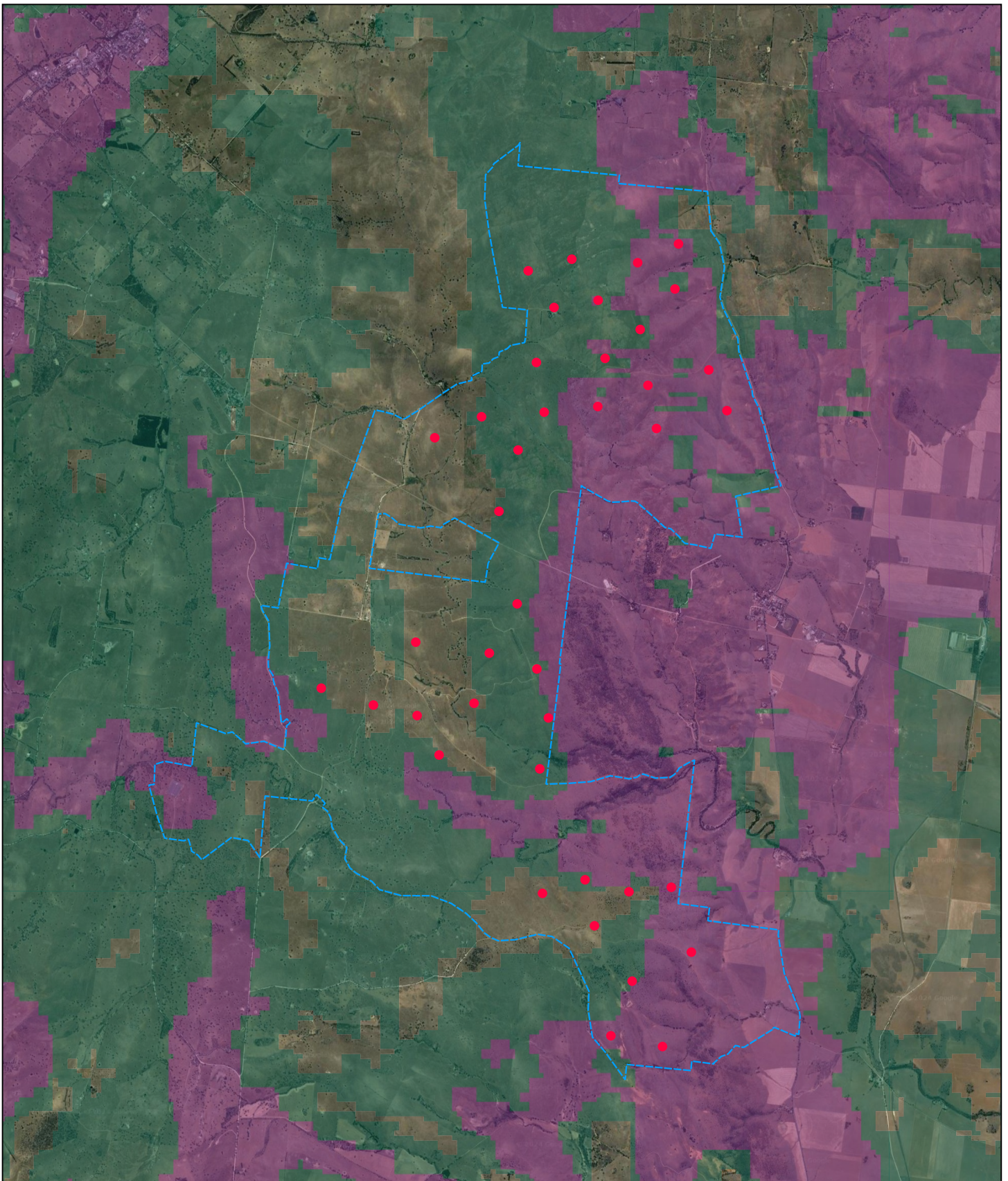
 Project Site Boundary (varied project)

 Turbines

 Telstra 4G

<p>Paper Size A4</p> <p>0 1 2 km</p>  <p>Map Projection: Universal Transverse Mercator Horizontal Datum: Geocentric Datum of Australia 1994 Grid: Map Grid Of Australia, Zone 54</p>		 	<p>Palmer Wind Farm Electromagnetic Interference Assessment</p> <p>Telstra 4G Spectrum Coverage</p>	<p>Project No. 12610992 Revision No. 1 Date. 31/01/2024</p> <p>FIGURE 18</p>
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 Data source: Google Earth Imagery 2023. Created by: ME



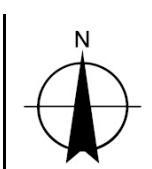
LEGEND

- Project Site Boundary (varied project)
- Turbines
- Vodafone 3G Indoor
- Vodafone 4G Indoor

Paper Size A4

0 1 2 km

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid Of Australia, Zone 54



Palmer Wind Farm
Electromagnetic Interference
Assessment

Vodafone Spectrum Coverage

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FIGURE 19

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Appendix D

Consultation letters

OFFICIAL



Australian Government
Bureau of Meteorology



In reply, please quote:
Palmer Range wind farm

19 December 2023

Mr. Marcus Eymael
GHD
Level 15 133 Castlereagh Street
Sydney NSW 2000

Dear Marcus,

The Bureau has carried out a technical assessment of the potential effects of the Palmer Range wind farm on the Adelaide (Buckland) weather radar which is located 62 km northwest of the proposed Palmer Range wind farm.

The assessment found that any wind farm built at the proposed Palmer Range site would pose a high risk of interference to a segment of the Adelaide (Buckland Park) weather radar.

This risk is due to the following factors:

- Based on the 220 m tip height of the turbines, most of the turbines will potentially affect a segment of the Adelaide radar, hence the risk rating of interference is high
- Mannum township, with a population of around 2,500, lies behind the Palmer Range wind farm and will most likely lose weather radar coverage from the Adelaide radar.

Implications

In regard to the impact on weather services provided to the Mannum township, it is rare to have thunderstorms and severe weather coming from the east. When this happens, this area can be also monitored by the Mt.Gambier and Rainbow radars.

The Adelaide radar coverage impact area to the east of the Palmer Range wind farm, as shown in Figure 1, is therefore covered by both Mt Gambier and Rainbow radars to some extent, allowing for partial compensation of the radar data, which is helpful for services such as state-based warnings for severe weather and severe thunderstorms approaching from the east.

The most impacted service is likely to be on the rainfall estimates that feed into hydrological services (e.g. flood forecasts) in the impacted Adelaide radar coverage area east of the Palmer Range wind farm. The impact on wind observations and forecasts cannot be neglected either.

Melbourne Office

GPO Box 1289, Melbourne VIC 3001 Australia | T: +61 3 9669 4000 | www.bom.gov.au | ABN 92 637 533 532

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Options

The Bureau recommends the following options to remediate the impacts on real time rainfall observations and forecasts as described above:

- East side of the wind farm, "downstream" of the radar (Figure 1), in the area around and to the east of Mannum, we recommend the installation of rain gauges, and automatic weather stations (AWS), with precise numbers and locations to be determined.
- West side of the wind farm towards Adelaide, we also recommend the installation of rain gauges and automatic weather stations, with precise numbers and locations to be determined.

The design of the network to include new rain gauges and automatic weather stations would need to be assessed.

The algorithms that are part of the Rainfields¹ software would need to be adjusted and maintained, together with the development and provision of new layers of data in the visualization tools used by the forecasters. The costs of these measures will need proper assessment and estimates.

Continue the conversation

We would like to continue the conversation and work with you to minimise and manage the impacts of the Palmer Range wind farm project on the regional radar service.

The Bureau's Strategic Relationship Framework Agreement is a non-binding agreement for wind farm developers and the Bureau to document a commitment to work together to:

- support developers in establishing and operating wind energy projects with an impact assessment,
- minimise and manage potential impacts of wind farm projects on the Bureau's capacity to perform its functions under the Meteorology Act 1955.

We would be pleased to discuss our impact assessment further and to provide you with the agreement template for you to review.

The Bureau is committed to providing products and services that benefit the Australian community and support innovation in industry.

Please direct further correspondence to energy@bom.gov.au including Palmer Range wind farm in the subject line and let us know if you have any queries.

¹ Rainfields is a comprehensive framework providing real-time quality controlled, quantitative precipitation estimation and quantitative precipitation forecasting for the operational Australian weather radar network.

OFFICIAL



Yours sincerely,

A handwritten signature in black ink, appearing to be 'Bryan Hodge', with a stylized flourish at the end.

Bryan Hodge PSM | General Manager Observing Systems & Operations | Chief Engineer
Data and Digital Group
Bureau of Meteorology
GPO Box 1289 Melbourne VIC 3001

OFFICIAL



Figure 1: Adelaide radar coverage map showing area impacted by wind farm

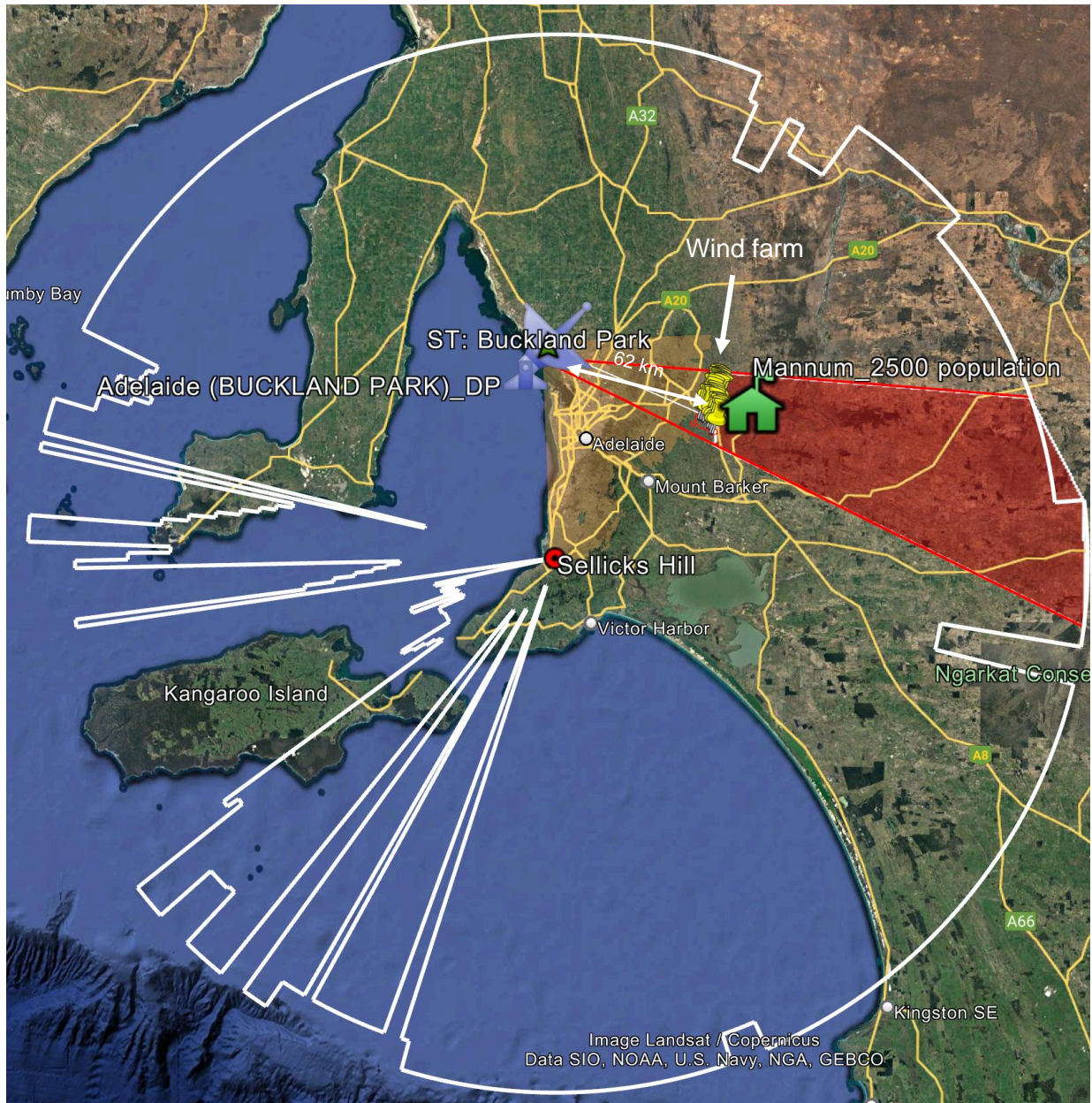


Figure 1 shows the existing coverage from Adelaide radar in the area enclosed by the irregular white circle. The red shaded sector shows the area in which radar coverage will be impaired by the installation of wind turbines at Palmer Range. The green house icon indicates the location of the Mannum township.

From: Adrian Cresswell <Adrian.Cresswell@bom.gov.au>
Sent: Thursday, 21 December 2023 3:26 PM
To: Brendan Siebert; Marcus Eymael
Cc: Nicholas Dent; Ellie Lourey; windfarmenquiries; Energy; Ben.Gilbert@ghd.com
Subject: RE: Wind Farm EMI Assessment - Palmer Wind Farm [SEC=OFFICIAL]
Attachments: 20231219 Palmer Range wind farm onshore_assessment response letter PJS 231221.pdf

Hi Marcus and Brendan,

Please find enclosed the Bureau's response to your request for a technical assessment of the proposed Palmer wind farm. Our assessment has found that any wind farm built at this location would pose a risk of interference to a segment of the Adelaide (Buckland Park) weather radar located approximately 62km from the Palmer wind farm. Radar coverage from adjacent radars in the area to the east and southeast somewhat mitigates this impact. We would be pleased to discuss our technical assessment further.

We look forward to continuing this discussion and working with you to minimise and manage the potential impacts of this development on the services provided by the Bureau in the area.

Best regards,

Adrian Cresswell
Business Engagement Lead
Business Solutions Group

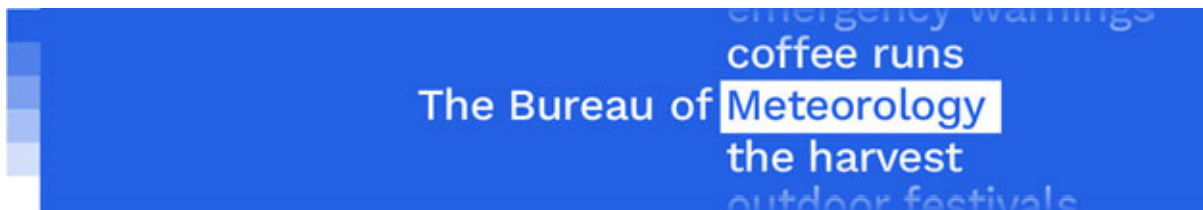
M: 0416 287 000
Level 15, 300 Elizabeth St, Surry Hills NSW 2010
adrian.cresswell@bom.gov.au | www.bom.gov.au



Australian Government
Bureau of Meteorology



The Bureau of Meteorology acknowledges the Traditional Custodians of Australia and their continuing connection to land, sea, and community.
Important: This message may contain confidential or legally privileged information. If you think it was sent to you by mistake, please delete all copies and advise the sender.



From: Brendan Siebert <Brendan.Siebert@ghd.com>
Sent: Thursday, December 14, 2023 5:06 PM
To: Adrian Cresswell <Adrian.Cresswell@bom.gov.au>
Cc: Nicholas Dent <Nicholas.Dent@ghd.com>; Ellie.Lourey@tilt Renewables.com
Subject: FW: Wind Farm EMI Assessment - Palmer Wind Farm [SEC=OFFICIAL]

Hi Adrian,

Thank you for the time on the phone today to go through the wind farm impact assessment process.

Regarding Palmer, Tilt is expecting to submit the DA mid-Jan.

Ideally, GHD would receive the Bureau's analysis prior to that to allow us to integrate the findings into the EMI Assessment report before the submission.

Best regards,

Brendan Siebert
BE(IT&Telecommunications)(Hons.) RPEV MIEAust
Senior Engineer - Telecommunications

GHD
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Level 4 211 Victoria Square Adelaide SA 5000 Australia
D +61 8 8111 6743 O +61 8 8111 6600 E brendan.siebert@ghd.com

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Please consider the environment before printing this email

From: Brendan Siebert
Sent: Tuesday, December 12, 2023 7:18 PM
To: Marc Keppler <Marc.Keppler@bom.gov.au>; 'Mohammad Zomorodi' <Mohammad.Zomorodi@bom.gov.au>; 'Energy' <energy@bom.gov.au>
Cc: 'Ellie.Lourey@tilt Renewables.com' <Ellie.Lourey@tilt Renewables.com>; Marcus Eymael <Marcus.Eymael@ghd.com>; Ben Gilbert <Ben.Gilbert@ghd.com>
Subject: RE: Wind Farm EMI Assessment - Palmer Wind Farm [SEC=OFFICIAL]

Hi Marc,

Can you assist with the below query in Mohammad's absence?

Best regards,

Brendan Siebert
BE(IT&Telecommunications)(Hons.) RPEV MIEAust
Senior Engineer - Telecommunications

GHD
Proudly employee-owned | ghd.com
Level 4 211 Victoria Square Adelaide SA 5000 Australia
D +61 8 8111 6743 O +61 8 8111 6600 E brendan.siebert@ghd.com

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From: Brendan Siebert <Brendan.Siebert@ghd.com>
Sent: Tuesday, December 12, 2023 7:15 PM
To: Mohammad Zomorodi <Mohammad.Zomorodi@bom.gov.au>; Energy <energy@bom.gov.au>
Cc: Ellie.Lourey@tilt Renewables.com; Marcus Eymael <Marcus.Eymael@ghd.com>; Ben Gilbert <Ben.Gilbert@ghd.com>
Subject: RE: Wind Farm EMI Assessment - Palmer Wind Farm [SEC=OFFICIAL]

Hi Mohammad,

GHD are finalising the Palmer Wind Farm Electromagnetic Impact Assessment for Tilt Renewables and require the Bureau's input prior to submission.

Is it possible that you can share the Bureau's desktop analysis results for inclusion into the assessment report? GHD are awaiting feedback since September.

Best regards,

Brendan Siebert
BE(IT&Telecommunications)(Hons.) RPEV MIEAust
Senior Engineer - Telecommunications

GHD
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Level 4 211 Victoria Square Adelaide SA 5000 Australia
D +61 8 8111 6743 O +61 8 8111 6600 E brendan.siebert@ghd.com

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Please consider the environment before printing this email

From: Marcus Eymael <Marcus.Eymael@ghd.com>
Sent: Monday, October 23, 2023 3:29 PM
To: Energy <energy@bom.gov.au>
Cc: Brendan Siebert <Brendan.Siebert@ghd.com>; Mohammad Zomorodi <Mohammad.Zomorodi@bom.gov.au>
Subject: RE: Wind Farm EMI Assessment - Palmer Wind Farm [SEC=OFFICIAL]

To whom it may concern,
I'm following up on this matter, when can GHD expect a response?

Marcus Eymael
Security & Communications Consultant
Building Engineering

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Level 15 133 Castlereagh Street Sydney NSW 2000 Australia
D +61 2 9239 7980 E marcus.eymael@ghd.com

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From: Mohammad Zomorodi <Mohammad.Zomorodi@bom.gov.au>
Sent: Tuesday, September 26, 2023 11:11 AM
To: Marcus Eymael <Marcus.Eymael@ghd.com>
Cc: Brendan Siebert <Brendan.Siebert@ghd.com>; windfarmenquiries <windfarmenquiries@bom.gov.au>; Energy <energy@bom.gov.au>
Subject: RE: Wind Farm EMI Assessment - Palmer Wind Farm [SEC=OFFICIAL]

Hi Marcus,

The Bureau of Meteorology's assessment of the proposed Palmer wind farm is now complete. Desktop analysis shows that the proposed wind farm is high risk to the Bureau's radiocommunication assets including its weather radar network.

The Bureau business solution will be in contact with you shortly to investigate approaches managing the risk. Please direct any further correspondence to energy@bom.gov.au and let us know if you have any queries.

Kind regards,

Mohammad

Dr. Mohammad Zomorodi

Radio Frequency Spectrum Manager
Data & Digital, Operational Technology & Engineering

M: 0415 524 457 | T: 03 9669 4413

Level 7, 700 Collins St, Docklands, VIC 3008

Mohammad.Zomorodi@bom.gov.au | www.bom.gov.au



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From: Marcus Eymael <Marcus.Eymael@ghd.com>

Sent: Thursday, September 21, 2023 3:24 PM

To: Mohammad Zomorodi <Mohammad.Zomorodi@bom.gov.au>; windfarmenquiries <windfarmenquiries@bom.gov.au>

Cc: Brendan Siebert <Brendan.Siebert@ghd.com>

Subject: RE: Wind Farm EMI Assessment - Palmer Wind Farm [SEC=OFFICIAL]

Hi Mohammad,

Please find attached the requested form and files.

Marcus Eymael

Security & Communications Consultant
Building Engineering

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Level 15 133 Castlereagh Street Sydney NSW 2000 Australia

D +61 2 9239 7980 E marcus.eymael@ghd.com

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From: Mohammad Zomorodi <Mohammad.Zomorodi@bom.gov.au>
Sent: Tuesday, September 19, 2023 2:09 PM
To: Marcus Eymael <Marcus.Eymael@ghd.com>; windfarmenquiries <windfarmenquiries@bom.gov.au>
Cc: Brendan Siebert <Brendan.Siebert@ghd.com>
Subject: RE: Wind Farm EMI Assessment - Palmer Wind Farm [SEC=OFFICIAL]

Hi Marcus,

Thank you for contacting the Bureau of Meteorology for an assessment of the impact of the proposed Palmer wind farm in SA on the Bureau's radiocommunication assets including the weather radars.

To help us run our desktop analysis, please fill in the details collection form and attach it with the required files to return email (windfarmenquiries@bom.gov.au).

It should be noted that the Adelaide S-band radar is at 64 km of the proposed wind farm.

Kind regards,
Mohammad

Dr. Mohammad Zomorodi
Radio Frequency Spectrum Manager
Data & Digital, Operational Technology & Engineering
M: 0415 524 457 | T: 03 9669 4413
Level 7, 700 Collins St, Docklands, VIC 3008
Mohammad.Zomorodi@bom.gov.au | www.bom.gov.au



From: Marcus Eymael <Marcus.Eymael@ghd.com>
Sent: Tuesday, September 19, 2023 1:21 PM
To: windfarmenquiries <windfarmenquiries@bom.gov.au>; Mohammad Zomorodi <Mohammad.Zomorodi@bom.gov.au>
Cc: Brendan Siebert <Brendan.Siebert@ghd.com>
Subject: FW: Wind Farm EMI Assessment - Palmer Wind Farm

Hi Mohammad,

GHD is conducting the Electromagnetic Interference Assessment report on behalf of Tilt Renewables for a wind farm feasibility study on land in Palmer, SA. If the study progresses through feasibility, this assessment will be used to support approvals of the project.

Based on the publicly available information on the ACMA database, there are no BOM p2p links crossing boundary or nearby weather watch radars, and suggested there is no impact from the current wind turbine location. Can you or someone else confirm whether there will be an effect on BOM services?

I have attached the site boundary and turbine layout in the .kml file and coordinates in the attached excel spreadsheet.

The turbine specifications will not exceed the dimensions shown below:

- Maximum tip height: Up to 220m
- Minimum clearance from ground level: No less than 37m
- Rotor diameter: Up to 180m

Please do not hesitate to contact me if you have any questions.

Marcus Eymael
Security & Communications Consultant
Building Engineering

GHD

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Level 15 133 Castlereagh Street Sydney NSW 2000 Australia

D +61 2 9239 7980 **E** marcus.eymael@ghd.com

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From: Mangalath, Nitin (ENet) <Mangalath.Nitin2@electranet.com.au>
Sent: Friday, 22 September 2023 11:41 AM
To: Marcus Eymael
Cc: Brendan Siebert; Luck, Colleen (ENet); Fleet, Aaron (ENet); Killmier, Leigh (ENet); Peter Grear (InTouch)
Subject: RE: Wind Farm EMI Assessment - Palmer Wind Farm

Hi Marcus,

I have checked the turbine KML you provided against ElectraNet's existing point-to-point links and can confirm the proposed turbine locations are not in the path of any of them.

Nitin Mangalath
Experienced Telecommunications Engineer
ElectraNet

M: 0410 783 901
E: mangalath.nitin2@electranet.com.au W: electranet.com.au
Corporate: ElectraNet Pty Limited • 52-55 East Terrace, Adelaide • PO Box 7096 Hutt Street Post Office, Adelaide, SA, 5000

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Think before you print!

From: Marcus Eymael <Marcus.Eymael@ghd.com>
Sent: Tuesday, September 19, 2023 2:49 PM
To: Luck, Colleen (ENet) <Luck.Colleen3@electranet.com.au>; Fleet, Aaron (ENet) <Fleet.Aaron@electranet.com.au>; Killmier, Leigh (ENet) <Killmier.Leigh@electranet.com.au>; Mangalath, Nitin (ENet) <Mangalath.Nitin2@electranet.com.au>
Cc: Brendan Siebert <Brendan.Siebert@ghd.com>
Subject: RE: Wind Farm EMI Assessment - Palmer Wind Farm

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Much appreciated, please loop in Brendan in any further communications.

Marcus Eymael
Security & Communications Consultant
Building Engineering

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D +61 2 9239 7980 E marcus.eymael@ghd.com

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From: Luck, Colleen (ENet) <Luck.Colleen3@electranet.com.au>
Sent: Tuesday, September 19, 2023 4:46 PM
To: Fleet, Aaron (ENet) <Fleet.Aaron@electranet.com.au>; Marcus Eymael <Marcus.Eymael@ghd.com>; Killmier, Leigh (ENet) <Killmier.Leigh@electranet.com.au>; Mangalath, Nitin (ENet) <Mangalath.Nitin2@electranet.com.au>
Subject: RE: Wind Farm EMI Assessment - Palmer Wind Farm

You don't often get email from luck.colleen3@electranet.com.au. [Learn why this is important](#)

Hi Marcus,

We can definitely assist you. Leigh Killmier is the Project Manager managing the connection on our side and I believe he is likely to have an RFI register for this project – I note we do not have any Radio links in this area and rely on OPGW but we will require some time to confirm more formally for you.

[@Fleet, Aaron \(ENet\)](#) thanks for forwarding on. [@Killmier, Leigh \(ENet\)](#) looping you in as the main point of contact for Marcus. I will ask the project engineer for this project [@Mangalath, Nitin \(ENet\)](#) to respond via you to assist GHD.

Kind Regards

Colleen

Colleen Luck
Manager Telecommunications
ElectraNet

P: +61 8 8404 7654 M: +61 413 154 816
E: Luck.Colleen3@electranet.com.au W: electranet.com.au
Corporate: ElectraNet Pty Limited • 52-55 East Terrace, Adelaide • PO Box 7096 Hutt Street Post Office, Adelaide, SA, 5000
My Office: 52-55 East Terrace, Adelaide SA 5000

ElectraNet acknowledges the Traditional Owners of the land and waters on which we operate. We pay our respects to their Elders past, present and emerging and extend our respect to all other Aboriginal and Torres Strait Islander people of Australia. Learn more [here](#).

From: Fleet, Aaron (ENet) <Fleet.Aaron@electranet.com.au>
Sent: Tuesday, September 19, 2023 4:01 PM
To: Luck, Colleen (ENet) <Luck.Colleen3@electranet.com.au>
Cc: Marcus Eymael <Marcus.Eymael@ghd.com>
Subject: FW: Wind Farm EMI Assessment - Palmer Wind Farm

Hi Colleen,
Is this request something your team can assist Marcus with?

Thank you

Regards

Aaron Fleet
Facilities Services Manager
ElectraNet

P: +61 8 8404 7637 F: +61 8 8404 7182 M: 0407 177 585
E: Fleet.Aaron@electranet.com.au W: www.electranet.com.au
Corporate: ElectraNet Pty Limited • 52-55 East Terrace, Rymill Park, Adelaide • PO Box 7096 Hutt Street Post Office, Adelaide, SA, 5000
My Office: Level 1, 99 Frome Street, Adelaide

From: Marcus Eymael <Marcus.Eymael@ghd.com>
Sent: Tuesday, 19 September 2023 3:48 PM
To: Fleet, Aaron (ENet) <Fleet.Aaron@electranet.com.au>
Subject: RE: Wind Farm EMI Assessment - Palmer Wind Farm

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Hi Aaron,
This was a shot in the dark, when I rang ElectraNet your name came up as the most relevant person to ask. If you could point me in the right direction that would be great, I'm looking for someone that manages your radio network.

Marcus Eymael
Security & Communications Consultant
Building Engineering

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Level 15 133 Castlereagh Street Sydney NSW 2000 Australia
D +61 2 9239 7980 E marcus.eymael@ghd.com

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From: Fleet, Aaron (ENet) <Fleet.Aaron@electranet.com.au>
Sent: Tuesday, September 19, 2023 4:15 PM
To: Marcus Eymael <Marcus.Eymael@ghd.com>
Subject: RE: Wind Farm EMI Assessment - Palmer Wind Farm

Hi Marcus,
I'm assuming you have the incorrect contact for this although I do work for ElectraNet, who were you after?

Regards

Aaron Fleet
Facilities Services Manager
ElectraNet

P: +61 8 8404 7637 F: +61 8 8404 7182 M: 0407 177 585
E: Fleet.Aaron@electranet.com.au W: www.electranet.com.au
Corporate: ElectraNet Pty Limited • 52-55 East Terrace, Rymill Park, Adelaide • PO Box 7096 Hutt Street Post Office, Adelaide, SA, 5000
My Office: Level 1, 99 Frome Street, Adelaide

From: Marcus Eymael <Marcus.Eymael@ghd.com>
Sent: Tuesday, 19 September 2023 1:21 PM
To: Fleet, Aaron (ENet) <Fleet.Aaron@electranet.com.au>
Cc: Brendan Siebert <Brendan.Siebert@ghd.com>
Subject: Wind Farm EMI Assessment - Palmer Wind Farm

CAUTION: This email originated from outside of ElectraNet. Do not click links or open attachments unless you recognise the sender and know the content is safe.

Hi Aaron,

GHD is conducting the Electromagnetic Interference Assessment report on behalf of Tilt Renewables for a wind farm feasibility study on land in Palmer, SA. If the study progresses through feasibility, this assessment will be used to support approvals of the project.

Based on the publicly available information on the ACMA database, there are no ElectraNet p2p links crossing. Can you or someone else confirm whether there will be an effect on ElectraNet services?

I have attached the site boundary and turbine layout in the .kml file and coordinates in the attached excel spreadsheet. The turbine specifications will not exceed the dimensions shown below:

- Maximum tip height: Up to 220m
- Minimum clearance from ground level: No less than 37m
- Rotor diameter: Up to 180m

Please do not hesitate to contact me if you have any questions.

Marcus Eymael
Security & Communications Consultant
Building Engineering

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From: Ryan Ruddick <Ryan.Ruddick@ga.gov.au>
Sent: Monday, 25 September 2023 9:56 AM
To: Marcus Eymael; Client Services
Cc: Brendan Siebert
Subject: RE: Wind Farm EMI Assessment - Palmer Wind Farm [SEC=OFFICIAL]

Follow Up Flag: Follow up
Flag Status: Flagged

Dear Marcus,

Geoscience Australia do not foresee any impact on our geodetic infrastructure (including GNSS reference stations) as a result of the proposed windfarm at Palmer, SA.

Kind regards.

Ryan Ruddick (He/Him) | Director
GNSS Infrastructure and Informatics Section | Positioning Australia
Space Division

t +61 2 6249 9426 t +61 429 771 069 ga.gov.au



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Geoscience Australia acknowledges the traditional owners and custodians of Country throughout Australia and acknowledges their continuing connection to land, waters and community. We pay our respects to the people, the cultures and the elders past and present.

From: Marcus Eymael <Marcus.Eymael@ghd.com>
Sent: Tuesday, September 19, 2023 1:19 PM
To: Client Services <ClientServices@ga.gov.au>; Ryan Ruddick <Ryan.Ruddick@ga.gov.au>
Cc: Brendan Siebert <Brendan.Siebert@ghd.com>
Subject: Wind Farm EMI Assessment - Palmer Wind Farm

Hi Ryan,

GHD is conducting the Electromagnetic Interference Assessment report on behalf of Tilt Renewables for a wind farm feasibility study on land in Palmer, SA. If the study progresses through feasibility, this assessment will be used to support approvals of the project.

Based on the publicly available information on the ACMA database, there are no Geoscience Australia p2p links crossing. Can you or someone else confirm whether there will be an effect on Geoscience Australia services?

I have attached the site boundary and turbine layout in the .kml file and coordinates in the attached excel spreadsheet. The turbine specifications will not exceed the dimensions shown below:

- Maximum tip height: Up to 220m
- Minimum clearance from ground level: No less than 37m
- Rotor diameter: Up to 180m

Please do not hesitate to contact me if you have any questions.

Marcus Eymael
Security & Communications Consultant
Building Engineering

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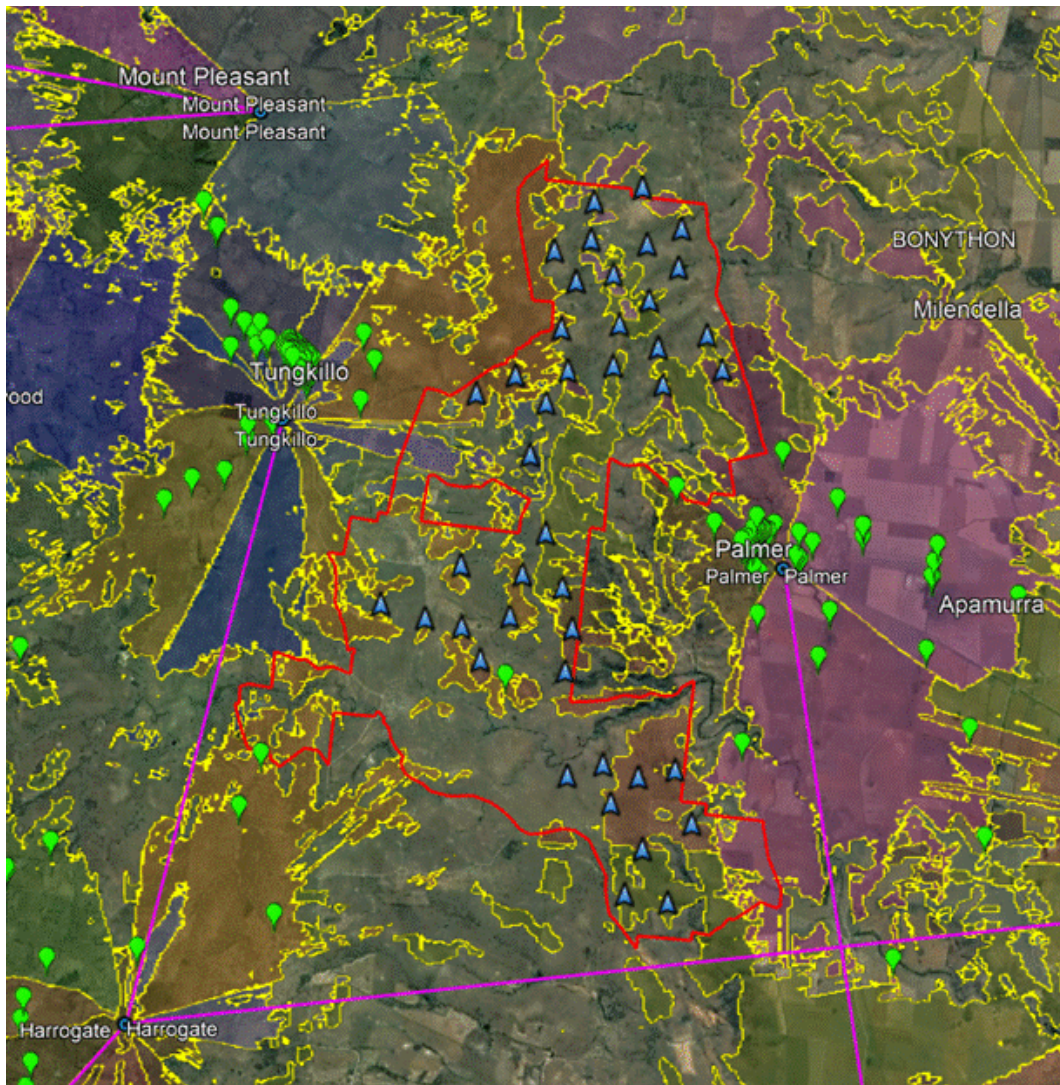
From: Network_Capacity_Enquiries <Network_Capacity_Enquiries@nbnco.com.au>
Sent: Wednesday, 20 September 2023 2:14 PM
To: Marcus Eymael
Cc: Brendan Siebert; Network_Capacity_Enquiries
Subject: Wind Farm EMI Assessment - Palmer Wind Farm [Commercial - Anyone]

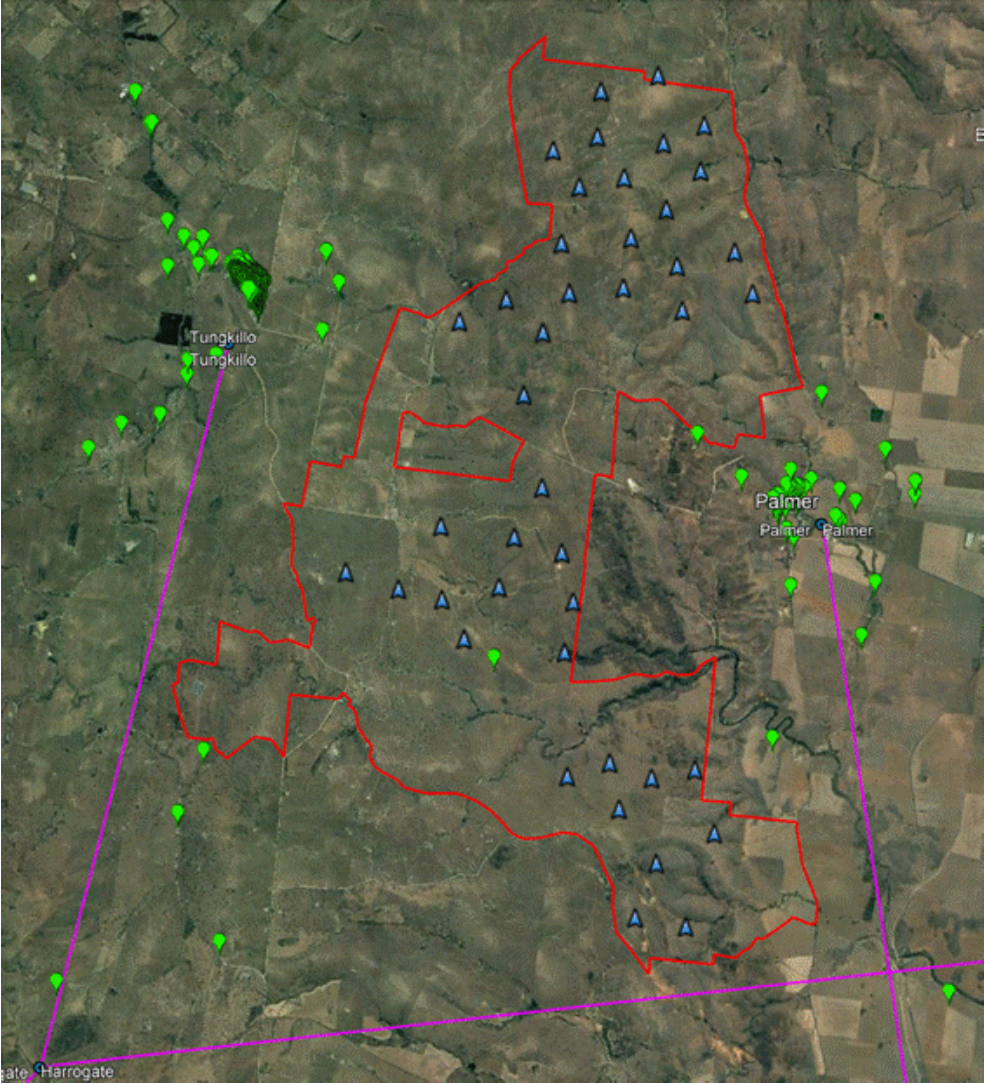
Good Morning Marcus,

Please see below Franks comments. Any questions please reach out:

Desktop Analysis

I have reviewed the data provided based on the proposed wind farm location ; The wind farm boundaries are inside existing nbn wireless coverage boundaries, however none of the proposed wind tower locations pose any risk of introducing a physical obstruction to the existing RF Path Profiles or boresight paths of existing nbn microwave links. It is also noted there is a nbn connected customer premises within the wind farm boundary however the likelihood of intrusion into their RF path toward the nbn eNB causing degraded service is considered very unlikely.





Images show current operational nbn wireless coverage areas relative to wind farm location and turbines. Numerous parts of the wind farm are inside current nbn Wireless Coverage Boundaries.

Legend: blue triangle = wind turbine, yellow line = nbn Wireless Coverage Boundary, purple line = nbn microwave link, green icon = nbn Fixed Wireless customer connections

Of potential greater concern is any impact from wind farm operated RF transmission equipment impacting nbn licensed spectrum.

Therefore, please provide information on any planned RF transmission equipment planned to be installed so a potential interference impact can be assessed. This information should include as a minimum, the operating transmission frequencies and transmit power, channel bandwidths, antenna types and their radiation patterns as well as their exact location with antenna height, boresight azimuth and tilt [either mechanical or electrical tilt].

A standard nbn response for wind farm applications regarding potential interference impact on the nbn Fixed Wireless network is as follows;

Potential Impacts of the Proposed Palmer Wind Farm on NBN Co Spectrum Communication Assets

Referring to the email dated 19th September 2023 regarding the application for the Palmer Wind Farm .

We confirm that NBN Co Spectrum Pty Ltd (**nbn Spectrum**) has a number of spectrum licenses within 75 km of the proposed Palmer Wind Farm.

nbn has strict obligations to provide internet services to the community, and this area has been determined as a FW service area where the footprint of this service is now in place.

nbn will be forced to consider its position as part of the planning should there an interference issue.

If the Application is amended before it is lodged, we request that we are sent any amended Application so we can determine whether we have any objections to the amended Application.

We note that, as you would be aware, under section 197 of the *Radiocommunications Act 1992* (Cth) it is an offence to knowingly or recklessly do anything likely to interfere substantially with radiocommunications or otherwise substantially disrupt or disturb radiocommunications.

Thank you

Whitney Tucker

Escalations and Complaints Business Partner
Regional Development & Engagement

Please note workdays: Monday to Thursday

M +61 429 682 709 | **E** whitneytucker@nbnco.com.au

Level 4, 202 Pier Street Perth, WA 6000

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From: Marcus Eymael <Marcus.Eymael@ghd.com>
Sent: Tuesday, September 19, 2023 1:17 PM
To: Network_Capacity_Enquiries <Network_Capacity_Enquiries@nbnco.com.au>; Whitney Tucker <whitneytucker@nbnco.com.au>
Cc: Brendan Siebert <Brendan.Siebert@ghd.com>
Subject: [External] Wind Farm EMI Assessment - Palmer Wind Farm

EXTERNAL SENDER – Be cautious opening Links and Attachments

Hi Whitney,

GHD is conducting the Electromagnetic Interference Assessment report on behalf of Tilt Renewables for a wind farm feasibility study on land in Palmer, SA. If the study progresses through feasibility, this assessment will be used to support approvals of the project.

Based on the publicly available information on the ACMA database, there are no NBN Co p2p links crossing. Can you or someone else confirm whether there will be an effect on NBN Co services?

I have attached the site boundary and turbine layout in the .kml file and coordinates in the attached excel spreadsheet. The turbine specifications will not exceed the dimensions shown below:

- Maximum tip height: Up to 220m
- Minimum clearance from ground level: No less than 37m
- Rotor diameter: Up to 180m

Please do not hesitate to contact me if you have any questions.

Marcus Eymael
Security & Communications Consultant
Building Engineering

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From: Sal Stillone <Sal.Stillone@optus.com.au>
Sent: Friday, 29 September 2023 6:03 PM
To: Marcus Eymael
Cc: Brendan Siebert; Thomas Gallos
Subject: RE: Wind Farm EMI Assessment - Palmer Wind Farm

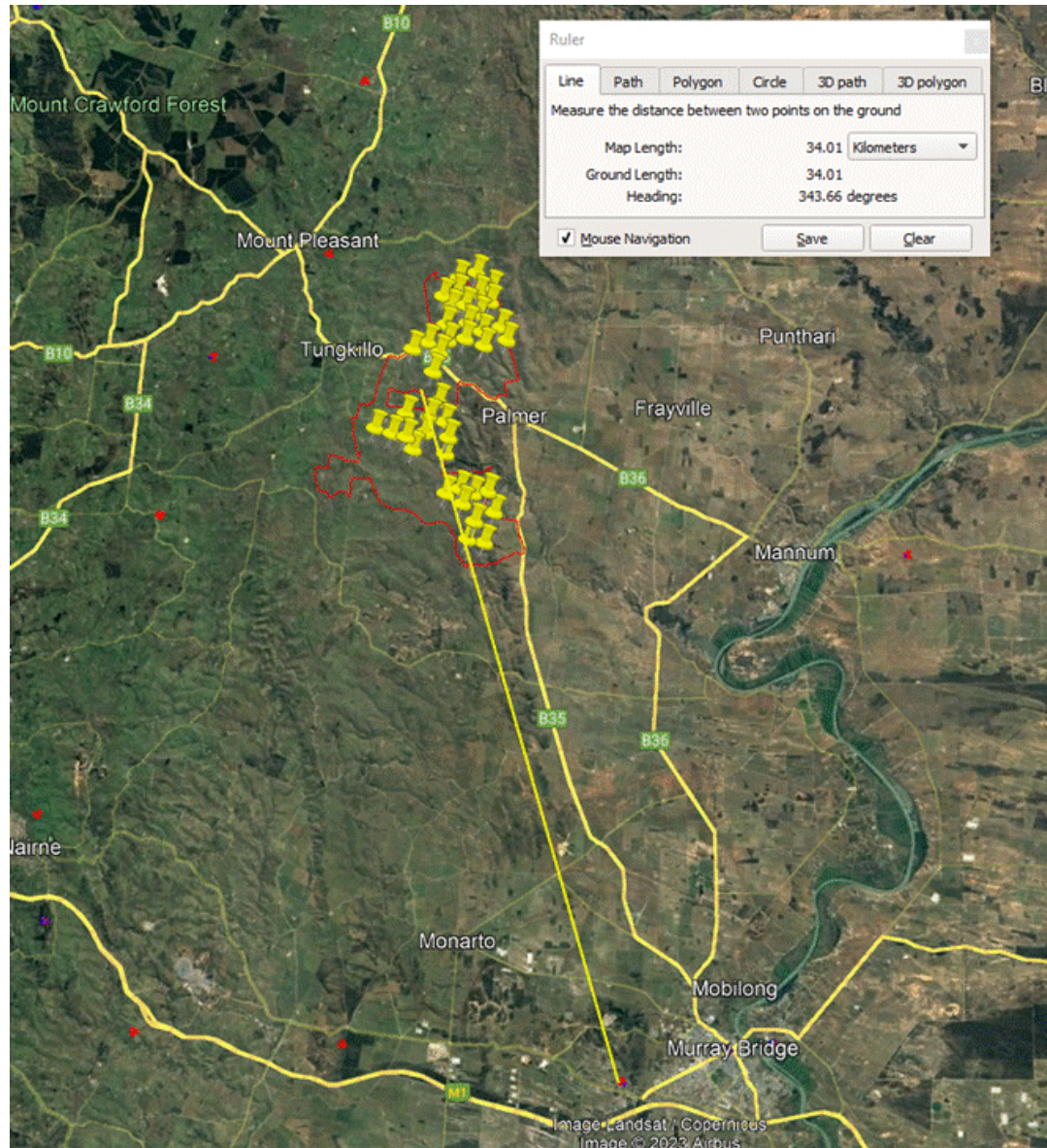
Follow Up Flag: Follow up
Flag Status: Flagged

Hi Marcus,

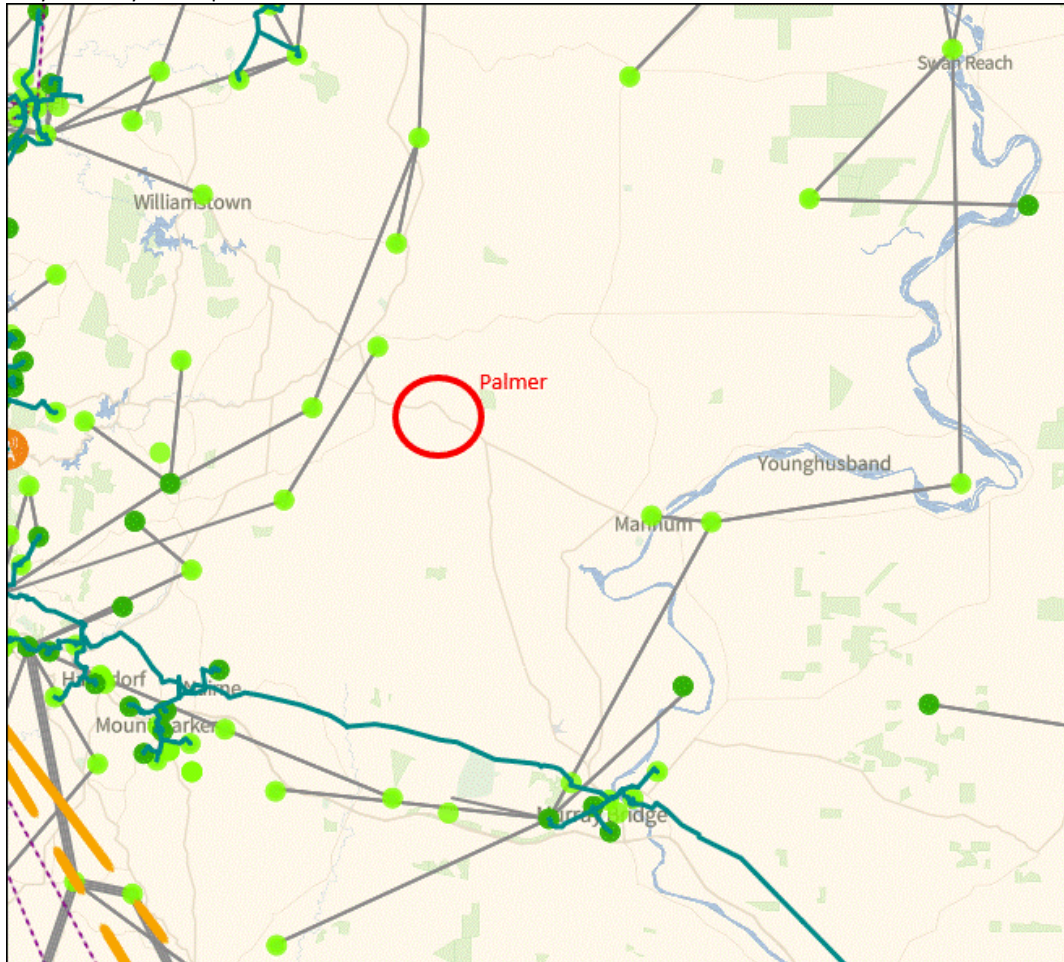
Thanks for your email on the proposed wind farm in Paler SA.

I have checked with my colleague in SA, completed a desktop assessment and we conclude that the Wind Farm will not impact the Optus mobile network.

Palmer, which is located 30km NW of Murray Bridge and we don't have any existing site or have any plans for a new site in the area.



There are no microwave links currently passing through the area but would require transmission team (Michael O) to confirm if they have any future plans.



Regards,

Sal Stillone
Manager State Radio Planning and Quality WA | Networks
t: 08 9288 3007
m: 0402 470 026
Level 3, 2 Victoria Avenue, Perth WA
Sal.Stillone@optus.com.au



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From: Marcus Eymael <Marcus.Eymael@ghd.com>
Sent: Tuesday, 19 September 2023 11:14 AM
To: Sal Stillone <Sal.Stillone@optus.com.au>
Cc: Brendan Siebert <Brendan.Siebert@ghd.com>
Subject: Wind Farm EMI Assessment - Palmer Wind Farm

[External email] Please be cautious when clicking on any links or attachments.

Hi Sal,

GHD is conducting the Electromagnetic Interference Assessment report on behalf of Tilt Renewables for a wind farm feasibility study on land in Palmer, SA. If the study progresses through feasibility, this assessment will be used to support approvals of the project.

Based on the publicly available information on the ACMA database, there are no Optus p2p links crossing. Can you or someone else confirm whether there will be an effect on Optus services?

I have attached the site boundary and turbine layout in the .kml file and coordinates in the attached excel spreadsheet. The turbine specifications will not exceed the dimensions shown below:

- Maximum tip height: Up to 220m
- Minimum clearance from ground level: No less than 37m
- Rotor diameter: Up to 180m

Please do not hesitate to contact me if you have any questions.

Marcus Eymael
Security & Communications Consultant
Building Engineering

GHD

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Level 15 133 Castlereagh Street Sydney NSW 2000 Australia

D +61 2 9239 7980 E marcus.eymael@ghd.com

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From: AGD:SAGRN <SAGRN@sa.gov.au>
Sent: Tuesday, 31 October 2023 1:43 PM
To: Marcus Eymael
Cc: AGD:SAGRN; Brendan Siebert
Subject: RE: Wind Farm EMI Assessment - Palmer Wind Farm | INC00004316717

OperatingCentre: 33
JobNo: 12610992
CompleteRepository: 12610992
RepoEmail: 12610992@ghd.com
Description: Palmer Wind Farm - Technical Assessments
RepoType: Project

Some people who received this message don't often get email from sagr@sa.gov.au. [Learn why this is important](#)

OFFICIAL

Hi Marcus,

This assessment is complete and there are not expected to be any effects on SAGRN services.

In future, the correct avenue for enquiries is sagr@sa.gov.au.

Regards,

Stuart

Stuart Fillmore | Manager Service Delivery
Public Safety Solutions | Attorney-General's Department
E stuart.fillmore@sa.gov.au | www.agd.sa.gov.au
M 0407 834 639



From: Marcus Eymael <Marcus.Eymael@ghd.com>
Sent: Monday, 30 October 2023 3:33 PM
To: Sagr Operations-SAGRN (Application) <sagr@motorolasolutions.com>
Cc: frank.depiaz@motorolasolutions.com; john.mavropoulos@motorolasolutions.com; david.loy@sa.gov.au; Fran.Altree@sa.gov.au; Brendan Siebert <Brendan.Siebert@ghd.com>
Subject: RE: Wind Farm EMI Assessment - Palmer Wind Farm

Hi all,
Just following up on this email, when can GHD expect a response?

Marcus Eymael
Security & Communications Consultant
Building Engineering

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From: Marcus Eymael

Sent: Tuesday, September 19, 2023 1:23 PM

To: 'sagr@motorolasolutions.com' <sagr@motorolasolutions.com>

Cc: 'frank.depiaz@motorolasolutions.com' <frank.depiaz@motorolasolutions.com>;

'john.mavropoulos@motorolasolutions.com' <john.mavropoulos@motorolasolutions.com>; 'david.loy@sa.gov.au' <david.loy@sa.gov.au>; 'Fran.Altree@sa.gov.au' <Fran.Altree@sa.gov.au>; Brendan Siebert <Brendan.Siebert@ghd.com>

Subject: Wind Farm EMI Assessment - Palmer Wind Farm

To whom it may concern,

GHD is conducting the Electromagnetic Interference Assessment report on behalf of Tilt Renewables for a wind farm feasibility study on land in Palmer, SA. If the study progresses through feasibility, this assessment will be used to support approvals of the project.

Based on the publicly available information on the ACMA database, there are no SA GRN p2p links crossing. Can someone confirm whether there will be an effect on SA GRN services?

I have attached the site boundary and turbine layout in the .kml file and coordinates in the attached excel spreadsheet. The turbine specifications will not exceed the dimensions shown below:

- Maximum tip height: Up to 220m
- Minimum clearance from ground level: No less than 37m
- Rotor diameter: Up to 180m

Please do not hesitate to contact me if you have any questions.

Marcus Eymael

**Security & Communications Consultant
Building Engineering**

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From: Hamra, Justin <Justin.Hamra@sawater.com.au>
Sent: Thursday, 2 November 2023 11:17 AM
To: Brendan Siebert
Cc: Theo Kalaitzidis; Marcus Eymael
Subject: RE: CN:002164743 is your SA Water reference

CompleteRepository: 12610992
Description: Palmer Wind Farm - Technical Assessments
JobNo: 12610992
OperatingCentre: 33
RepoEmail: 12610992@ghd.com
RepoType: Project

Hello Brendan,

SA Water does not have any 'in-house' experts in this area, however, in previous instances of potential signal interruption to critical water/wastewater assets, we have issued the following statement by way of guidance.

SA Water's existing water and wastewater systems are critical to the wellbeing of South Australian residents. Any interruption to radio communications due to the location of a wind farms is unacceptable.

SA Water will not approve or take any responsibility in the case of interference (of any kind) from wind farms. The wind farm designer shall ensure that there is no radio communications interference to SA Water's systems. Should best endeavours of the wind farm owners fail to achieve this, it is expected that immediate rectification of the reduction in quality of service be borne by the wind farm.

If required, SA Water can provide the coordinates of SA Water sites in the area.

I hope this answers your question. Feel free to pass any further questions through to me.

Regards,

Justin

JUSTIN HAMRA

Principal Engineer - Electrical
SA Water

T

M 0436 659 797

E justin.hamra@sawater.com.au

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www.sawater.com.au

250 Victoria Square/Tarntanyangga, Adelaide SA 5000
GPO Box 1751, Adelaide SA 5001

From: Brendan Siebert <Brendan.Siebert@ghd.com>

Sent: Wednesday, November 1, 2023 11:45 AM

To: Hamra, Justin <Justin.Hamra@sawater.com.au>

Cc: Theo Kalaitzidis <Theo.Kalaitzidis@ghd.com>; Marcus Eymael <Marcus.Eymael@ghd.com>
Subject: FW: CN:002164743 is your SA Water reference

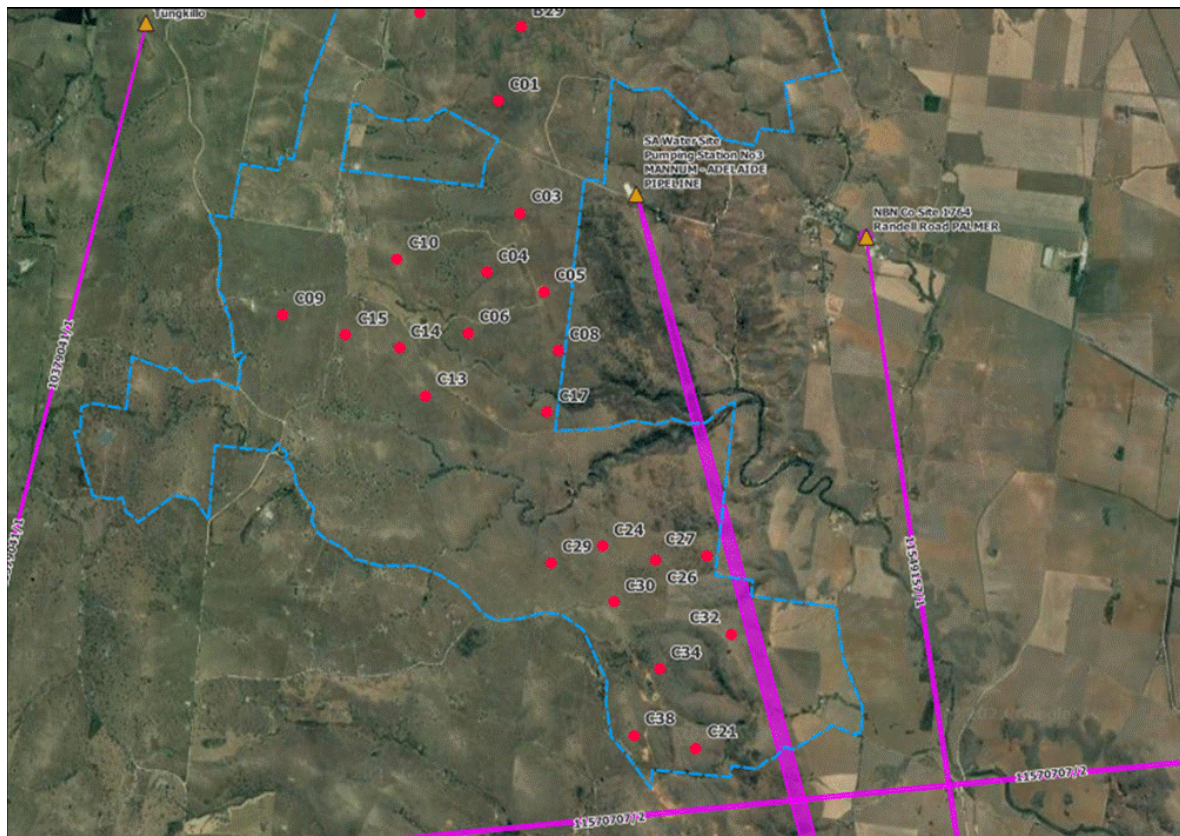


Hi Justin,

My colleague Theo Kalaitzidis advised that you may be able to identify the relevant party in SA Water who can assist with our point-to-point radio communication query related to a proposed wind farm development.

The proposed wind farm is in Palmer (just outside of Mannum) and there is a SA Water pumping station adjacent to the wind farm. GHD are consulting with SA Water so that SA Water can conduct their own analysis to confirm that the wind farm will not impact their communications assets or advise otherwise.

An excerpt from GHD's analysis is below:



None of the WTG sit within a point-to-point radio link Fresnel exclusion zone, however the blade tip extents of two WTG, C27 and C32, are ~150m and ~120m respectively, away from link 1958469/1 Fresnel exclusion zone.

This link is operated by South Australian Water Corporation (SA Water) servicing the Pumping Station No3 Mannum – Adelaide Pipeline. GHD's preliminary analysis is that the UHF radio link will be unaffected by the proposed wind farm development and are awaiting SA Water's own assessment to be included into this report.

Can SA Water advise on impact to SA Water's radio communications assets by the proposed wind farm development? Attached are turbine locations and project boundary in .CSV and .KML formats for review.

Appreciate the assistance.

Best regards,

Brendan Siebert

BE(IT&Telecommunications)(Hons.) RPEV MIEAust

Senior Engineer - Telecommunications

GHD

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Level 4 211 Victoria Square Adelaide SA 5000 Australia

D +61 8 8111 6743 **O** +61 8 8111 6600 **E** brendan.siebert@ghd.com

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Please consider the environment before printing this email

From: Marcus Eymael <marcus.eymael@ghd.com>

Sent: Thursday, September 28, 2023 10:40 AM

To: CustomerCare <CustomerCare@sawater.com.au>

Cc: Brendan Siebert <Brendan.Siebert@ghd.com>

Subject: RE: CN:002164743 is your SA Water reference

Hi Mel,

We are conducting an EMI analysis on behalf of Tilt Renewables for a proposed wind farm in Palmer. Based on publicly available information we've noted that there is a **SA Water owned and operated point-to-point radio link** quite close to the proposed wind farm. It is critical that GHD consults with SA Water to ensure that the proposed wind farm does not impact your operations. We'd be looking to talk to someone that manages your radio fleet network/services.

Marcus Eymael

Security & Communications Consultant

Building Engineering

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Please consider the environment before printing this email

From: CustomerCare <CustomerCare@sawater.com.au>

Sent: Wednesday, September 27, 2023 2:34 PM

To: Marcus Eymael <marcus.eymael@ghd.com>

Subject: CN:002164743 is your SA Water reference

You don't often get email from customercare@sawater.com.au. [Learn why this is important](#)

SA Water Reference: CN:002164743

Hello Marcus,

Thank you for your correspondence dated 19 September 2023 regarding a point of contact at SA Water.

So that I may assist you can I confirm what kind of works are taking place and how SA Water would be involved.

The information you provided looks to be associated with electrical and therefore not SA Water related.

Thank you for your cooperation in this matter and should you have any enquiries, please do not hesitate to contact the Customer Care Centre on 1300 SA WATER (1300 729 283).

Yours sincerely,

Mel

Customer Care Centre Officer

SA Water

T 1300 729 283

F 08 7003 3329

E customercare@sawater.com.au

sawater.com.au

----- Original Message -----

An online submission has been submitted.

Enquiry:

General and billing enquiry

Are you the account holder?:

No

Message:

I work for GHD and am looking to contact someone in regards to SA Water point-to-point radio links. GHD is conducting the Electromagnetic Interference Assessment report on behalf of Tilt Renewables for a wind farm feasibility study on land in Palmer, SA.

First Name:

Marcus

Last Name:

Eymael

Phone Number:

0403122893

Email Address:

marcus.eymael@ghd.com

Location:

Palmer

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From: ! Windfarm Assessment Requests <WindfarmAssessmentRequests@team.telstra.com>
Sent: Friday, 27 October 2023 4:18 PM
To: Marcus Eymael
Cc: Brendan Siebert
Subject: RE: Wind Farm EMI Assessment - Palmer Wind Farm
Attachments: Palmer Windfarm Response.pdf

Follow Up Flag: Follow up
Flag Status: Flagged

Hi Marcus,

Please find attached Telstra's response to the proposed Palmer Wind Farm.

If you have any queries on the response please do not hesitate to get back to me.

Regards,
David Jonas
Senior Chapter Lead
Fixed Access Planning WA, SA & NT
Connectivity Engineering
Global Networks & Technology



Flow to Work – CAN Reliability Team

P 08 6224 6268
M 0438 934 894
E David.Jonas@team.telstra.com
W www.telstra.com

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If I've sent it to you by accident, please delete it immediately

General

From: Marcus Eymael <Marcus.Eymael@ghd.com>
Sent: Tuesday, September 19, 2023 11:11 AM
To: ! Windfarm Assessment Requests <WindfarmAssessmentRequests@team.telstra.com>; Jonas, David <david.jonas@team.telstra.com>
Cc: Brendan Siebert <Brendan.Siebert@ghd.com>
Subject: Wind Farm EMI Assessment - Palmer Wind Farm

[External Email] This email was sent from outside the organisation – be cautious, particularly with links and attachments.

Hi David,

GHD is conducting the Electromagnetic Interference Assessment report on behalf of Tilt Renewables for a wind farm feasibility study on land in Palmer, SA. If the study progresses through feasibility, this assessment will be used to support approvals of the project.

Based on the publicly available information on the ACMA database, there are no Telstra p2p links crossing. Can you or someone else confirm whether there will be an effect on Telstra services?

I have attached the site boundary and turbine layout in the .kml file and coordinates in the attached excel spreadsheet.
The turbine specifications will not exceed the dimensions shown below:

- Maximum tip height: Up to 220m
- Minimum clearance from ground level: No less than 37m
- Rotor diameter: Up to 180m

Please do not hesitate to contact me if you have any questions.

Marcus Eymael
Security & Communications Consultant
Building Engineering

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27 October 2023

Marcus Eymael
GHD
Sydney NSW 2000

Re: Proposed Palmer Wind Farm

Dear Marcus,

To provide a better understanding of potential impacts to Telstra infrastructure a desktop assessment was undertaken. Based on this assessment, to minimise potential interference to Telstra's telecommunications network, Telstra requires the developer to confirm its agreement to the conditions and matters set out below:

- 1) There are no expected impacts to Telstra's Mobile network due to this wind farm based on the turbine locations provided.
- 2) Based on the turbine locations provided and information regarding Telstra existing point to point radio links obtained from Waypoint and maprad.io, the proposed wind farm should not impact on any of Telstra existing point to point radio links.
- 3) A detailed analysis of the full power coordination impact (Low Frequency Induction (LFI) and/or Earth Potential Rise (EPR)) of the wind farm development is required. This includes location of the wind farm switch yard, the route and potential of any associated HV transmissions lines and the LFI and EPR impact on any Telstra plant they may affect.
- 4) It is recommended that you contact Before You Dig Australia, so you are aware of the underground assets in the area. They will provide you with the location of Telstra's as well as any other utilities' underground assets.

The developer also confirms its role as the proponent and ultimate owner of the proposed wind farm and that it has the authority to ensure that the conditions set out above are implemented and complied with. If the agreement of any other person or entity is required to ensure the conditions set out in this letter are complied with, the developer undertakes to obtain that agreement in writing and to provide it to Telstra prior to lodging a development application for the wind farm.

If the proposed plans and specifications of the development are altered or amended, Telstra reserves the right to request further conditions and amendments to the development.

Should you wish to discuss any aspect of this letter please do not hesitate to contact the undersigned. Otherwise, I would appreciate you responding to me confirming the developer's agreement to the conditions and matters set out above.



Yours faithfully,

David Jonas
Senior Access Planner
Fixed Access Planning
david.jonas@team.telstra.com

From: Marcus Eymael
Sent: Tuesday, 19 September 2023 1:08 PM
To: land.planning@defence.gov.au; Adam.Murray3@defence.gov.au
Cc: Brendan Siebert
Subject: Wind Farm EMI Assessment - Palmer Wind Farm
Attachments: Project Boundary.kml; Turbine Locations.csv; Turbines.kml

CompleteRepository: 12610992
Description: Palmer Wind Farm - Technical Assessments
JobNo: 12610992
OperatingCentre: 33
RepoEmail: 12610992@ghd.com
RepoType: Project

Hi Adam,

GHD is conducting the Electromagnetic Interference Assessment report on behalf of Tilt Renewables for a wind farm feasibility study on land in Palmer, SA. If the study progresses through feasibility, this assessment will be used to support approvals of the project.

Based on the publicly available information on the ACMA database, there are no Defence p2p links crossing. Can you or someone else confirm whether there will be an effect on Defence services?

I have attached the site boundary and turbine layout in the .kml file and coordinates in the attached excel spreadsheet.

The turbine specifications will not exceed the dimensions shown below:

- Maximum tip height: Up to 220m
- Minimum clearance from ground level: No less than 37m
- Rotor diameter: Up to 180m

Please do not hesitate to contact me if you have any questions.

Marcus Eymael
Security & Communications Consultant
Building Engineering

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From: Marcus Eymael
Sent: Monday, 30 October 2023 4:07 PM
To: Colin lee, Nokia; Syed Mohyuddin
Cc: Brendan Siebert
Subject: RE: Wind Farm EMI Assessment - Palmer Wind Farm

CompleteRepository: 12610992
Description: Palmer Wind Farm - Technical Assessments
JobNo: 12610992
OperatingCentre: 33
RepoEmail: 12610992@ghd.com
RepoType: Project

Hi all,
Just following up on this email, when can GHD expect a response?

Marcus Eymael
Security & Communications Consultant
Building Engineering

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Please consider the environment before printing this email

From: Marcus Eymael
Sent: Tuesday, September 19, 2023 1:16 PM
To: Colin lee, Nokia <Colin.Lee@Nokia.com>; Syed Mohyuddin <Syed.Mohyuddin@tpgtelecom.com.au>
Cc: Brendan Siebert <Brendan.Siebert@ghd.com>
Subject: Wind Farm EMI Assessment - Palmer Wind Farm

Hi Colin and Syed,

GHD is conducting the Electromagnetic Interference Assessment report on behalf of Tilt Renewables for a wind farm feasibility study on land in Palmer, SA. If the study progresses through feasibility, this assessment will be used to support approvals of the project.

Based on the publicly available information on the ACMA database, there are no Vodafone p2p links crossing. Can you or someone else confirm whether there will be an effect on Vodafone services?

I have attached the site boundary and turbine layout in the .kml file and coordinates in the attached excel spreadsheet. The turbine specifications will not exceed the dimensions shown below:

- Maximum tip height: Up to 220m
- Minimum clearance from ground level: No less than 37m
- Rotor diameter: Up to 180m

Please do not hesitate to contact me if you have any questions.

Marcus Eymael
Security & Communications Consultant
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Palmer Wind Farm
Variation Application - Flora and Fauna Impact
Assessment

Palmer Wind Farm Variation Application - Flora and Fauna Impact Assessment

26 February 2024

Version Final

Prepared by EBS Ecology for Tilt Renewables Australia Pty Ltd

Document Control					
Revision No.	Date issued	Authors	Reviewed by	Date Reviewed	Revision type
1	03/02/2023	G. Wilson	A. Derry	03/02/2023	Draft 1
2	08/08/2023	H. Merigot	Dr M. Louter	09/08/2023	Draft 2
3	02/02/2024	H. Merigot	Dr M. Louter	01/02/2024	Draft 3
4	26/02/2024	A. Carpenter	A. Derry	26/02/2024	Final

Distribution of Copies			
Revision No.	Date issued	Media	Issued to
1	15/02/2023	Electronic	J. Beckett, N. Taggart, Tilt Renewables Australia Pty Ltd (Tilt)
2	01/09/2023	Electronic	N. Taggart & J. Beckett, Tilt Renewables Australia Pty Ltd (Tilt)
3	02/02/2024	Electronic	N. Taggart & J. Beckett, Tilt Renewables Australia Pty Ltd (Tilt)
4	26/02/2024	Electronic	N. Taggart & J. Beckett, Tilt Renewables Australia Pty Ltd (Tilt)

EBS Ecology Project Number: EX230107 (previously EX211204)

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CITATION: EBS Ecology (2024) Palmer Wind Farm Variation Application - Flora and Fauna Impact Assessment. Report to Tilt Renewables Australia Pty Ltd. EBS Ecology, Adelaide.

Cover photograph: *Eucalyptus camaldulensis* very open woodland with *Allocasuarina verticillata* within the Varied Project Area.

EBS Ecology
112 Hayward Avenue
Torrensville, South Australia 5031
t: 08 7127 5607
<http://www.ebsecology.com.au>
email: info@ebsecology.com.au



GLOSSARY AND ABBREVIATION OF TERMS

BAM	Bushland Assessment Method
BDBSA	Biological Database of South Australia
CEMP	Construction Environmental Management Plan
DCCEEW	Department of Climate Change, Energy, the Environment and Water (Commonwealth)
DEW	Department of Environment and Water (South Australia)
EBS	Environmental and Biodiversity Services Pty Ltd, trading as EBS Ecology
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
FRWL	Flinders Ranges Worm Lizard
GHFF	Grey-headed Flying Fox
ha	Hectare(s)
INTG	Iron-grass Natural Temperate Grassland of South Australia
LSA Act	<i>Landscape South Australia Act 2019</i>
m	Metre(s)
MNES	Matters of National Environmental Significance, as defined under the EPBC Act
Native vegetation	A plant or plants of a species indigenous to South Australia (including dead trees as specified in the <i>Native Vegetation Regulations 2017</i> , and planted vegetation protected under the NV Act such as SEB or Heritage Agreements)
NPW Act	<i>National Parks and Wildlife Act 1972</i>
NV Act	<i>Native Vegetation Act 1991</i>
NVC	Native Vegetation Council
OEMP	Operational Environmental Management Plan
PBGW	Peppermint Box (<i>Eucalyptus odorata</i>) Grassy Woodland of South Australia
PBTL	Pygmy Blue-tongue Lizard (<i>Tiliqua adelaidensis</i>)
PMST	Protected Matters Search Tool
Varied Project	Palmer Wind Farm (as proposed to be varied, by the reduction of the number of WTG to 40 and the increase of the maximum tip height to 220 m)
Varied Project Area	Farming and cropping land located 50 km northeast of Adelaide, South Australia.
SA	South Australia(n)
SEB	Significant Environmental Benefit
Search Area	10 km buffer around the Project Area considered in the desktop assessment database searches
sp.	Species (singular)
spp.	Species (plural)
ssp.	Subspecies
TEC	Threatened Ecological Community
VA(s)	Vegetation association(s)
var.	Variety (a taxonomic rank below that of species and subspecies, but above that of form)
WTE	Wedge-tailed Eagle

EXECUTIVE SUMMARY

Tilt Renewables has development plan consent for the Wind Farm Project, comprising up to 103 wind turbines with a maximum tip height of 165 m. Tilt Renewables is seeking approval to vary the approved project to reduce the number of turbines to 40 and to increase the maximum tip height to 220 m. EBS Ecology was engaged by Tilt Renewables (the Proponent) to assess the potential flora and fauna constraints for the Project. The Project is located in the eastern Mount Lofty Ranges of South Australia, approximately 50 kilometres (km) east of Adelaide. The site extends 15 km in a north to south direction, centred on ridgelines. As a result of a variation, Area A of the approved project will be deleted. The Project will be split into two clusters, referred to as Areas B and C. The turbine and infrastructure layout will be finalised taking into account the constraints outlined in this report.

EBS Ecology was engaged by Tilt Renewables to undertake the following:

- Review all the previous ecological studies that have been undertaken for the Varied Project Area to:
 - Identify and update flora and fauna values of Commonwealth (Matters of National Environmental Significance) and State significance, and threatened species statuses as they may have changed since previous surveys;
 - Identify 'key ecological risk areas' within the Varied Project Area and any areas to be excluded;
- Undertake field surveys that assist in the preparation of ecological constraints assessment report.
- Prepare an ecological constraints assessment that will:
 - Support Development Application for the variation of the approved project under the *Planning, Development and Infrastructure Act 2016*.
 - Support a Native Vegetation Removal Application (Data Clearance Report) which will meet standards under the *Native Vegetation Act 1991*.
 - Support a referral under the *Environmental Protection and Biodiversity Conservation Act 1999*.
 - Identify requirements for targeted species-specific surveys that may be required.
 - Identify consultation requirements, and environmental approvals that may be required to facilitate the development of the proposed Project.

This report combines the results of previous surveys, an updated desktop assessment and a combined October 2022 spring flora and fauna survey, to provide an overall picture of the ecological constraints for the Project.

An updated desktop assessment was undertaken to determine the potential for any additional threatened flora and fauna species and TECs (both Commonwealth and State listed) to occur within the Varied Project Area since the previous desktop assessment in 2014. This was achieved by undertaking database searches using a 10 km buffer of the Varied Project Area. An additional search was undertaken on 8 June 2023 to include species listed under the EPBC Act on 31 March 2023.

A field survey, undertaken in October 2022, mapped 14 vegetation associations across the two sections of Area B and C of the Approved Project Area, which consisted of grasslands, woodlands, shrublands and riparian vegetation. Targeted surveys of Iron-grass (*Lomandra* sp.) natural temperate grasslands of South Australia (INTG) and Peppermint Box (*Eucalyptus odorata*) grassy woodlands of South Australia (PBGW) were undertaken identifying that both TEC's occur in Area B and C of the Approved Project. Approximately 108 ha of the INTG TEC occurs in the northeast of the survey area and 29 ha of PBGW occurs in the South of the Project Area. The Varied Project Area was then refined to avoid INTG TEC entirely (noting the INTG remaining within the Varied Project Area does not qualify as a TEC).

A total of 14 2-ha bird survey sites were established across the site to observe and record bird species that occur within the Varied Project Area. Targeted Wedge-tailed Eagle (*Aquila audax*) (WTE) and Peregrine Falcon (*Falco peregrinus*) nest searches were conducted on previously surveyed nests. Areas were searched opportunistically for new nest locations.

Native vegetation throughout the Varied Project Area provides habitat for threatened species, with two species listed under the EPBC Act identified as occurring in the Project Area based on past 2013 surveys and the October 2022 surveys:

- Diamond Firetail (*Stagonopleura guttata*) (EPBC Act: Vulnerable; NPW Act: Vulnerable); and
- Southern Whiteface (*Aphelocephala leucopsis*) (EPBC Act: Vulnerable).

An additional species was observed outside of the Varied Project Area, and as such was determined as likely to occur within the Varied Project Area:

- Hooded Robin (*Melanodryas cucullata cucullata*) (EPBC Act: Endangered; NPW Act: Rare).

An additional species was identified in the desktop assessment as likely to occur within the Varied Project Area:

- Grey-headed Flying-fox (*Pteropus poliocephalus*) (EPBC Act: Vulnerable; NPW Act: Rare).

No EPBC Act listed threatened flora species were identified as likely or highly likely to occur in the Varied Project Area.

Past and current surveys identified six species listed as threatened under the NPW Act as occurring in the Varied Project Area:

- Peregrine Falcon (*Falco peregrinus*) (NPW Act: Rare);
- White-winged Chough (*Corcorax melanorhamphos*) (NPW Act: Rare);
- Elegant Parrot (*Neophema elegans*) (NPW Act: Rare);
- White-bellied Cuckooshrike (*Coracina papuensis robusta*) (NPW Act: Rare);
- *Eucalyptus fasciculosa* (Pink Gum) (NPW: Rare); and
- *Ptilotus erubescens* (Hairy-tails) (NPW: Rare).

The desktop assessment identified an additional 6 species assessed as likely / highly likely to occur in the Varied Project Area:

- *Maireana rohrlachii* (Rohrlach's Bluebush) (NPW: Rare).
- Eastern Shrike-tit (*Falcunculus frontatus* ssp. *frontatus*) (NPW: Rare);

- Little Eagle (*Hieraaetus morphnoides*) (NPW: Vulnerable);
- Purple-gaped Honeyeater (*Lichenostomus cratitius occidentalis*) (NPW: Rare);
- Jacky Winter (*Microeca fascinans fascinans*) (NPW: Rare);
- Painted Buttonquail (*Turnix varius ssp. varius*) (NPW: Rare); and
- Common Brushtail Possum (*Trichosurus vulpecula*) (NPW: Rare).

Additional constraints identified by the desktop assessment and past and current surveys include migratory birds (10 species), Wedge-tailed Eagle (WTE) nests, Peregrine Falcon nests and introduced weeds Declared under the *Landscape South Australia Act 2016*.

Ecological constraints in the Varied Project Area that might influence the final layout are summarised in the table on the following pages (page v & vi). Recommendations on how to address these constraints are also listed in the table. Amendments have been made to the table to demonstrate the implementation of the recommendations to date.

Constraint Summary	Constraint Details	Recommendations	Implementation of recommendation
Native vegetation	<ul style="list-style-type: none"> • 14 vegetation associations occur in the Varied Project Area. 	<ul style="list-style-type: none"> • Consider the mitigation hierarchy at all stages of the Project design phase. • Utilise existing disturbed areas for Project infrastructure where possible. • Retain high value vegetation where possible, particularly high habitat fauna value Woodland and Mallee Vas B3, B4, C3, C4, C5, C6, C9 and C10 and consider Project design that avoids this constraint. • Seek native vegetation clearance approval under the NV Act. This includes the preparation of a Clearance Data Report and calculation of offset requirements. • Prior to the commencement of construction, develop a Construction Environmental Management Plan (CEMP) that implements measures to minimise, rehabilitate and offset unavoidable impacts to native vegetation. 	<ul style="list-style-type: none"> • 301.28 ha of the 350.93 ha proposed to be cleared occurs in poor quality grassland habitat (VA B2 and C2). • VA C10 is being avoided. • VA C9 is currently within the micro-siting area of the Varied Project but is not impacted by any infrastructure/the disturbance footprint and will continue to be avoided entirely by project infrastructure in any future micro-siting. • The proposed disturbance footprint avoids impacts to approximately 99 % of VA C3. The proposed disturbance footprint avoids impacts to approximately 99 % of VA C4. • A Clearance Data Report has been prepared and the report will be updated following an approval of the Varied Project.
EPBC Act listed species and habitat	<ul style="list-style-type: none"> • Southern Whiteface • Hooded Robin • Grey-headed Flying-fox • Diamond Firetail • Migratory bird species. 	<ul style="list-style-type: none"> • Minimise impact to native vegetation by applying the mitigation hierarchy during the project design phase and implementing a CEMP. • Avoid areas identified as the INTG and Peppermint Box woodland TECs. 	<ul style="list-style-type: none"> • Varied Project Area has been adjusted to avoid INTG TEC (now outside of the Varied Project Area). • Peppermint Box woodland TEC is being avoided.

Palmer Wind Farm Variation Application - Flora and Fauna Impact Assessment

Constraint Summary	Constraint Details	Recommendations	Implementation of recommendation
		<ul style="list-style-type: none"> • Undertake an assessment of potential impacts against the EPBC Act <i>Significant Impact Guidelines</i> and refer the Project to Department of Climate Change, Energy, the Environment and Water (DCCEEW) for assessment. • Undertake further bird surveys to meet the requirements of the <i>Onshore Wind Farms – interim guidance on bird and bat management</i> (draft), issued by DCCEEW. • Develop and implement a bird strike monitoring programme prior to and during the Palmer Wind Farms operational phase. 	<ul style="list-style-type: none"> • A significant Impact Self-Assessment has been undertaken and a referral is being prepared. • Six bird surveys have been undertaken to meet the relevant requirements. A further two surveys will be undertaken to ensure surveys have been undertaken in each season across two years.
Wedge-tailed Eagle and Peregrine Falcon nests	<ul style="list-style-type: none"> • 10 WTE nests and 4 Peregrine Falcon nests have been located by field surveys. 	<ul style="list-style-type: none"> • Avoid impact to nests by implementing 1 km protection buffers around each nest location. • Develop and implement a nest monitoring programme prior to and during the Palmer Wind Farm's operational phase. • Develop and implement a bird strike monitoring programme prior to and during the Palmer Wind Farms operational phase. 	<ul style="list-style-type: none"> • 1 km WTG exclusion buffers have been placed around each nest location and around area considered to be suitable nesting habitat for the Peregrine Falcon. Exclusion buffers have been maintained even where nests were not able to be accessed to validate their use.
NPW Act listed fauna	<ul style="list-style-type: none"> • White-winged Chough • White-bellied Cuckooshrike • Peregrine Falcon • Eastern Shrike-tit • Little Eagle • Purple-gaped Honeyeater • Jacky Winter • Elegant Parrot • Painted Buttonquail • Common Brushtail Possum 	<ul style="list-style-type: none"> • Consider the mitigation hierarchy at all stages of the project design phase. • Prior to the commencement of construction, develop a CEMP that implements measures to minimise unavoidable impacts to native vegetation that provides habitat to NPW threatened species. 	<ul style="list-style-type: none"> • More than 20 iterations of the design have been undertaken, many of which with the aim of avoiding known impacts to flora and fauna including micro-siting the area and disturbance footprint to avoid known constraints such as the WTE and Peregrine Falcon buffers.
NPW Act listed flora	<ul style="list-style-type: none"> • <i>Eucalyptus fasciculosa</i> • <i>Ptilotus erubescens</i> • <i>Mentha diemenica</i> • <i>Maireana rohrlachii</i> 	<ul style="list-style-type: none"> • Avoid/minimise works in the southern extent of the Varied Project Area to avoid potential impacts on identified NPW Act Rare Pink Gum woodland (VA C5 and C6). • Survey proposed project impact footprint for NPW Act listed threatened flora. • Microsite infrastructure to avoid threatened flora and maintain 20 m protection buffers as far as practicable. 	<p>More than 20 iterations of the design have been undertaken, many of which with the aim of avoiding known impacts to flora and fauna. This has included minimising impacts to VA C5 and C6 as far as practicable. The proposed disturbance footprint avoids impacts to approximately 93 % of VA C5. The proposed disturbance footprint avoids impacts to approximately 84 % of VA C6.</p>

Palmer Wind Farm Variation Application - Flora and Fauna Impact Assessment

Constraint Summary	Constraint Details	Recommendations	Implementation of recommendation
Declared weeds	<ul style="list-style-type: none"> • African Boxthorn • Gorse • Artichoke Thistle • Salvation Jane • Horehound. • Olive • Dog Rose 	<ul style="list-style-type: none"> • Any CEMP or Operational Environmental Management Plan (OEMP) should include biosecurity measures. • Comply with any legislative requirements during Palmer Wind Farm construction and operation. 	
Watercourses	<ul style="list-style-type: none"> • Erosion in ephemeral watercourses. 	<ul style="list-style-type: none"> • Avoid clearing vegetation within 10 m of a watercourse where practicable. 	<ul style="list-style-type: none"> • Impacts to water courses have been minimised where possible with consideration of topographical, design and landholder constraints.
Other	<ul style="list-style-type: none"> • Risk assessment • EPBC Act species listed as possibly occurring in the Varied Project Area. 	<ul style="list-style-type: none"> • Undertake a risk assessment to determine the potential impact of the proposed wind farm on bird species where the risk element of concern was collision. Species to be assessed include raptor species and threatened bird species known from the site and those species determined as likely to occur from the BDBSA search. • Once designs have been finalised, a targeted fauna survey for the PBTL and FRWL should be conducted in grassland habitat suitable for PBTL with the design footprint, or as per instructions from DCCEEW. • A general discussion with DCCEEW on EPBC concerns regarding fulfilling the obligatory number of bird and bat surveys (2 years) required for the Project as more surveys may need to be conducted if past surveys are not taken into account. 	<ul style="list-style-type: none"> • Tilt Renewables have consulted with DCCEEW on the bird and bat survey requirements for Palmer Wind Farm. • An Avian and Bat Risk Assessment has been undertaken. • Surveys for PBTL and FRWL and habitat were undertaken within the proposed design route. No PTBL or FRWL were found and as a result of the surveys, the likelihood of these species occurring was downgraded to “unlikely”. • Six bird surveys have been undertaken to meet the relevant requirements. A further two surveys will be undertaken to ensure that surveys have been undertaken in each season for 2 years.

Table of Contents

1	INTRODUCTION.....	1
1.1	Palmer Wind Farm.....	1
1.2	Varied Project Area.....	1
1.3	Objectives.....	1
2	COMPLIANCE AND LEGISLATIVE SUMMARY.....	5
2.1	Environment Protection and Biodiversity Conservation Act 1999.....	5
2.2	Native Vegetation Act 1991.....	6
2.3	National Parks and Wildlife Act 1972.....	7
2.4	Landscape South Australia Act 2019.....	8
2.5	Planning, Development and Infrastructure Act 2016.....	8
3	BACKGROUND INFORMATION.....	9
3.1	Administrative boundaries.....	9
3.2	Interim Biogeographical Regionalisation of Australia.....	9
3.3	Wetlands and watercourses.....	10
3.4	Current and historical land use.....	11
3.5	Previous works undertaken.....	11
3.6	Current scope of work.....	12
4	DESKTOP ASSESSMENT METHODS.....	14
4.1	Database searches.....	14
4.1.1	Protected Matters Search Tool.....	14
4.1.2	Biological Databases of South Australia.....	14
4.2	Literature review.....	14
4.3	Likelihood of occurrence assessment.....	15
4.4	Limitations.....	16
5	FIELD SURVEY METHODS.....	17
5.1	Bushland Assessment Method.....	17
5.2	Threatened Ecological Community surveys.....	20
5.2.1	Peppermint Box (Eucalyptus odorata) Grassy Woodland of South Australia & Iron-grass Natural Temperate Grassland of South Australia.....	20
5.3	Fauna.....	20
5.3.1	Bird utilization surveys.....	20
5.3.2	Wedge-tailed Eagle nest surveys.....	23
5.3.3	Targeted Peregrine Falcon nest searches.....	23
5.3.4	Pygmy Blue Tongue Lizard and Flinders Ranges Worm Lizard assessments.....	24
5.3.5	Opportunistic fauna.....	24
5.3.6	Spatial data.....	24

6	DESKTOP ASSESSMENT RESULTS.....	25
6.1	Matters of National Environmental Significance	25
6.1.1	Wetlands of International Importance	25
6.1.2	Threatened Ecological Communities	25
6.1.3	Nationally listed threatened flora	26
6.1.4	Nationally listed threatened fauna	28
6.1.5	Migratory fauna	31
6.2	Matters of State significance	32
6.2.1	State listed threatened flora	32
6.2.2	State listed threatened fauna	38
7	FIELD SURVEY RESULTS.....	44
7.1	Vegetation associations.....	44
7.1.1	VA B1: Lomandra effusa with Austrostipa sp. grassland	46
7.1.2	VA B2: Austrostipa sp. grassland with mixed exotic forbs and grasses	47
7.1.3	VA B3: Eucalyptus camaldulensis creek line with Cyperus gymnocaulos	48
7.1.4	VA B4: Eucalyptus camaldulensis and Allocasuarina verticillata very open woodland over exotic grasses and forbs.....	49
7.1.5	VA C1: Lomandra effusa and Austrostipa sp. grassland with mixed exotics	50
7.1.6	VA C2: Austrostipa sp. grassland over mixed exotic forbs and grasses	51
7.1.7	VA C3: Eucalyptus camaldulensis over Cyperus gymnocaulos	53
7.1.8	VA C4: Eucalyptus camaldulensis woodland over Acacia pycnantha shrubland and Austrostipa sp.	54
7.1.9	VA C5: Eucalyptus fasciculosa very open woodland over Austrostipa sp.	56
7.1.10	VA C6: Eucalyptus fasciculosa open woodland with Dodonaea viscosa +/- Acacia euthycarpa +/- Bursaria spinosa over Austrostipa sp.	57
7.1.11	VA C7: Xanthorrhoea quadrangulata shrubland with Austrostipa sp.	59
7.1.12	VA C8: Ficinia nodosa with Juncus subsecundus and Cyperus gymnocaulos sedgeland	60
7.1.13	VA C9: Acacia euthycarpa tall shrubland over Austrostipa sp.	61
7.1.14	VA C10: Eucalyptus odorata mallee woodland over Austrostipa sp.	62
7.2	Threatened Ecological Communities observed	63
7.2.1	Peppermint Box (Eucalyptus odorata) Grassy Woodland of South Australia	63
7.2.2	Iron-grass Natural Temperate Grassland of South Australia	63
7.3	Flora.....	65
7.3.1	Threatened flora	65
7.3.2	Weeds.....	65
7.4	Fauna.....	66
7.4.1	Threatened fauna	66
7.4.2	Birds	70
7.4.3	Bats	75
7.4.4	Raptor nests and habitat.....	75
7.4.5	Exotic fauna	78

8	CONSTRAINTS ANALYSIS DISCUSSION	79
8.1	Native Vegetation	79
8.1.1	Mitigation Hierarchy	79
8.2	Identification of EPBC Act threatened habitat and species	79
8.2.1	Threatened Ecological Communities	79
8.2.2	EPBC listed threatened flora	80
8.2.3	Nationally listed threatened fauna	80
8.2.4	Threatened migratory fauna	82
8.3	Identification of NPW Act threatened species	83
8.3.1	State listed threatened flora	83
8.3.2	State listed threatened fauna	84
8.4	Wedge-tailed Eagles.....	84
8.5	Additional constraints.....	85
8.5.1	Declared weeds	85
8.5.2	Proximity to watercourses.....	85
8.5.3	Wind farm impacts on avifauna	85
9	RECOMMENDATIONS.....	87
9.1	Approval requirements.....	91
10	REFERENCES.....	92
11	APPENDICES.....	102
11.1	Appendix 1. Assessment of likelihood of National (EPBC Act) and State (NPW Act) listed threatened flora and fauna identified by the PMST (DCCEEW, 2023) and BDBSA (DEW, 2023a) to occur in the Varied Project Area (marine and migratory marine species omitted). 102	
11.2	Appendix 2. Flora species identified within the Varied Project Area in 2013 and 2022.	134

List of Tables

Table 1. Commonwealth and South Australian legislation relevant to biodiversity impacts of the Project.	5
Table 2. IBRA bioregion, subregion, and environmental association environmental landscape summary.....	9
Table 3. Previous surveys conducted by EBS Ecology at the proposed Palmer Wind Farm site.	11
Table 4. Previous reports undertaken for Palmer Wind Farm.	11
Table 5. Surveys undertaken as part of the current scope of works.	12
Table 6. Criteria for the likelihood of occurrence of threatened species.	15
Table 7. Field assessments undertaken in 2022 and 2023.....	17
Table 8. The locations of vegetation survey sites (BAM sites).....	17
Table 9. The locations of bird survey sites.	21

Table 10. WTE and Peregrine Falcon nests observed within and surrounding the Varied Project Area.	23
Table 11. Matters of National Environmental Significance identified by the PMST and BDDBSA database search. A 10 km buffer around the Varied Project Area was used.	25
Table 12. TECs identified by the PMST (DCCEEW 2023) as potentially occurring within 10 km of the Varied Project Area. Cells highlighted in green are present.	26
Table 13. Nationally threatened flora potentially occurring within 10 km of the Varied Project Area. Cells highlighted in orange are possible to occur.	27
Table 14. Nationally threatened fauna potentially occurring within 10 km of the Varied Project Area. Cells highlighted in green are highly likely/likely to occur; cells highlighted in orange are possible to occur.	28
Table 15. Migratory fauna listed under the EPBC Act potentially occurring within 10 km of the Varied Project Area. Cells highlighted in orange are possible to occur.	31
Table 16. State threatened flora potentially occurring within 10 km of the Varied Project Area. Cells highlighted in green are highly likely/likely to occur; cells highlighted in orange are possible to occur.	32
Table 17. State threatened fauna potentially occurring within 10 km of the Varied Project Area. Cells highlighted in green are highly likely/likely to occur; cells highlighted in orange are possible to occur.	38
Table 18. Vegetation associations identified within the Varied Project Area.	44
Table 19. Vegetation association B1.	46
Table 20. Vegetation association B2.	47
Table 21. Vegetation association B3.	48
Table 22. Vegetation association B4.	49
Table 23. Vegetation association C1.	50
Table 24. Vegetation association C2.	51
Table 25. Vegetation association C3.	53
Table 26. Vegetation association C4.	54
Table 27. Vegetation association C5.	56
Table 28. Vegetation association C6.	57
Table 29. Vegetation association C7.	59
Table 30. Vegetation association C8.	60
Table 31. Vegetation association C9.	61
Table 32. Vegetation association C10.	62
Table 33. Assessment of woodland communities containing <i>E. odorata</i> (Peppermint Box).	63
Table 34. Assessment of grassland communities containing <i>Lomandra sp.</i> (Iron-grass).	63
Table 35. Declared and environmental weeds located within the Varied Project Area.	65
Table 36. Fauna species observed within the Approved Project Area (2013) and Varied Project Area (2022-2024).	67
Table 37. Bird species observed during the Bird Utilisation Surveys from Spring 2022 to Summer 2024.	71
Table 38. WTE and Peregrine Falcon nests observed within the Varied Project Area.	75

Table 39. Recommendations to address ecological constraints and implementation of recommendations to date..... 88

List of Figures

Figure 1. Location of the Varied Project Area and waterbodies. 3

Figure 2. Location of the potential site layout (designs provided by Tilt on 31 January 2024). 4

Figure 3. Location the BAM survey sites within the Varied Project Area. 19

Figure 4. Location bird utilisation survey sites within the Varied Project Area and previously recorded Peregrine Falcon and Wedge-tailed Eagle nests within the Varied Project Area. 22

Figure 5. Nationally and State threatened flora identified within 10 km of the Varied Project Area (DEW 2023a) (Map 1 of 3). 35

Figure 6. Nationally and State threatened flora identified within 10 km of the Varied Project Area (DEW 2023a) (Map 2 of 3). 36

Figure 7. Nationally and State threatened flora identified within 10 km of the Varied Project Area (DEW 2023a) (Map 3 of 3). 37

Figure 8. Nationally and State threatened fauna identified within 10 km of the Varied Project Area (DEW 2023a) (Map 1 of 4). 40

Figure 9. Nationally and State threatened fauna identified within 10 km of the Varied Project Area (DEW 2023a) (Map 2 of 4). 41

Figure 10. Nationally and State threatened fauna identified within 10 km of the Varied Project Area (DEW 2023a) (Map 3 of 4). 42

Figure 11. Nationally and State threatened fauna identified within 10 km of the Varied Project Area (DEW 2023a) (Map 4 of 4). 43

Figure 12. Locations of the BAM survey sites established across the Varied Project Area. 45

Figure 13. Location of PBGW TEC within the Varied Project Area. 64

Figure 14. Location of WTE nests and Peregrine nests and suitable habitat within and nearby the Varied Project Area with a 1 km turbine exclusion buffer. 77

1 INTRODUCTION

1.1 Palmer Wind Farm

Tilt Renewables has development plan consent for the Wind Farm Project, comprising up to 103 wind turbines with a maximum tip height of 165 m. Tilt Renewables is seeking approval to vary the approved project to reduce the number of turbines to 40 and to increase the maximum tip height to 220 m. The Project is located near Palmer (Palmer Wind Farm - the Project), approximately 50-kilometre (km) east of Adelaide. The Project will incorporate wind turbine generators (herein referred to as WTGs or turbines) along with associated infrastructure including substations, access tracks, transmission lines and underground cabling.

1.2 Varied Project Area

The Varied Project Area is located approximately 50 km east of Adelaide and is situated within the eastern hills of the Mount Lofty Ranges, in South Australia (SA). Following the variation, the Varied Project Area will extend approximately 15 km in a north to south direction, centred on ridgelines, and is split into Area B (the northern area) and Area C (southern area) (Figure 1). Previously, there were three areas comprising the Varied Project Area, Area A was further north, but this area is being deleted from the Varied Project Area as part of the variation (EBS Ecology 2014).

1.3 Objectives

Previous ecological desktop and field assessments have been undertaken for the Project by EBS Ecology from 2012 to 2021 to support Federal and State project approval documents such as a referral under the *Environment Protection and Biodiversity Conservation Act 1999*, Development Application, Native Vegetation Clearance Application, Avian Risk Assessment and compliance with Clean Energy Council Best Practice Guidelines (2013).

EBS Ecology has been engaged by Tilt Renewables to undertake an updated detailed ecological constraints assessment of the potential ecological impacts of the proposed Palmer Wind Farm, and where potential impacts have been identified, to propose options and recommendations for mitigation.

EBS Ecology was engaged by Tilt Renewables to undertake the following:

- Review all the previous ecological studies that have been undertaken for the Approved Palmer Wind Farm Project Area to:
 - Identify and update flora and fauna values of Commonwealth (Matters of National Environmental Significance) and State significance, and threatened species statuses as they may have changed since previous surveys;
 - Identify 'key ecological risk areas' within the Varied Project Area and any areas to be excluded within the Varied Project Area;
- Undertake field surveys that assist in the preparation of ecological constraints assessment report.

- Prepare an ecological constraints assessment that will:
 - Support Development Application for the variation of the approved Project under the *Planning, Development and Infrastructure Act 2016*.
 - Support a Native Vegetation Removal Application (Data Clearance Report) which will meet standards under the *Native Vegetation Act 1991*.
 - Support a Referral under the *Environmental Protection and Biodiversity Conservation Act 1999*.
 - Identify requirements for targeted species-specific surveys that may be required, as well as the proposed timeframes for completing these surveys.
 - Identify consultation requirements, and environmental approvals that may be required to facilitate the development of the proposed Project.

In December 2023 this report was amended to include works completed to date and the implementation of the recommendations throughout the iterative design process.

Whilst the overall ecological constraints are summarised in this report, the breakdown of monetary offsets and Significant Environmental Benefit (SEB) calculations for the infrastructure associated with the Palmer Wind Farm, will be provided in a separate report to be submitted to the Native Vegetation Council. There will be a requirement by Tilt Renewables to make an appropriate Significant Environmental Benefit through either on-ground works or payment into the Native Vegetation Fund.

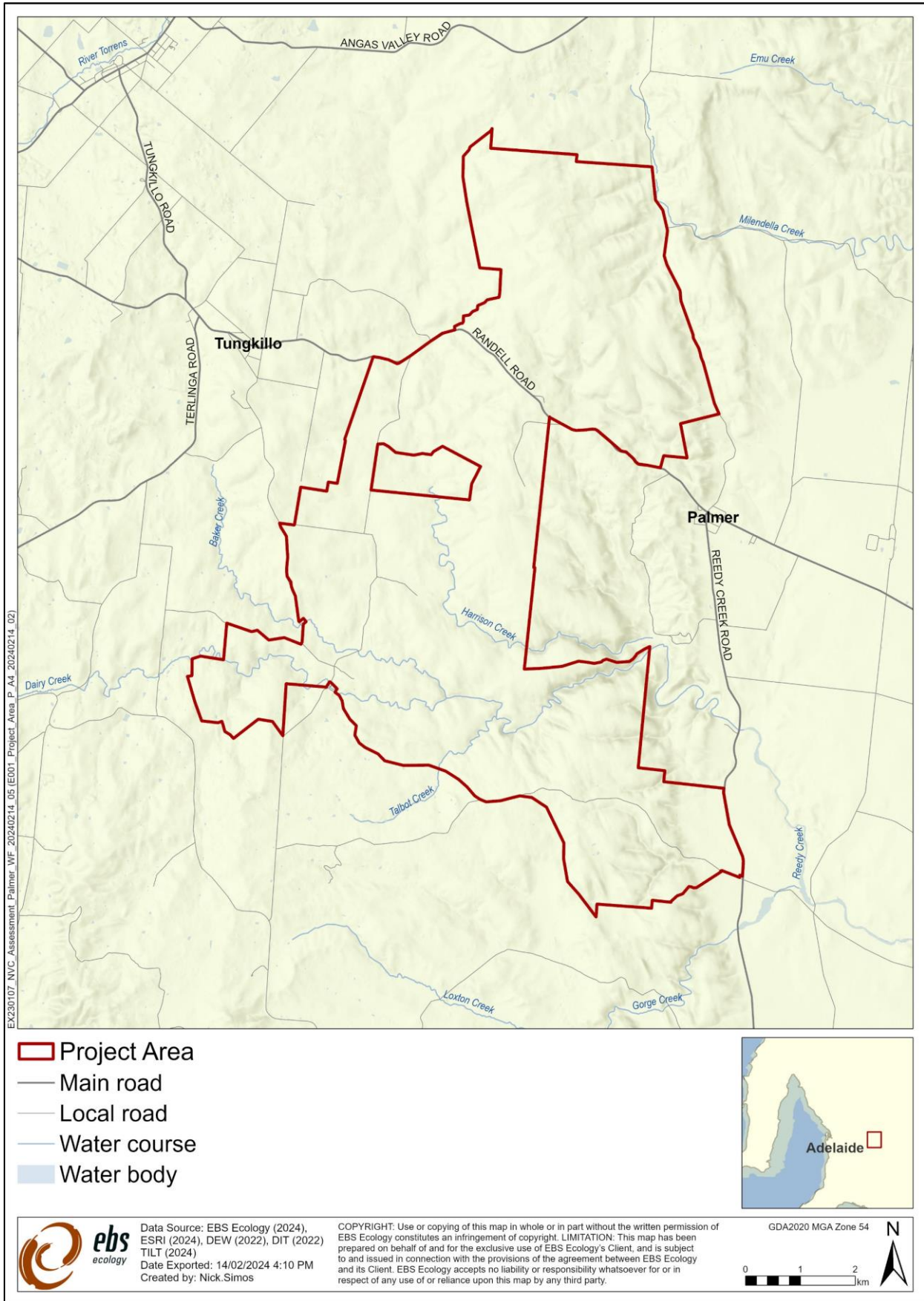


Figure 1. Location of the Varied Project Area and waterbodies.

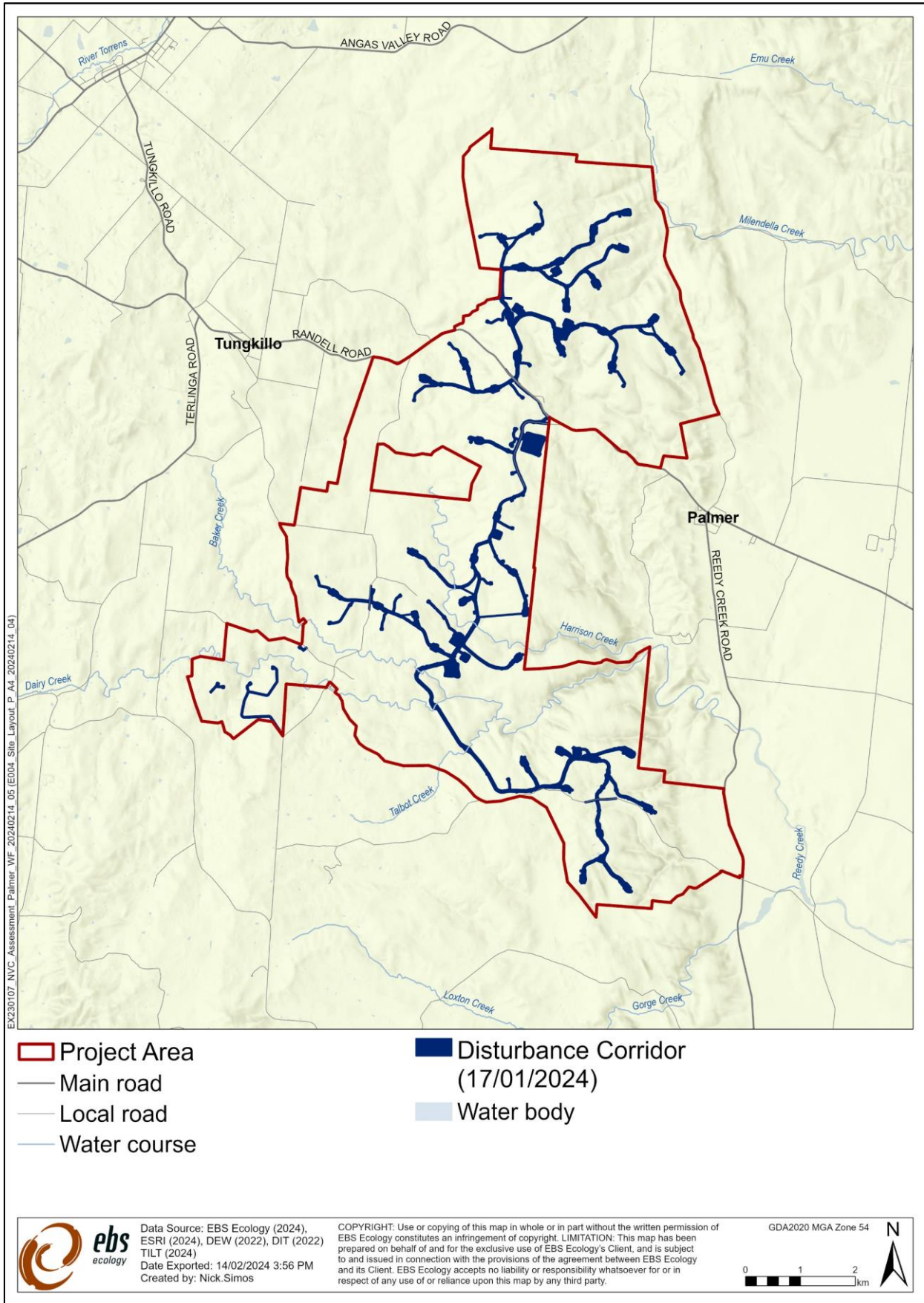


Figure 2. Location of the potential site layout (designs provided by Tilt on 31 January 2024).

2 COMPLIANCE AND LEGISLATIVE SUMMARY

Impacts on ecological matters resulting from the Project, including clearing of vegetation and potential impact to threatened species and ecological communities, are subject to Commonwealth and State (South Australian) legislation (Table 1). The relevance of this legislation to the Project is discussed further in the following sections.

Table 1. Commonwealth and South Australian legislation relevant to biodiversity impacts of the Project.

Authority	Legislation
Commonwealth	<i>Environment Protection and Biodiversity Conservation Act 1999</i> (EPBC Act)
South Australia	<i>National Parks and Wildlife Act 1972</i> (NPW Act)
	<i>Native Vegetation Act 1991</i> (NV Act)
	<i>Landscape South Australia Act 2019</i> (LSA Act)
	<i>Planning, Development and Infrastructure Act 2016</i> (PDI Act)

Note: This summary is not intended to be a substitute for particular legal advice and does not address the legal implications of every set of circumstances.

2.1 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act and the *Environment Protection and Biodiversity Conservation Regulations 2000* provide a legal framework to protect and manage Nationally and Internationally important flora, fauna, ecological communities and heritage places – defined in the Act as Matters of National Environmental Significance (MNES) (DotE 2013a). The nine MNES protected under the Act are:

1. World Heritage properties;
2. National Heritage places;
3. Wetlands of international importance (listed under the Ramsar Convention);
4. Listed threatened species and ecological communities;
5. Migratory species protected under international agreements;
6. Commonwealth marine areas;
7. The Great Barrier Reef Marine Park;
8. Nuclear actions (including uranium mines); and
9. A water resource, in relation to coal seam gas development and large coal mining development.

Two of the nine MNES protected under the Act are of relevance to the Varied Project Area:

- Listed threatened species and ecological communities; and
- migratory species protected under international agreements.

Any action that has, will have, or is likely to have a significant impact on MNES requires referral under the EPBC Act. Substantial penalties apply for undertaking an action that has, will have, or is likely to have a significant impact on a MNES without approval.

The EPBC Act Significant Impact Guidelines (DotE 2013a) provide overarching guidance on determining whether an action is likely to have a significant impact on a matter of national environmental significance.

2.2 Native Vegetation Act 1991

The Varied Project Area is currently subject to the NV Act. Native vegetation within the Varied Project Area is protected under the NV Act and *Native Vegetation Regulations 2017*. Any proposed clearance of native vegetation in South Australia (unless exempt under the *Native Vegetation Regulations 2017*) is to be assessed against the NV Act Principles of Clearance and requires approval from the Native Vegetation Council (NVC). A net environmental benefit, either through contribution to the Native Vegetation Fund or via implementation of an on-ground SEB, is generally conditional on an approval being granted.

Native vegetation refers to any naturally occurring local plant species that are indigenous to South Australia, from small ground covers and native grasses to large trees and water plants.

"Clearance", in relation to native vegetation, means:

- The killing or destruction of native vegetation.
- The removal of native vegetation.
- The severing of branches, limbs, stems, or trunks of native vegetation.
- The burning of native vegetation.
- Any other substantial damage to native vegetation, including the draining or flooding of land, or any other act or activity, that causes the killing or destruction of native vegetation, the severing of branches, limbs, stems or trunks of native vegetation or any other substantial damage to native vegetation.

Approval must be obtained before performing any activity that could cause substantial damage to native plants. This also applies to dead trees that may provide habitat for animals. These activities include but are not limited to:

- The cutting down, destruction or removal of whole plants.
- The removal of branches, limbs, stems, or trunks (including brush cutting and woodcutting).
- Burning.
- Poisoning.
- Slashing of understorey.
- Drainage and reclamation of wetlands.
- Grazing by animals (in some circumstances).
- Change of land use.

Under the NV Act, the NVC considers applications to clear native vegetation under ten principles. Native vegetation should not be cleared if it is significantly at odds with these principles:

- It contains a high level of diversity of plant species.
- It is an important wildlife habitat.
- It includes rare, vulnerable, or endangered plant species.

- The vegetation comprises a plant community that is rare, vulnerable, or endangered.
- It is a remnant of vegetation in an area which has been extensively cleared.
- It is growing in, or association with, a wetland environment.
- It contributes to the amenity of the area.
- The clearance of vegetation is likely to contribute to soil erosion, salinity, or flooding.
- The clearance of vegetation is likely to cause deterioration in the quality of surface or underground water.
- After clearance, the land is to be used for a purpose which is unsustainable.

The principles apply in all cases, except where the clearance of native vegetation fits an exemption set out in the *Native Vegetation Regulations 2017* or can be classified as an 'intact stratum'. 'Intact stratum' means that applications will usually be denied when the vegetation has not been seriously degraded by human activity within the last 20 years.

All approved vegetation clearance must also be conditional on achieving a SEB to offset the clearance. The requirement for a SEB also applies to several of the exemptions. Potential SEB offsets include:

- The establishment and management of a set-aside area to encourage the natural regeneration of native vegetation.
- The protection and management of an established area of native vegetation.
- Entering into a Heritage Agreement on land where native vegetation is already established to further preserve or enhance the area in perpetuity.
- A payment to the Native Vegetation Fund.

2.3 National Parks and Wildlife Act 1972

Native plants and animals in South Australia are protected under the NPW Act. It is an offence to take a native plant or protected animal without approval. Threatened plant and animal species are listed in Schedules 7 (Endangered species), 8 (Vulnerable species) and 9 (Rare species) of the Act. Persons must not:

- Take a native plant on a reserve, wilderness protection area, wilderness protection zone, land reserved for public purposes, a forest reserve or any other Crown land.
- Take a native plant of a prescribed species on private land.
- Take a native plant on private land without the consent of the owner (such plants may also be covered by the NV Act).
- Take a protected animal or the eggs of a protected animal without approval.
- Keep protected animals unless authorised to do so.
- Use poison to kill a protected animal without approval.

Conservation rated flora and fauna species listed on Schedules 7, 8, or 9 of the NPW Act may occur within the Varied Project Area. Persons must comply with the conditions imposed upon permits and approvals.

2.4 Landscape South Australia Act 2019

Under the LSA Act, regional landscape boards have been established. The aim is to deliver landscape related services to regional communities, including effective water management, pest plant and animal control, soil and land management and support for broader sustainable primary production programs. Under the LSA Act, landholders have a legal responsibility to manage declared pest plants and animals and prevent land and water degradation.

2.5 Planning, Development and Infrastructure Act 2016

The PDI Act repealed the *Development Act 1993*. The Act, along with the *Planning, Development and Infrastructure (General) Regulations 2017* and *Planning and Design Code*, provide the legislative framework for carrying out planning and development works within the state. The *Planning and Design Code* is the cornerstone of the new system and has replaced all council development plans to become the single source of planning policy for assessing development applications. No development can be undertaken without an appropriate Development Approval being obtained from the relevant authority after an application and assessment process.

3 BACKGROUND INFORMATION

3.1 Administrative boundaries

The Varied Project Area occurs within the Mid-Murray Local Government Area and the Murraylands and Riverland Landscape Management Region, Sturt county, and the Tungkillo and Jutland hundreds (DEW 2023b).

3.2 Interim Biogeographical Regionalisation of Australia

The Project is located on the far eastern slopes of the Mount Lofty Ranges. The Eastern Mount Lofty Ranges delineates the transition from the high rainfall Mount Lofty Ranges to the semi-arid Murray Mallee/Murray Plains (Kahrimanis *et al.* 2001).

Interim Biogeographical Regionalisation of Australia (IBRA) is a landscape-based approach to classifying the land surface across a range of environmental attributes, which is used to assess and plan for the protection of biodiversity (DCCEEW 2023a). The Varied Project Area falls within the Kanmantoo IBRA bioregion, Fleurieu subregion, and Scotts Hill and Eden Valley environmental associations. Less than 10 percent of the remnant native vegetation within the Scotts Hill and Eden Valley environmental associations is remaining, which highlights its importance. Most of the native vegetation is located on private land and is subject to grazing. Landscape and remnancy descriptions are summarised in Table 2.

Table 2. IBRA bioregion, subregion, and environmental association environmental landscape summary.

Kanmantoo IBRA bioregion	
Temperate, well-defined uplands of Cambrian and Late Proterozoic marine sediments, and a lateritized surface becoming increasingly dissected northwards, with eucalypt open forests and woodlands and heaths on mottled yellow and ironstone gravelly duplex soils in the wetter areas, and <i>Eucalyptus odorata</i> and drooping sheoak on shallow rocky soils in drier areas. Extensively cleared for agriculture.	
Fleurieu IBRA subregion	
This subregion is predominantly an undulating to low hilly upland with steeper marginal ranges and hills. A lateritized surface occurs on the Fleurieu Peninsula and becomes increasingly dissected northward to where only a few remnants survive as rounded crests and summits with mottled, yellow duplex soils. The lowest lying areas are within the Inman Valley where soft glacial and fluvio-glacial deposits have been lowered more quickly than the surrounding sedimentary rocks. Much of the native vegetation has been cleared, however some remains in reserves and small isolated inaccessible areas. Low open woodland commonly dominated by <i>Eucalyptus obliqua</i> and <i>E. baxteri</i> are found in higher rainfall areas on deep, lateritic soils. Shallower or sandy soils support <i>E. fasciculosa</i> , <i>E. cosmophylla</i> and in the northern part of the region <i>E. goniocalyx</i> . <i>E. leucoxyton</i> dominates the woodlands on podzolised soils in the lower rainfall areas, <i>E. viminalis</i> ssp. <i>cygnetensis</i> dominates the wetter and cooler woodlands and <i>E. odorata</i> characterises drier sites. Eucalypts give way to drooping sheoak (<i>Allocasuarina verticillata</i>) in the most arid woodlands and in coastal situations on shallow rocky soils.	
Remnant vegetation	Approximately 12% (45,372 ha) of the subregion is mapped as remnant native vegetation, of which 24% (10,865 ha) is formally conserved.
Landform	Hills and valleys; alternating subparallel hilly ridges and valleys with a general N-S trend in north. In south, hilly dissected tableland.
Geology	Dissected lateritized surface in south

Soil	Hard setting loams with red clayey subsoils, highly calcareous loamy earths, Hard setting loams with mottled yellow clayey subsoil, Coherent sandy soils, Cracking clays.
Vegetation	Eucalyptus woodlands with a shrubby understorey.
Conservation significance	117 species of threatened fauna, 268 species of threatened flora. 9 wetlands of national significance.
Eden Valley IBRA environmental association	
Remnant vegetation	Approximately 6% (3934 ha) of the association is mapped as remnant native vegetation, of which 3% (100 ha) is formally conserved.
Landform	Undulating upland plain with broad interfluves and occasional higher hills.
Geology	Metasediments and alluvium.
Soil	Hard pedal mottled-yellow duplex soils, bleached sands and reddish weakly structured sandy soils.
Vegetation	Woodlands of SA blue gum and woodlands of river red gum.
Conservation significance	23 species of threatened fauna, 65 species of threatened flora. 0 wetlands of national significance.
Scotts Hill IBRA environmental association	
Remnant vegetation	Approximately 10% (9673 ha) of the association is mapped as remnant native vegetation, of which 5% (464 ha) is formally conserved.
Landform	Structurally controlled ridges with steep slopes.
Geology	Metasediments.
Soil	Grey-brown weakly structured sandy soils, hard pedal mottled-yellow duplex soils and reddish siliceous loams.
Vegetation	Low woodland of drooping sheoak and peppermint box and low open scrub of scarlet mintbush and mallee correa.
Conservation significance	41 species of threatened fauna, 59 species of threatened flora. 0 wetlands of national significance.

3.3 Wetlands and watercourses

The Project is upstream of a Wetland of International importance, being the RAMSAR listed Coorong and Lakes Alexandrina (DCCEEW 2019).

The Varied Project Area encompasses parts of the Marne and Saunders catchments, with a number of ephemeral creek lines running through the area (see Figure 1). These are considered tributaries of the River Murray and are included within the River Murray Protection Area (*River Murray Act 2003*). Surface and groundwater resources within the Varied Project Area fall within the Marne Saunders and Eastern Mount Lofty Ranges Prescribed Water Resource Areas. Some small surface water bodies are within Area C, mostly within the lower section (DEW 2013b). Reedy Creek occurs within the Varied Project Area, in the eastern corner of Area C and Reedy Creek Swamp is located approximately 6-10 km east of Area C, which is located next to the River Murray (see Figure 1).

3.4 Current and historical land use

Land use within the area is predominantly agricultural (e.g., grazing for sheep and cattle). Native vegetation in the area has been extensively cleared, with most of the footprint containing grasslands with large outcrops of rocks and boulders. Woodland vegetation and habitat for woodland birds is generally restricted within smaller patches and located within the south of the Varied Project Area.

3.5 Previous works undertaken

Previous surveys and reports have been prepared for earlier iterations of the proposed Project. Three areas were originally approved to form part of the Palmer Wind Farm (Area A, B and C). Each of the surveys that EBS previously conducted at the proposed Palmer Wind Farm and the timing of works, are summarised in Table 3.

Table 3. Previous surveys conducted by EBS Ecology at the proposed Palmer Wind Farm site.

Survey	Dates	Area assessed	EBS reference code
- Vegetation survey	5 November 2012	A and B	E21001
	14 November 2012		E21001
- Birds, bats and Pygmy Blue-tongue Lizard surveys	18-20 February 2013	A and B	E21001
- Additional birds and raptor nest inspection	21 to 23 August 2013	A, B and C	E21001
- Additional <i>Lomandra</i> grassland analysis	11 September 2013	A and B	E21001
- Additional <i>Lomandra</i> grassland, bird, bat and Pygmy Blue-tongue Lizard analyses	29 October – 2 November 2013	Area C	E21001
- Vegetation assessment of new turbine areas - Assessments of bird species within gorges - Additional bird surveys	25 – 27 November 2013	A, B and C	E21001
- Vegetation assessment of new proposed access tracks, public road options, transmission lines and other infrastructure amenities	22 – 29 January 2014	A, B and C	E21001
- Follow-up vegetation assessment to aid flexibility in design of turbine layout and associated infrastructure	15 – 17 April 2014	A, B and C	E21001
- Follow up targeted EPBC <i>Lomandra</i> survey in response to infrastructure layout changes	27 – 28 August 2014	A	E21001

Table 4 provides a list of advice letters and reports that have been written in relation to previous iterations of this Project based on the surveys outlined above in Table 3.

Table 4. Previous reports undertaken for Palmer Wind Farm.

Report	Year undertaken	Report type	EBS reference code
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Palmer Wind Farm Variation Application - Flora and Fauna Impact Assessment

Sanderston Wind Farm flora and fauna results (EBS 2013a)	2013	Letter Report	E21001
Update of flora and fauna results Sanderston Wind Farm_Trustpower (EBS 2013b)	2013	Letter report	E21001
Palmer Wind Farm Flora and Fauna Report_Trustpower (EBS 2014a)	2014	Flora and fauna report	E21001
Palmer Wind Farm Native Vegetation Clearance Report (EBS 2014b)	2014	Native vegetation data report	E21001
Palmer Wind Farm Rehabilitation Plan (EBS 2014c).	2014	Management plan	E21001
Palmer Wind Farm Weed Management Plan (EBS 2014d)	2014	Management plan	E21001
Palmer Wind Farm EPBC Referral (EBS 2014e)	2014	EPBC referral	E21001
Development Application response to Submission (EBS 2014f)	2014	Letter report	E21001
Desktop Assessment of Additional Areas (EBS 2014g)	2014	Letter report	E21001D
Palmer Wind Farm Expert Witness statements (EBS 2017)	2017	Statement report	E60817
Advice letter to Tilt Renewables – Risk Assessment (EBS 2020)	2020	Letter Report	E91206

3.6 Current scope of work

As part of the new scope of works as requested by Tilt Renewables to EBS in 2022 / 2023, additional surveys were undertaken or are to be undertaken and are summarised in Table 5. This current scope of works covers Area B and C of the Approved Project (i.e. a larger area than the final Varied Project Area), and then Tilt Renewables refined the Varied Project Area within this (i.e. not all of Area B is included).

Table 5. Surveys undertaken as part of the current scope of works.

Survey	Dates	Area assessed	Report name	EBS reference code
- WTE nest assessment - Targeted TEC assessment	9 – 10 March 2022	B and C	This report	EX211204
- Follow up vegetation assessment - WTE and Peregrine Falcon nest assessment	17 – 21 October 2022	B and C	This report	EX211204 / EX230107
- Bird utilisation survey (spring 2022) - Bird utilisation survey (summer 2023) - Peregrine Falcon habitat assessment - Bird utilisation survey (autumn 2023)	17 – 21 October 2022 23 – 25 January 2023 26 – 28 April 2023	B and C	Palmer Wind Farm BUS survey Report (EBS, 2023a)	EX230107
- Bird utilisation survey (winter 2023 & Spring 2023)	10 – 13 July 2023	B and C	Palmer Wind Farm Winter BUS survey Report (EBS, 2023b)	EX230107
- Bird utilisation survey (spring 2023)	16 – 18 October 2023	B and C	Palmer Wind Farm Spring BUS survey Report (EBS, 2023c)	EX230107
		B and C	Avian Risk Assessment (EBS, 2024)	EX230107

As part of this scope of works an updated Desktop Assessment was undertaken in 2022 to identify any newly listed threatened flora and fauna species – the results of this assessment, form part of the current constraints report. Following additional species being listed as threatened under the EPBC Act on the 31st March 2023, an updated threatened species search was undertaken and any additional species included in this report.

The presence of species within Palmer Wind Farm has been determined based on the field surveys undertaken as described in Table 3 and the surveys undertaken in March 2022 and October 2022, January 2023, April 2023, July 2023 and October 2023.

4 DESKTOP ASSESSMENT METHODS

A desktop assessment was undertaken to determine the potential for any additional threatened flora and fauna species and Threatened Ecological Communities (TECs) (both Commonwealth and State listed) to occur within the Varied Project Area. This was achieved by undertaking database searches using a 10-kilometre (km) buffer around the Varied Project Area.

4.1 Database searches

4.1.1 *Protected Matters Search Tool*

The Protected Matters Search Tool (PMST) was used to generate a report on 16 January 2023 (DCCEE 2023b) to identify Nationally threatened flora and fauna, migratory fauna and TECs under the EPBC Act relevant to the Varied Project Area. An updated PMST report was generated on 8 June 2023 to incorporate newly listed threatened species under the EPBC Act added on 31st March 2023.

Species and TECs identified in the PMST report that are known or likely to occur within 10 km of the Varied Project Area were assessed for their likelihood of occurrence. Species listed as marine under the EPBC Act, which are not also listed as threatened or migratory, only require EPBC Referral if they are likely to be significantly impacted within a Commonwealth Marine Area. As Commonwealth Marine Areas commence three nautical miles from shore, marine species are not relevant to this Project and have been excluded from further assessment. Further, fauna that complete their life cycle in marine habitats, such as sharks and whales, have also been excluded from further assessment due to their irrelevance to the Project, which is located on terrestrial land.

4.1.2 *Biological Databases of South Australia*

A Biological Database of South Australia (BDBSA) search was obtained from the Department of Environment and Water (DEW) on 13 June 2023 (Recordset number: DEWNRBDBSA230614-1) to identify NPW Act threatened flora and fauna species previously recorded within 10 km of the Varied Project Area (DEW 2023a).

The BDBSA is comprised of an integrated collection of species records from the South Australian Museum, conservation organisations, private consultancies, Birds SA, Birdlife Australia and the Australasian Wader Study Group, which meet DEW's standards for data quality, integrity and maintenance. Only species with a spatial reliability of less than 1 km (or where the record locations could be verified within 10 km of the Varied Project Area) were assessed for their likelihood of occurrence.

4.2 Literature review

Existing information and literature relevant to the Varied Project Area was reviewed, including:

- Aerial imagery;
- Previous reports

- Spatial datasets, e.g., DEW biological survey sites, IBRA, vegetation cover, protected areas, vegetation floristic mapping, surface and ground water and roadside significant sites from NatureMaps (DEW 2023b); and
- Reports, plans and web-based information, including:
 - South Australian (SA) Planning and Design Code, Part 10;
 - SA Planning and Property Atlas; and
 - EPBC Act species profiles, conservation advice and recovery plans.

The aforementioned information was used to assess:

- Vegetation cover within the Varied Project Area and immediate surrounds;
- Potential vegetation associations present (including TECs); and
- Flora and fauna species of conservation significance known or likely to occur within the Varied Project Area.

4.3 Likelihood of occurrence assessment

Threatened species and ecological communities identified as potentially occurring in the Varied Project Area by desktop research were assessed as to their likelihood of occurrence. This search was based on the Varied Project Area (as it currently stands). Each threatened species and ecological community has been rated as either ‘Highly Likely’, ‘Likely’, ‘Possible’, or ‘Unlikely’ to occur in the Varied Project Area according to the criteria listed in Table 6.

Table 6. Criteria for the likelihood of occurrence of threatened species.

Likelihood	Criteria
Highly Likely	<ul style="list-style-type: none"> • The species was recorded in the Varied Project Area during the field survey; or • Recorded in the Search Area in last 10 years, the species has specific habitat requirements, and that habitat occurs, or may occur, in the Varied Project Area; or • Recorded in the Search Area in last 10 years, the species does not have specific habitat requirements and there is intact native vegetation in the Varied Project Area.
Likely	<ul style="list-style-type: none"> • Recorded in the Project or Search Area between 11 and 20 years ago, the species has specific habitat requirements, and that habitat occurs, or may occur, in the Varied Project Area; or • Recorded in the Project or Search Area between 11 and 20 years ago, the species does not have specific habitat requirements and there is intact native vegetation in the Varied Project Area. • Recorded in the Search or Varied Project Area in the last 21 – 40 years, the species does not have specific habitat requirements and there is intact native vegetation in the Varied Project Area; or • Recorded in the Search or Varied Project Area in the last 21 – 40 years, the species has specific habitat requirements, and that habitat occurs, or may occur, in the Varied Project Area.
Possible	<ul style="list-style-type: none"> • Recorded in the Search Area in last 10 or 20 years, the species has specific habitat requirements, but that habitat does not occur in the Varied Project Area; or • Recorded in the Search Area in last 10 or 20 years, the species does not have specific habitat requirements, but there is no intact native vegetation in the Varied Project Area; or

Likelihood	Criteria
	<ul style="list-style-type: none"> • Recorded in the Search or Varied Project Area between 21 and 40 years ago, but there is no intact native vegetation in the Project Area; or • Recorded in the Search or Varied Project Area in the last 21 – 40 years, the species has specific habitat requirements, but that habitat does not occur in the Varied Project Area; or • Records of the species in the Project or Search Area are more than 40 years old, survey effort is not considered adequate, suitable habitat for the species occurs, or may occur, in the Varied Project Area, the species is difficult to detect, and species of similar habitat needs have been recorded; or • There are no historical records of the species in the Search or Project Areas, survey effort is not considered adequate suitable habitat for the species occurs, or may occur, in the Varied Project Area, the species is difficult to detect, and species of similar habitat needs have been recorded.
Unlikely	<ul style="list-style-type: none"> • Records of the species in the Project or Search Area are more than 40 years old and survey effort is considered adequate to detect the species; or • Records of the species in the Project or Search Area are more than 40 years old, survey effort is not considered adequate, but suitable habitat for the species does not occur in the Varied Project Area; or • There are no historical records of the species in the Search or Project Areas and survey effort is considered adequate to detect the species; or • There are no historical records of the species in the Search or Project Areas survey effort is not considered adequate, but suitable habitat for the species does not occur in the Varied Project Area; or • There are no historical records of the species in the Search or Project Areas survey effort is not considered adequate, suitable habitat for the species occurs, or may occur, in the Varied Project Area, but the species is not difficult to detect and no species that require similar habitat needs have been recorded.

4.4 Limitations

Flora and fauna records were sourced from the BDBSA. The BDBSA only includes verified flora and fauna records submitted to DEW or partner organisations. It is recognised that knowledge is poorly captured, and it is possible that threatened species occur that are not reflected by database records. Although much of the BDBSA data have been through a variety of validation processes, the lists may contain errors and should be used with caution. DEW gives no warranty that the data are accurate or fit for any particular purpose of the user or any person to whom the user discloses the information.

BDBSA flora and fauna records were limited to a 10 km buffer around the Varied Project Area. The reliability of the BDBSA data ranges from 100 m to over 100 km. Fauna species, in particular birds, can traverse distances more than the 10 km search buffer, and therefore, additional species may occur.

The findings and conclusions expressed by EBS Ecology are based solely upon information in existence at the time of the assessment.

5 FIELD SURVEY METHODS

To date, a range of field assessments have been undertaken at Palmer Wind Farm. To view the field work and methods undertaken prior to 2021, see EBS Ecology (2014a). This constraints report documents the field assessments undertaken at Palmer Wind Farm since 2022. The dates of field work undertaken in 2022 and 2023 are provided in Table 7.

Table 7. Field assessments undertaken in 2022 and 2023.

Date	Survey type
9-10 March 2022	<ul style="list-style-type: none"> WTE nest status checks
17-21 October 2022	<ul style="list-style-type: none"> Spring BUS BAM survey Targeted INTG and PBGW surveys
23-25 January 2023	<ul style="list-style-type: none"> Summer BUS
26-28 April 2023	<ul style="list-style-type: none"> Autumn BUS
10-13 July 2023	<ul style="list-style-type: none"> Winter BUS Targeted PBTL and FRWL surveys
16-18 October 2023	<ul style="list-style-type: none"> Spring BUS

5.1 Bushland Assessment Method

A broad field survey was undertaken in spring 2022 across the Varied Project Area between 17th – 21st October 2022 by EBS staff H. Merigot, P. Drummond, E. West and G. Wilson. The condition of all remnant bushland contained within the Varied Project Area was assessed in accordance with the Bushland Assessment Method (BAM) (NVC 2020b). To determine the SEB offset requirements and potential values for payment into the Native Vegetation Fund resulting from the clearance of native vegetation.

Vegetation Associations and condition were surveyed according to the BAM, which is derived from the Nature Conservation Society of South Australia's Bushland Condition Monitoring methodology (Croft *et al.* 2007, 2008a, 2008b, 2009; Milne and Croft 2012; Milne and McCallum 2012). The BAM is used to assess areas of native vegetation requiring clearance and calculate the vegetation condition and SEB requirements. Details of site selection/stratification and assessment protocols, and the biodiversity value components assessed and the factors that influence these components are outlined in the NVC *Bushland Assessment Manual* (Native Vegetation Council 2020).

A total of 19 sites were surveyed using this method, with locations chosen based on differences in vegetation composition and condition. The locations of vegetation survey sites (or BAM sites) are listed in Table 8 and shown on the map in Figure 3. Where possible, all plant species were identified in the field. Plants that could not be identified at that time were collected as voucher specimens, stored appropriately and identified later.

Table 8. The locations of vegetation survey sites (BAM sites).

BAM Site	Longitude	Latitude
B2	139.14909	-34.82125
B3	139.10547	-34.82357

Palmer Wind Farm Variation Application - Flora and Fauna Impact Assessment

BAM Site	Longitude	Latitude
B4	139.11984	-34.81592
C1	139.15036	-34.90652
C2a	139.11797	-34.85708
C2b	139.13343	-34.91204
C2c	139.14954	-34.90609
C2d	139.09167	-34.86581
C2e	139.12388	-34.88549
C3a	139.10761	-34.86408
C3b	139.12438	-34.88532
C4	139.09042	-34.86977
C5	139.13301	-34.91077
C6b	139.13828	-34.89575
C7a	139.15126	-34.90322
C7b	139.15073	-34.90008
C7c	139.14846	-34.89653
C8	139.13566	-34.90816
C10	139.13144	-34.90324

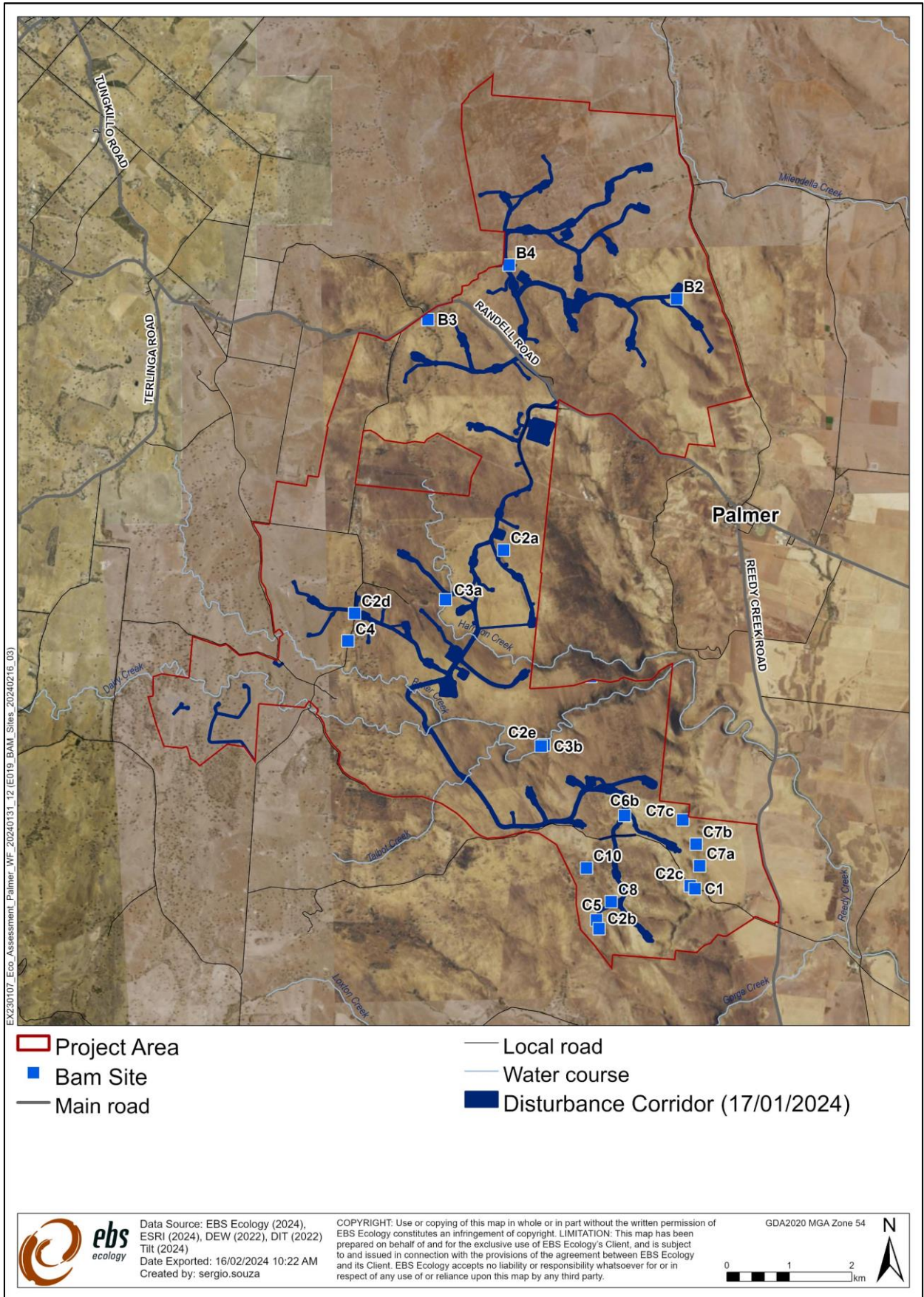


Figure 3. Location the BAM survey sites within the Varied Project Area.

5.2 Threatened Ecological Community surveys

5.2.1 *Peppermint Box (Eucalyptus odorata) Grassy Woodland of South Australia & Iron-grass Natural Temperate Grassland of South Australia*

Targeted surveys were undertaken in areas of Peppermint Box (*Eucalyptus odorata*) woodland and *Lomandra* sp. (Iron grass) grassland to determine if the areas qualified as a TEC under the EPBC Act. Surveys followed the criteria outlined in the EPBC Act Policy Statement 3.7: Peppermint Box (*Eucalyptus odorata*) Grassy Woodland of South Australia and Iron-grass Natural Temperate Grassland of South Australia (DEWR 2007).

The extent of *Lomandra* grassland patches and Peppermint Box Woodland were mapped aerially on an iPad and then calculated. Species diversity totals were obtained from a 50 x 50 metre (m) quadrat for each representative area. All species observed within the quadrats were recorded with totals compared against the benchmark criteria outlined in DEWR (2007).

5.3 Fauna

5.3.1 *Bird utilization surveys*

A total of 14 bird survey sites were established and undertaken during the October 2022 survey. Nine of these sites were a repeat from previous surveys undertaken by EBS in 2013 at the Palmer Wind Farm site (EBS Ecology 2014). The additional 5 survey sites were added to replace other sites that were difficult to access or to locate them closer to the proposed design route. They were conducted utilising methods consistent with Birdlife Australia Systematic Bird surveys (2-ha, 20 minute search) (Birdlife Australia 2023) recommended survey method (as per the Guidelines for Detecting Birds Listed as Threatened under the *Environment Protection and Biodiversity Conservation Act 1999* (Magrath, Weston, Olsen, & Antos, 2010) and Department of Environment and Water (DEW) biological survey methods (Owens, 2000).

The surveys were conducted twice at each site, once in the morning and once in the afternoon. Data collected for each observation were as follows:

- Species observed
- Number of individuals
- Height above ground (m) (minimum and maximum)
- Distance from observer (m)
- Behaviour:
 - o Flying in a single direction
 - o Flying (hovering or circling) over or around a single point
 - o Foraging (feeding) on ground
 - o Perching/resting/walking on ground
 - o Perching/resting/climbing on trees or shrubs

- Direction of flight where relevant.

The locations of the 14 bird survey sites are listed in Table 9 and mapped in Figure 4.

Table 9. The locations of bird survey sites.

Bird Survey Site	Easting	Northing
BS1	330315	6146999
BS2	328835	6146952
BS3	329038	6145345
BS4	330795	6145241
BS5	328907	6144780
BS6	326967	6144567
BS7	327926	6141193
BS8	327029	6140434
BS9	326383	6139957
BS10	328360	6140010
BS11	328641	6138011
BS12	329138	6136794
BS13	329290	6136211
BS14	330584	6136266

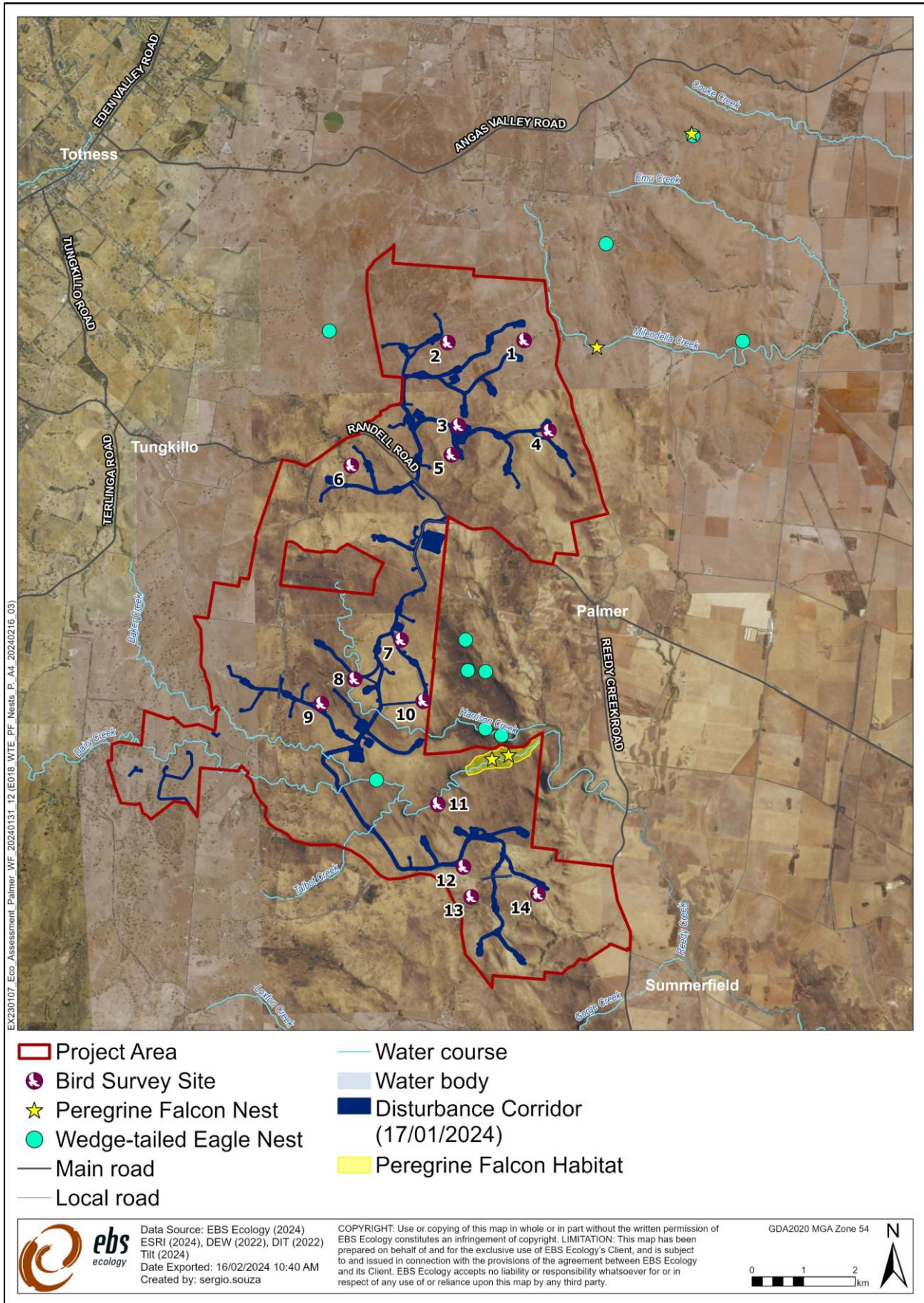


Figure 4. Location bird utilisation survey sites within the Varied Project Area and previously recorded Peregrine Falcon and Wedge-tailed Eagle nests within the Varied Project Area.

5.3.2 Wedge-tailed Eagle nest surveys

The Wedge-tailed Eagle (*Aquila audax*) (WTE) is often referred to as a flagship raptor species; although not a conservation significant listed species, it is iconic and readily identifiable to many people. The WTE is an at-risk bird species in relation to wind farm developments, due to its flight heights and flight behaviours.

Surveys conducted in 2013 identified the locations of 10 WTE nests within the Approved Project Area and surroundings. The search methodology used is described in full in EBS Ecology (2014). The location of WTE nests within and surrounding the Varied Project Area is presented in Table 10 and mapped in Figure 4.

During the October 2022 survey, WTE nest locations were revisited to determine the breeding success (if any) of birds present including all WTE nests within the Varied Project Area and those outside the Varied Project Area where access was granted from landowners. The location, dimensions and signs of activity were recorded for each nest. WTE sightings and behaviours were recorded during all survey periods. Photographs of each of the nesting sites were taken and the occupancy of a nest site was assessed as well as its status, particularly through the spring breeding period. The presence of a chick, fledgling or adult WTE, in or near the nest, was determined. Any eagles flying from the area upon arrival were also recorded. Other parameters were also used as an indication of nest occupancy such as fresh whitewash (bird excrement), prey remains on the ground beneath or within the nest and the presence of green leaves in the nest bowl (when views were available).

Table 10. WTE and Peregrine Falcon nests observed within and surrounding the Varied Project Area.

Nest type	Nest ID	Easting	Northing
WTE	WTE 4	333583	6150965
WTE	WTE 5	331901	6148872
WTE	WTE 6	326541	6147179
WTE	WTE 7	329180	6141194
WTE	WTE 8	329569	6140579
WTE	WTE 9	329221	6140600
WTE	WTE 10	329561	6139472
WTE	WTE 11	329878	6139343
WTE	WTE 12	327456	6138479
WTE	WTE 13	334546	6146980
Peregrine Falcon	PF 1	333560	6151006
Peregrine Falcon	PF 2	331725	6146867
Peregrine Falcon	PF 3	330014	6138966
Peregrine Falcon	PF 4	329693	6138886

5.3.3 Targeted Peregrine Falcon nest searches

During bird surveys conducted in 2013 throughout Areas B and C four Peregrine Falcon nests were identified as described in EBS Ecology (2014). In the October 2022 survey, all known locations of Peregrine Falcon nests within the Varied Project Area were revisited and those outside the Varied Project Area where access was granted from landowners to determine the presence of breeding Peregrines. One nest was

observed in use within the Varied Project Area. The location of Peregrine Falcon nests within the Varied Project Area is presented in Table 10 and mapped in Figure 3.

In addition, in January 2023 suitable nesting habitat for Peregrine Falcons was initially defined via aerial imagery, after which field assessments were undertaken to ground truth the extent of suitable Peregrine Falcon nesting habitat based on known nesting preferences.

5.3.4 Pygmy Blue Tongue Lizard and Flinders Ranges Worm Lizard assessments

The field survey was undertaken by two EBS ecologists on 10-13 July 2023 in conjunction with the winter BUS survey. The survey method was consistent with the *Survey guidelines for Australia's threatened reptiles: Guidelines for detecting reptiles listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999* (DSEWPC 2011).

Grassland areas for Pygmy Blue Tongue Lizard (PBTL) and grassland and open woodland with a grassy understorey for Flinders Ranges Worm Lizard (FRWL) along the proposed design route were assessed for the suitability of the habitat. Where spider holes and surface rocks were identified, targeted surveys were undertaken by walking the area and checking spider holes or lifting rocks.

For PBTL, each spider burrow was recorded using a Garmin GPS and inspected using a videoscope, which has an illuminated articulating insertion probe approximately 8 mm in diameter, and a digital video display screen (Yateks M-Series). The location of each spider hole was recorded with a Garmin GPS with an accuracy of approximately ± 4 m using *Geocentric Datum of Australia 1994* (GDA 94).

5.3.5 Opportunistic fauna

All native and exotic vertebrate fauna species opportunistically encountered during the field survey (directly observed, or tracks, scats, burrows, nests, and other signs of presence) were recorded across the Varied Project Area. Potential fauna refuge sites, such as hollows, rock crevices and creek lines were noted as an indication of availability of suitable habitat. Particular attention was given to identifying potential habitat for threatened species. For each opportunistic fauna observation, the species, number of individuals, GPS location, detection methodology (sight, sound, or sign) and habitat were recorded.

5.3.6 Spatial data

All spatial data has been captured or converted to the following coordinate reference system.

Datum: Geocentric Datum of Australia 2020 (GDA2020).

Projection: Map Grid of Australia 2020 (MGA2020), Zone 54.

All location coordinates listed in this report are expressed using this system. Spatial data converted from other coordinate reference systems may have accuracy limitations.

6 DESKTOP ASSESSMENT RESULTS

6.1 Matters of National Environmental Significance

The EPBC Act PMST report and BDBSA database search identified one Wetland of International Importance, five TEC, 51 threatened species and 15 migratory species protected under the EPBC Act, which may be relevant to the Varied Project Area. Table 11 summarises the results of the PMST report and the relevant MNES are discussed further below. The assessment of likelihood of National and State listed threatened flora and fauna (identified by the PMST) to occur within 10 km of the Varied Project Area is summarised in Table 16 and Table 17, and a detailed description of habitat preferences and likelihood of assessment is provided in Appendix 1.

It should be noted that some of these matters are not impacted by, or relevant to, the Project as they may be located outside of the Varied Project Area (such as five fish species and listed marine species, which are afforded specific protection within Commonwealth marine areas), and these matters are therefore not discussed further.

Table 11. Matters of National Environmental Significance identified by the PMST and BDBSA database search. A 10 km buffer around the Varied Project Area was used.

Matters of National Environmental Significance	Count
World Heritage Properties	0
National Heritage Places	0
Wetlands of International Importance	1
Great Barrier Reef Marine Park	0
Commonwealth Marine Area	0
Listed Threatened Ecological Communities	5
Listed Threatened Species	51 (22 flora, 24 fauna, 5 aquatic/marine)
Listed Migratory Species	15

6.1.1 Wetlands of International Importance

One wetland of International Importance was identified in the PMST as potentially occurring within 10 km of the Varied Project Area: The Coorong and Lakes Alexandrina and Albert Wetland. The Coorong and Lakes Alexandrina and Albert Wetland is located approximately 40 km downstream of the Varied Project Area. The Varied Project Area is not located within any wetland area and contains no watercourses that flow into any Wetlands of International Importance.

6.1.2 Threatened Ecological Communities

Five EPBC Act listed TEC were identified by the PMST as potentially occurring within 10 km of the Varied Project Area (Table 12). Of these, Two TECs were assessed as occurring within the survey area initially investigated for the Varied Project, however, the final Varied Project Area was refined and designed to exclude one of these TECs (INTG). The remaining three TECs were assessed as unlikely to occur in the Varied Project Area due to the absence of suitable habitat and / or the Varied Project Area occurring outside of the known distribution of these TECs.

Table 12. TECs identified by the PMST (DCCEEW 2023) as potentially occurring within 10 km of the Varied Project Area. Cells highlighted in green are present.

Threatened Ecological Community	EPBC status	PMST type of occurrence within Search Area	Occurrence within Varied Project Area
Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions.	EN	Community may occur	Absent – no relevant vegetation present within the Varied Project Area.
Iron-grass Natural Temperate Grassland of South Australia.	CE	Community likely to occur	Absent – relevant class of vegetation did not qualify as TEC.
Mallee Bird Community of the Murray Darling Depression Bioregion.	EN	Community likely to occur	Absent – outside of the range of this TEC.
Peppermint Box (<i>Eucalyptus odorata</i>) Grassy Woodland of South Australia.	CE	Community likely to occur	Present – relevant vegetation present in the Varied Project Area.
Plains Mallee Box Woodlands of the Murray Darling Depression, Riverina and Naracoorte Coastal Plain Bioregions.	CE	Community likely to occur	Absent – outside of the range of this TEC.

Conservation Codes: CE: Critically Endangered. EN/E: Endangered.

6.1.3 Nationally listed threatened flora

Twenty-two (22) threatened flora species listed under the EPBC Act were identified by the PMST as potentially occurring within 10 km of the Varied Project Area (Table 13).

Of these, ten threatened flora species have been assessed as possibly occurring within the Varied Project Area:

- Menzel's Wattle (*Acacia menzeli*) (EPBC Act: Vulnerable; NPW Act: Vulnerable);
- Neat Wattle (*Acacia rheticarpa*) (EPBC Act: Vulnerable; NPW Act: Vulnerable);
- White-beauty Spider-orchid (*Caladenia argocalla*) (EPBC Act: Endangered; NPW Act: Endangered);
- Stiff White Spider-orchid (*Caladenia rigida*) (EPBC Act: Endangered; NPW Act: Endangered);
- Greencomb Spider-orchid (*Caladenia tensa*) (EPBC Act: Endangered);
- Trailing Hop-bush (*Dodonaea procumbens*) (EPBC Act: Vulnerable; NPW Act: Vulnerable);
- Peep Hill Hop-bush (*Dodonaea subglandulifera*) (EPBC Act: Vulnerable; NPW Act: Endangered)
- Clover Glycine (*Glycine latrobeana*) (EPB Act: Vulnerable; NPW Act: Vulnerable);
- Silver Daisy-bush (*Olearia pannosa* ssp. *pannosa*) (EPBC Act: Vulnerable; NPW Act: Vulnerable);
and
- Pale Leek-orchid (*Prasophyllum pallidum*) (EPBC Act: Vulnerable; NPW Act: Rare).

The remaining twelve species were assessed as unlikely to occur in the Varied Project Area due to the absence of suitable habitat or the Varied Project Area being outside of the known range of the species.

Database records of EPBC listed flora species are mapped in Figure 5, Figure 6 and Figure 7, on pages 35-37.

The full likelihood assessment with the rationale for the likelihood of occurrence in the Varied Project Area is provided in Appendix 1.

Table 13. Nationally threatened flora potentially occurring within 10 km of the Varied Project Area. Cells highlighted in orange are possible to occur.

Scientific name	Common name	Conservation status		Data source	PMST likelihood/ year of most recent record	Likelihood of occurrence in the Varied Project Area
		Aus.	SA			
<i>Acacia menzeli</i>	Menzel's Wattle	VU	V	1,2	Known to occur / 1980	Possible
<i>Acacia rheticarpa</i>	Neat Wattle	VU	V	1,2	Known to occur / 1989	Possible
<i>Caladenia argocalla</i>	White-beauty Spider-orchid	EN	E	1,2	Known to occur / 2022	Possible
<i>Caladenia behrii</i>	Pink-lip Spider Orchid	EN	E	1	May occur / No records	Unlikely
<i>Caladenia rigida</i>	Stiff White Spider-orchid	EN	E	1,2	Known to occur / 2017	Possible
<i>Caladenia tensa</i>	Greencomb Spider-orchid	EN		1	Known to occur	Possible
<i>Dodonaea procumbens</i>	Trailing Hop-bush	VU	V	1	Likely to occur	Possible
<i>Dodonaea subglandulifera</i>	Peep Hill Hop-bush	EN	E	1	Known to occur	Possible
<i>Euphrasia collina</i> ssp. <i>osbornii</i>	Osborn's Eyebright	EN	E	1	May occur	Unlikely
<i>Glycine latrobeana</i>	Clover Glycine	VU	V	1,2	Known to occur / 2009	Possible
<i>Olearia pannosa</i> ssp. <i>pannosa</i>	Silver Daisy-bush	VU	V	1,2	Known to occur / 2016	Possible
<i>Prasophyllum pallidum</i>	Pale Leek-orchid	VU	R	1,2	Known to occur / 2022	Possible
<i>Prasophyllum pruinosum</i>	Plum Leek-orchid	EN	E	1	May occur	Unlikely
<i>Pterostylis cucullata</i>	Leafy Greenhood	VU	E	1	Likely to occur	Unlikely
<i>Pterostylis xerophila</i>	Desert Greenhood	VU	V	1	May occur	Unlikely
<i>Senecio macrocarpus</i>	Large-fruit Fireweed	VU	V	1	May occur	Unlikely
<i>Senecio megaglossus</i>	Superb Groundsel	VU	E	1,2	Likely to occur / 1984	Unlikely
<i>Swainsona pyrophila</i>	Yellow Swainson-pea	VU	R	1	Likely to occur	Unlikely
<i>Thelymitra epipactoides</i>	Metallic Sun-orchid	EN	E	1	May occur	Unlikely
<i>Thelymitra hygrophila</i>	Blue Star Sun-orchid	CE	E	1	Likely to occur	Unlikely
<i>Thelymitra matthewsii</i>	Spiral Sun-orchid	VU	E	1	Likely to occur	Unlikely
<i>Veronica derwentiana</i> subsp. <i>homalodonta</i>	Mount Lofty Speedwell	CE	E	1	Likely to occur	Unlikely

Conservation status

Aus: Australia (*Environment Protection and Biodiversity Conservation Act 1999*). SA: South Australia (*National Parks and Wildlife Act 1972*). Conservation Codes: CE: Critically Endangered. EN/E: Endangered. VU/V: Vulnerable. R: Rare.

Source of Information:

1. EPBC Act Protected Matters Report (DCCEEW 2023) – 10 km buffer applied to Varied Project Area;
2. Biological Database of South Australia data extract (DEW 2023a) (Recordset number DEWNRBDBSA230614-1) – 10 km buffer applied to Varied Project Area.

6.1.4 Nationally listed threatened fauna

Twenty-five (25) threatened fauna species listed under the EPBC Act were identified by the PMST as potentially occurring within 10 km of the Varied Project Area, consisting of 1 frog, 2 reptiles, 3 mammals and 19 Birds (Table 17).

Of these, four species were assessed as likely / highly likely / known to occur in the Varied Project Area based on recent records and suitable habitat within the Varied Project Area:

- Southern Whiteface (*Aphelocephala leucopsis leucopsis*) (EPBC Act: Vulnerable);
- Hooded Robin (*Melanodryas cucullata cucullata*) (EPBC Act: Endangered; NPW: Rare);
- Grey-headed Flying-fox (*Pteropus poliocephalus*) (EPBC Act: Vulnerable; NPW Act: Rare); and
- Diamond Firetail (*Stagonopleura guttata*) (EPBC Act: Vulnerable; NPW Act: Vulnerable).

An additional eight threatened fauna species were assessed as possibly occurring in the Varied Project Area:

- Southern Bell Frog (*Litoria raniformis*) (EPBC Act: Vulnerable; NPW Act: Vulnerable);
- Grey Falcon (*Falco hypoleucos*) (EPBC Act: Vulnerable; NPW: Rare);
- White-throated Needletail (*Hirundapus caudacutus*) (EPBC Act: Vulnerable, Migratory – terrestrial);
- Blue-winged Parrot (*Neophema chrysostoma*) (EPBC Act: Vulnerable; NPW Act: Vulnerable);
- Flinders Ranges Worm-lizard (*Aprasia pseudopulchella*) (EPBC Act: Vulnerable);
- Pygmy Blue-tongue Lizard (*Tiliqua adelaidensis*) (EPBC Act: Endangered; NPW Act: Endangered);
- Latham's Snipe (*Gallinago hardwickii*) (EPBC Act: Vulnerable & Migratory); and
- Common Greenshank (*Tringa nebularia*) (EPBC Act: Endangered & Migratory).

The remaining thirteen (13) species were assessed as unlikely to occur in the Varied Project Area due to the absence of suitable habitat or the Varied Project Area is outside of the species range.

Database records of EPBC listed fauna species are mapped in Figure 8, Figure 9, Figure 10 and Figure 11 on pages 40-43.

The full likelihood assessment with the rationale for the likelihood assessments is provided in Appendix 1.

Table 14. Nationally threatened fauna potentially occurring within 10 km of the Varied Project Area. Cells highlighted in green are highly likely/likely to occur; cells highlighted in orange are possible to occur.

Scientific name	Common name	Conservation status		Data source	PMST likelihood/ year of most recent record	Likelihood of occurrence in the Varied Project Area
		Aus.	SA			
AMPHIBIANS						
<i>Litoria Raniformis</i>	Southern Bell Frog	VU	V	1,2	Likely to occur / 1980	Possible
BIRDS						

Palmer Wind Farm Variation Application - Flora and Fauna Impact Assessment

Scientific name	Common name	Conservation status		Data source	PMST likelihood/ year of most recent record	Likelihood of occurrence in the Varied Project Area
		Aus.	SA			
<i>Aphelocephala leucopsis leucopsis</i>	Southern Whiteface	VU		1,2	Known to occur / 2022	Known / Highly likely
<i>Botaurus poiciloptilus</i>	Australasian Bittern	EN	E	1,2	Known to occur / 2004	Unlikely
<i>Calidris ferruginea</i>	Curlew Sandpaper	CR, Mi	E	1	Likely to occur	Unlikely
<i>Charadrius leschenaultii leschenaultii</i>	Greater Sand Plover	VU, Mi	R	2	1969	Unlikely
<i>Falco hypoleucos</i>	Grey Falcon	VU	R	1,2	Known to occur / 1964	Possible
<i>Gallinago hardwickii</i>	Latham's Snipe	VU, Mi (W)		1	Likely to occur	Possible
<i>Grantiella picta</i>	Painted Honeyeater	VU	R	1	Likely to occur	Unlikely
<i>Hirundapus caudacutus</i>	White-throated Needletail	VU, Mi (T)	V	1	Likely to occur	Possible
<i>Leipoa ocellata</i>	Malleefowl	VU	V	1	Likely to occur	Unlikely
<i>Lophochroa leadbeateri leadbeateri</i>	Major Mitchell's Cockatoo	EN	R	1	May occur	Unlikely
<i>Melanodryas cucullata cucullata</i>	Hooded Robin	EN	R	1,2	Known to occur / 2022	Likely
<i>Neophema chrysostoma</i>	Blue-winged Parrot	VU, Ma	V	1,2	Known to occur / 1999	Possible
<i>Numenius madagascariensis</i>	Eastern Curlew	CE, Mi (W)	E	1	May occur	Unlikely
<i>Pedionomus torquatus</i>	Plains-wanderer	CE	E	1	May occur	Unlikely
<i>Pezoporus occidentalis</i>	Night Parrot	EN	E	1	May occur	Unlikely
<i>Polytelis anthopeplus monarchoides</i>	Regent Parrot	VU	V	1	Likely to occur	Unlikely
<i>Rostratula australis</i>	Australian Painted Snipe	EN	E	1	Likely to occur	Unlikely
<i>Stagonopleura guttata</i>	Diamond Firetail	VU	V	1,2	Known to occur / 2020	Highly Likely/Known
<i>Tringa nebularia</i>	Common Greenshank	EN, Mi (W)		1	Likely to occur	Possible
<i>Zoothera lunulata ssp. halmaturina</i>	South Australian Bassian Thrush Southern FR, MLR, KI	EN	V	1,2	Likely to occur / 2012	Unlikely
MAMMALS						
<i>Isoodon obesulus ssp. obesulus</i>	Southern Brown Bandicoot	EN	V	1	May occur	Unlikely
<i>Nyctophilus corbeni</i>	Corben's Long-eared Bat, South-eastern Long-eared Bat	VU	V	1	May occur	Unlikely
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	VU	R	1,2	Likely to occur / 2020	Likely
REPTILES						
<i>Aprasia pseudopulchella</i>	Flinders Ranges Worm-lizard	VU		1	May occur	Possible
<i>Tiliqua adelaidensis</i>	Pygmy Blue-tongue Lizard	EN	E	1	May occur	Possible

Conservation status

Aus: Australia (*Environment Protection and Biodiversity Conservation Act 1999*). SA: South Australia (*National Parks and Wildlife Act 1972*). Conservation Codes: CE: Critically Endangered. EN/E: Endangered. VU/V: Vulnerable. R: Rare.

Source of Information:

Palmer Wind Farm Variation Application - Flora and Fauna Impact Assessment

1. EPBC Act Protected Matters Report (DCCEEW 2023) – 10 km buffer applied to Varied Project Area;
2. Biological Database of South Australia data extract (DEW 2023a) (Recordset number DEWNRBDBSA230614-1) - 10 km buffer applied to Varied Project Area.

6.1.5 Migratory fauna

A total of 15 migratory fauna species have been identified by the PMST as potentially occurring within 10 km of the Varied Project Area, an additional 6 have already been addressed in Section 6.1.4 (Table 15).

A total of eight (8) species were assessed as possibly occurring within the Varied Project Area. The remaining six species were assessed as unlikely to occur in the Varied Project Area due to the absence of suitable habitat or the Varied Project Area is outside of the species range.

The full likelihood assessment with the rationale for the likelihood of occurrence is provided in Appendix 1.

Table 15. Migratory fauna listed under the EPBC Act potentially occurring within 10 km of the Varied Project Area. Cells highlighted in orange are possible to occur.

Scientific name	Common name	Conservation status		Data source	PMST likelihood/ year of most recent record	Likelihood of occurrence within Varied Project Area
		Aus.	SA			
<i>Actitis hypoleucos</i>	Common Sandpiper	Mi (W)	R	1,2	Known to occur / 2006	Possible
<i>Apus pacificus</i>	Fork-tailed Swift	Mi (M)		1,2	Likely to occur / 2014	Possible
<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	Mi (W)		1	Known to occur	Possible
<i>Calidris ruficollis</i>	Red-necked Stint	Mi (W)		2	2012	Possible
<i>Calidris melanotos</i>	Pectoral Sandpiper	Mi (W)	R	1	Known to occur	Possible
<i>Calidris subminuta</i>	Long-toed Stint	Mi (W)	R	2	1977	Possible
<i>Charadrius bicinctus bicinctus</i>	Double-banded Plover	Mi (W)		2	2014	Possible
<i>Charadrius veredus</i>	Oriental Plover	Mi (W)		2	1987	Possible
<i>Myiagra cyanoleuca</i>	Satin Flycatcher	Mi (T)	E	1	Likely to occur	Unlikely
<i>Motacilla cinerea</i>	Grey Wagtail	Mi (T)		1	May occur	Unlikely
<i>Motacilla flava</i>	Yellow Wagtail	Mi (T)		1	May occur	Unlikely
<i>Pandion haliaetus</i>	Osprey	Mi (M)		1	Likely to occur	Unlikely
<i>Rhipidura rufifrons</i>	Rufous Fantail	Mi (T)		1	May occur	Unlikely

Conservation status

Aus: Australia (*Environment Protection and Biodiversity Conservation Act 1999*). SA: South Australia (*National Parks and Wildlife Act 1972*). Conservation Codes: CE: Critically Endangered. EN/E: Endangered. VU/V: Vulnerable. R: Rare. Mi = Migratory. (T) = Terrestrial. (W) = Wetland.

Source of Information:

1. EPBC Act Protected Matters Report (DCCEE 2023) – 10 km buffer applied to Varied Project Area;
2. Biological Database of South Australia data extract (DEW 2023a) (Recordset number DEWNRBDBSA230614-1) - 10 km buffer applied to Varied Project Area.

6.2 Matters of State significance

6.2.1 State listed threatened flora

An additional fifty (50) threatened flora species listed under the NPW Act (that are not listed under the EPBC Act) were identified by the BDBSA as potentially occurring within 10 km of the Varied Project Area (Table 16). Of these, four threatened flora species have been assessed highly likely / likely / known to occur within the Varied Project Area:

- *Eucalyptus fasciculosa* (Pink Gum) (NPW: Rare);
- *Ptilotus erubescens* (Hairy-tails) (NPW: Rare);
- *Mentha diemenica* (Slender Mint) (NPW: Rare); and
- *Maireana rohrlachii* (Rohrlach's Bluebush) (NPW: Rare).

Thirty-three (33) threatened flora species were assessed as possibly occurring and are shown in Table 16. The remaining thirteen (13) species were assessed as being unlikely to occur in the Varied Project Area due to the absence of suitable habitat and / or the Varied Project Area occurring outside of the known range of the species.

Database records of State listed flora species are mapped in Figure 5, Figure 6 and Figure 7, on pages 35-37. The full likelihood assessment with the rationale for the likelihood of occurrence in the Varied Project Area is provided in Appendix 1.

Table 16. State threatened flora potentially occurring within 10 km of the Varied Project Area. Cells highlighted in green are highly likely/likely to occur; cells highlighted in orange are possible to occur.

Scientific name	Common name	Conservation status		Data source	PMST likelihood/ year of most recent record	Likelihood of occurrence in the Varied Project Area
		Aus.	SA			
<i>Acacia iteaphylla</i>	Flinders Ranges Wattle		R	2	2021	Possible
<i>Amphibromus archeri</i>	Pointed Swamp Wallaby-grass		R	2	1998	Possible
<i>Amphibromus macrorhinus</i>	Long-nosed Swamp Wallaby-grass		R	2	2004	Possible
<i>Aristida australis</i>			R	2	1992	Possible
<i>Austrostipa densiflora</i>	Fox-tail Spear-grass		R	2	2003	Possible
<i>Austrostipa gibbosa</i>	Swollen Spear-grass		R	2	2013	Possible
<i>Austrostipa oligostachya</i>	Fine-head Spear-grass		E	2	2010	Possible
<i>Austrostipa tenuifolia</i>			R	2	1985	Possible
<i>Bothriochloa macra</i>	Red-leg Grass		R	2	2022	Possible
<i>Caladenia leptochila</i> ssp. <i>leptochila</i>	Narrow-lip Spider-orchid		R	2	2001	Unlikely
<i>Caladenia pusilla</i>	Pigmy Caladenia		R	2	2001	Unlikely
<i>Caladenia reticulata</i>	Veined Spider-orchid		R	2	2009	Unlikely
<i>Caladenia stellata</i>	Star Spider-orchid		R	2	1995	Unlikely

Palmer Wind Farm Variation Application - Flora and Fauna Impact Assessment

Scientific name	Common name	Conservation status		Data source	PMST likelihood/ year of most recent record	Likelihood of occurrence in the Varied Project Area
		Aus.	SA			
<i>Calotis scapigera</i>	Tufted Burr-daisy		R	2	1990	Possible
<i>Centrolepis cephaloformis</i> ssp. <i>cephaloformis</i>	Cushion Centrolepis		R	2	2010	Unlikely
<i>Crassula sieberiana</i>	Sieber's Crassula		E	2	2021	Possible
<i>Dianella longifolia</i> var. <i>grandis</i>	Pale Flax-lily		R	2	2015	Unlikely
<i>Diuris behrii</i>	Behr's Cowslip Orchid		V	2	1964	Unlikely
<i>Duma horrida</i> ssp. <i>horrida</i>	Spiny Lignum		R	2	1964	Possible
<i>Elatine gratioloides</i>	Waterwort		R	2	1960	Possible
<i>Eragrostis lacunaria</i>	Purple Love-grass		R	2	1992	Unlikely
<i>Eremophila gibbifolia</i>	Coccid Emubush		R	2	1994	Unlikely
<i>Eryngium ovinum</i>	Blue Devil		V	2	2013	Possible
<i>Eucalyptus dalrympleana</i> ssp. <i>dalrympleana</i>	Candlebark Gum		R	2	2021	Unlikely
<i>Eucalyptus fasciculosa</i>	Pink Gum		R	2	2022	Highly Likely / Known
<i>Eucalyptus leucoxylon</i> ssp. <i>megalocarpa</i>	Large-fruit Blue Gum		R	2	1992	Unlikely
<i>Eucalyptus viminalis</i> ssp. <i>viminalis</i>	Manna Gum		R	2	2003	Unlikely
<i>Gastrodia sesamoides</i>	Potato Orchid		R	2	2005	Possible
<i>Hypericum japonicum</i>	Matted St John's Wort		R	2	2017	Possible
<i>Juncus homalocaulis</i>	Wiry Rush		V	2	2004	Possible
<i>Juncus prismatocarpus</i>	Branching Rush		E	2	1990	Possible
<i>Lachnagrostis robusta</i>	Tall Blown-grass		R	2	2003	Possible
<i>Leptorhynchus elongatus</i>	Lanky Buttons		E	2	1980	Possible
<i>Luzula ovata</i>	Clustered Wood-rush		R	2	2004	Possible
<i>Maireana excavata</i>	Bottle Fissure-plant		V	2	1994	Possible
<i>Maireana rohlachii</i>	Rohrlach's Bluebush		R	2	2022	Highly likely / known
<i>Mentha diemenica</i>	Slender Mint		R	2	2013	Likely
<i>Microtis eremaea</i>	Slender Onion-orchid		E	2	1992	Possible
<i>Olearia passerinoides</i> ssp. <i>glutescens</i>	Sticky Daisy-bush		R	2	2010	Possible
<i>Pentapogon quadrifidus</i> var. <i>quadrifidus</i>	Five-awn Spear-grass		R	2	2009	Possible
<i>Pilularia novae-hollandiae</i>	Austral Pillwort		R	2	1960	Possible
<i>Potamogeton ochreateus</i>	Blunt Pondweed		R	2	1960	Possible

Palmer Wind Farm Variation Application - Flora and Fauna Impact Assessment

Scientific name	Common name	Conservation status		Data source	PMST likelihood/ year of most recent record	Likelihood of occurrence in the Varied Project Area
		Aus.	SA			
<i>Prostanthera chlorantha</i>	Green Mintbush		R	2	1965	Unlikely
<i>Ptilotus erubescens</i>	Hairy-tails		R	2	2014	Likely
<i>Rytidosperma laeve</i>	Smooth Wallaby-grass		R	2	1999	Possible
<i>Schoenus latelaminatus</i>	Medusa Bog-rush		V	2	1993	Possible
<i>Schoenus tesquorum</i>	Grassy Bog-rush		R	2	2017	Possible
<i>Sphaerolobium minus</i>	Leafless Globe-pea		R	2	1995	Possible
<i>Swainsona behriana</i>	Behr's Swainson-pea		V	2	1968	Possible
<i>Veronica decorosa</i>	Showy Speedwell		R	2	2005	Possible

Conservation status

Aus: Australia (*Environment Protection and Biodiversity Conservation Act 1999*). SA: South Australia (*National Parks and Wildlife Act 1972*). Conservation Codes: CE: Critically Endangered. EN/E: Endangered. VU/V: Vulnerable. R: Rare.

Source of Information:

1. EPBC Act Protected Matters Report (DCCEEW 2023) – 10 km buffer applied to Varied Project Area;
2. Biological Database of South Australia data extract (DEW 2023a) (Recordset number DEWNRBDBSA230614-1) - 10 km buffer applied to Varied Project Area.

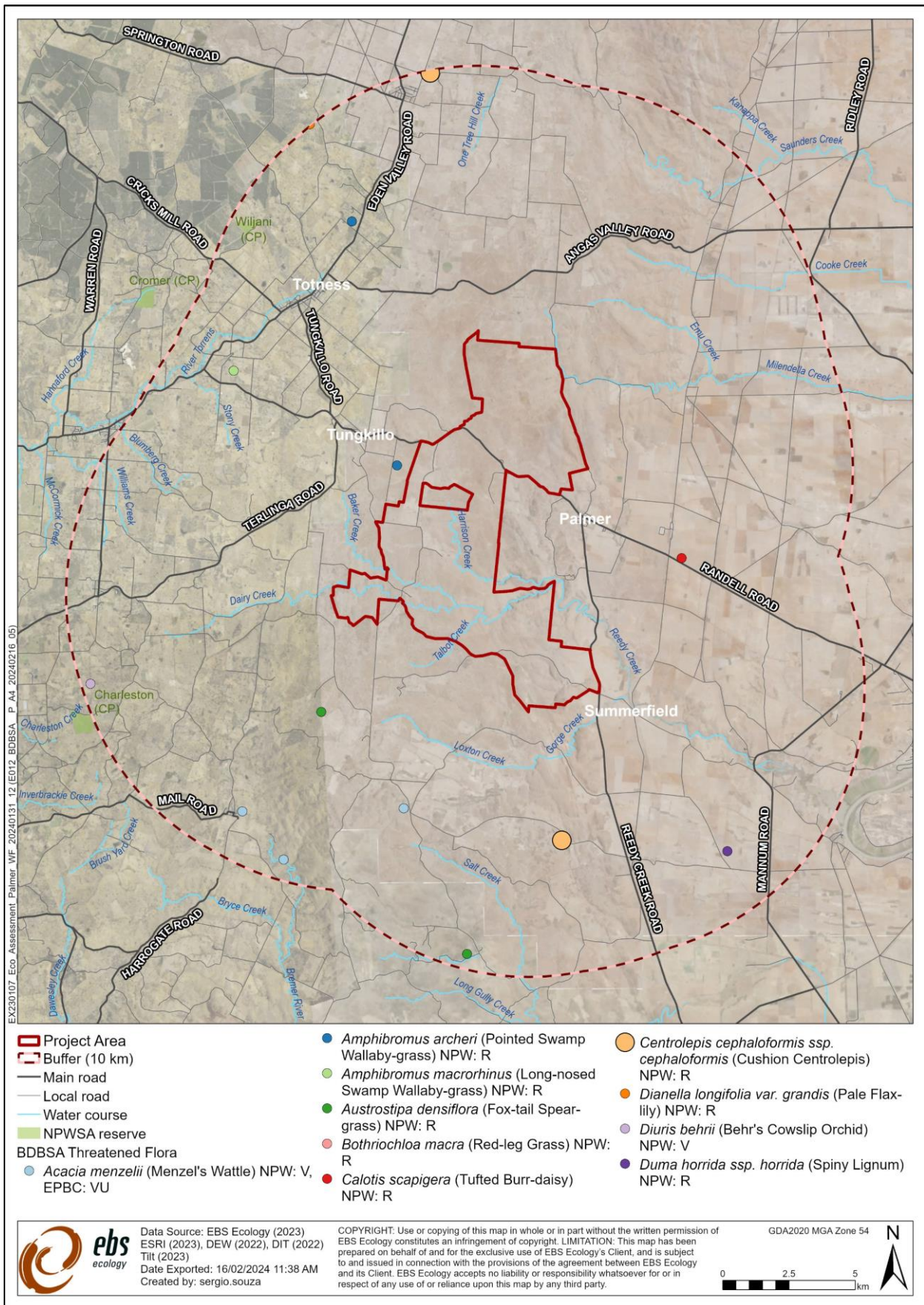


Figure 5. Nationally and State threatened flora identified within 10 km of the Varied Project Area (DEW 2023a) (Map 1 of 3).

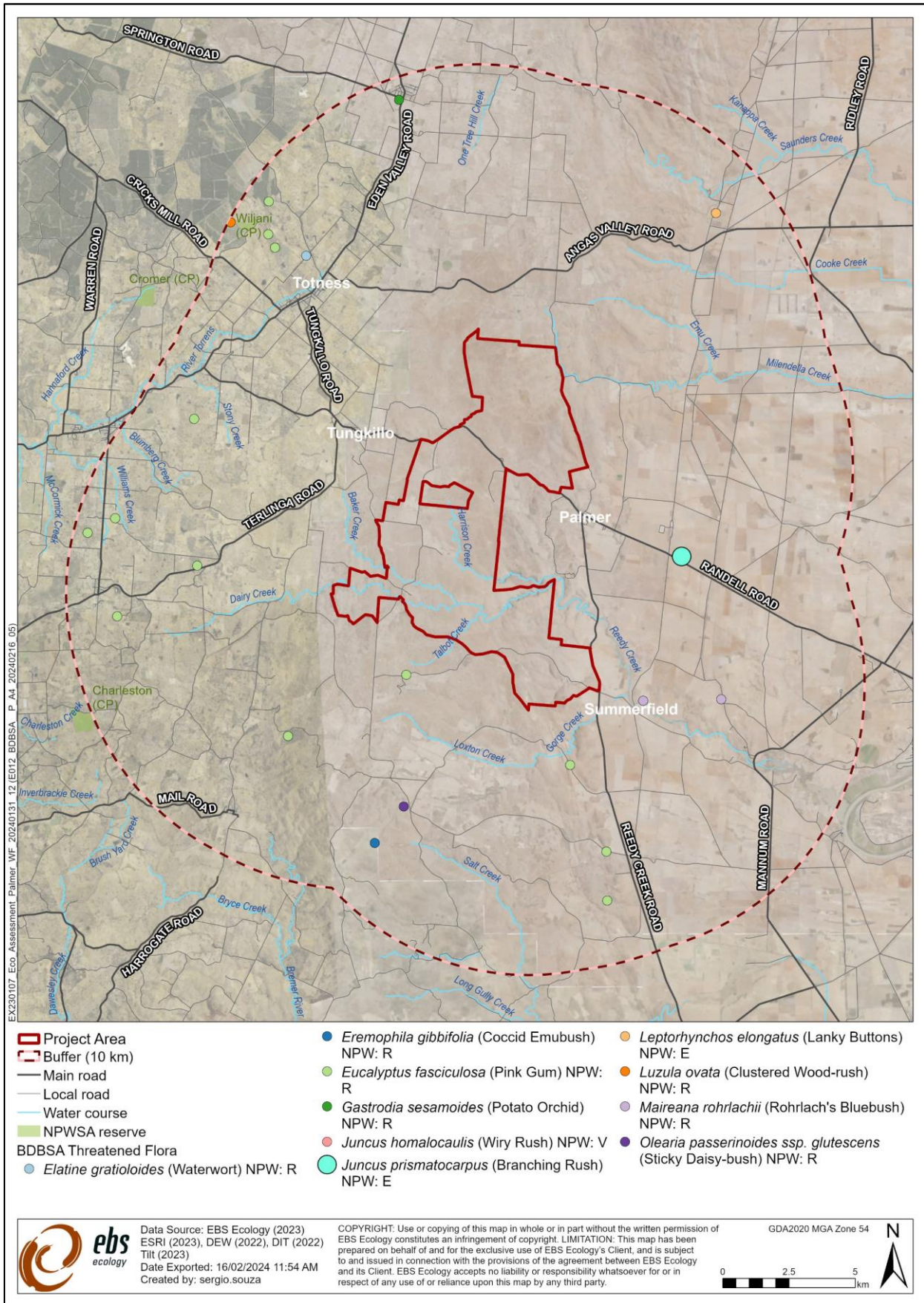


Figure 6. Nationally and State threatened flora identified within 10 km of the Varied Project Area (DEW 2023a) (Map 2 of 3).

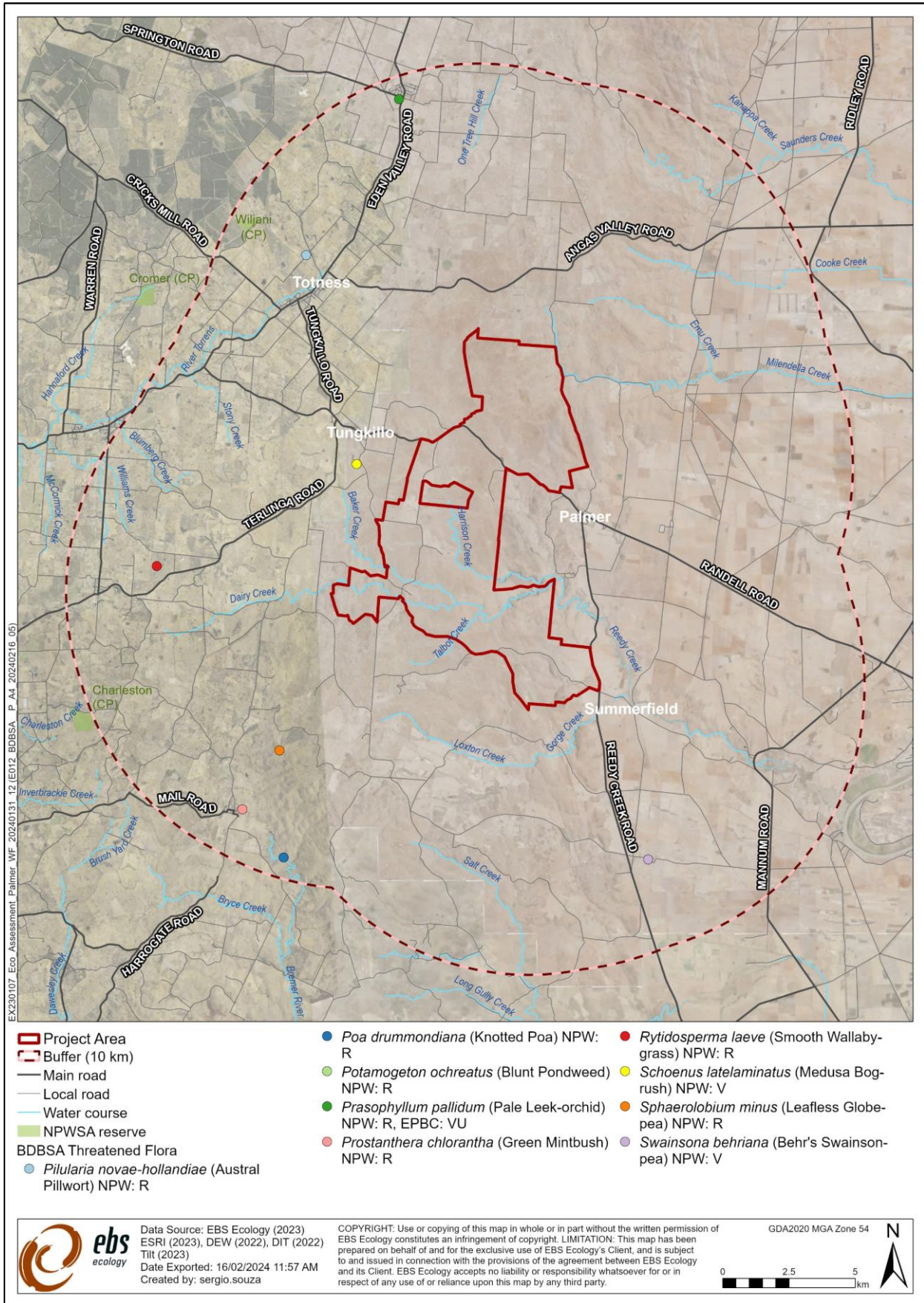


Figure 7. Nationally and State threatened flora identified within 10 km of the Varied Project Area (DEW 2023a) (Map 3 of 3).

6.2.2 State listed threatened fauna

An additional thirty-one (31) threatened fauna species listed under the NPW Act were identified by the desktop as potentially occurring within 10 km of the Varied Project Area, consisting of two amphibians, two reptiles, one mammal and 26 birds (Table 17).

Of these, ten (10) threatened fauna species were assessed as known / highly likely / likely to occur based on recent records, observations, and suitable habitat within the Varied Project Area (Table 17):

- White-winged Chough (*Corcorax melanorhamphos*) (NPW: Rare);
- White-bellied Cuckooshrike (*Coracina papuensis robusta*) (NPW: Rare);
- Peregrine Falcon (*Falco peregrinus*) (NPW: Rare);
- Eastern Shriketit (*Falcunculus frontatus ssp. frontatus*) (NPW: Rare);
- Little Eagle (*Hieraaetus morphnoides*) (NPW: Vulnerable);
- Purple-gaped Honeyeater (*Lichenostomus cratitius occidentalis*) (NPW: Rare);
- Jacky Winter (*Microeca fascinans fascinans*) (NPW: Rare);
- Elegant Parrot (*Neophema elegans elegans*) (NPW: Rare);
- Painted Buttonquail (*Turnix varius ssp. varius*) (NPW: Rare); and
- Common Brushtail Possum (*Trichosurus vulpecula*) (NPW: Rare).

An additional sixteen (15) threatened fauna species were assessed as possibly occurring within the Varied Project Area and are shown in Table 17. The remaining six species were assessed as unlikely to occur in the Varied Project Area due to the absence of suitable habitat and / or the Varied Project Area occurring outside of the known distribution of these species.

Database records State listed fauna species are mapped in Figure 8, Figure 9, Figure 10 and Figure 11 on pages 40-43.

The full likelihood assessment with the rationale for the likelihood assessments is provided in Appendix 1.

Table 17. State threatened fauna potentially occurring within 10 km of the Varied Project Area. Cells highlighted in green are highly likely/likely to occur; cells highlighted in orange are possible to occur.

Scientific name	Common name	Conservation status		Data Source	PMST likelihood/ year of most recent record	Likelihood of occurrence in the Varied Project Area
		Aus.	SA			
AMPHIBIANS						
<i>Emydura macquarii</i>	Macquarie River Turtle		V	1	2012	Unlikely
<i>Pseudophryne bibronii</i>	Brown Toadlet		R	1	2016	Possible
BIRDS						
<i>Anhinga novaehollandiae novaehollandiae</i>	Australasian Darter		R	1	2016	Possible
<i>Ardea intermedia plumifera</i>	Plumed Egret		R	1	2017	Unlikely

Palmer Wind Farm Variation Application - Flora and Fauna Impact Assessment

Scientific name	Common name	Conservation status		Data Source	PMST likelihood/ year of most recent record	Likelihood of occurrence in the Varied Project Area
		Aus.	SA			
<i>Cinlosoma castanotum</i>	Chestnut-backed Quailthrush		R	2	2014	Possible
<i>Cladorhynchus leucocephalus</i>	Banded Stilt		V	2	2012	Unlikely
<i>Coracina papuensis robusta</i>	White-bellied Cuckooshrike		R	3	2022 (EBS record)	Highly likely/Known
<i>Corcorax melanorhamphos</i>	White-winged Chough		R	2	2022	Highly likely/Known
<i>Coturnix ypsilophora australis</i>	Brown Quail		V	2	2018	Possible
<i>Egretta garzetta nigripes</i>	Little Egret		R	2	2017	Possible
<i>Falco peregrinus</i>	Peregrine Falcon		R	2	2020	Highly likely/Known
<i>Falco subniger</i>	Black Falcon		R	2	2010	Possible
<i>Falcunculus frontatus ssp. frontatus</i>	Eastern Shrike-tit		R	2	2021	Likely
<i>Hieraaetus morphnoides</i>	Little Eagle		V	2	2018	Likely
<i>Lichenostomus cratitius occidentalis</i>	Purple-gaped Honeyeater		R	2	2018	Likely
<i>Lophoictinia isura</i>	Square-tailed Kite		E	2	2013	Possible
<i>Melithreptus gularis</i>	Black-chinned Honeyeater		V	2	2014	Possible
<i>Microeca fascinans fascinans</i>	Jacky Winter (MLR, SE)		R	2	2022	Likely
<i>Myiagra inquieta</i>	Restless Flycatcher		R	2	2018	Possible
<i>Neophema elegans elegans</i>	Elegant Parrot		R	2	2021	Highly likely/Known
<i>Oxyura australis</i>	Blue-billed Duck		R	2	2016	Unlikely
<i>Petroica boodang boodang</i>	Scarlet Robin		R	2	2016	Possible
<i>Petroica phoenicea</i>	Flame Robin		V	2	2015	Unlikely
<i>Plectorhyncha lanceolata</i>	Striped Honeyeater		R	2	2003	Possible
<i>Spatula rhynchotis</i>	Australasian Shoveler		R	1,2	2017	Possible
<i>Turnix varius ssp. varius</i>	Painted Buttonquail		R	1,2	2018	Likely
<i>Tyto novaehollandiae novaehollandiae</i>	Masked Owl		E	1,2	1900	Unlikely
<i>Zanda funerea whiteae</i>	Yellow-tailed Black Cockatoo		V	1,2	2020	Possible
MAMMALS						
<i>Trichosurus vulpecula</i>	Common Brushtail Possum		R	1,2	2002	Likely
REPTILES						
<i>Egernia cunninghami</i>	Cunningham's Skink		E	2	2021	Possible
<i>Morelia spilota</i>	Carpet Python		R	2	2020	Possible

Conservation status

Aus: Australia (*Environment Protection and Biodiversity Conservation Act 1999*). SA: South Australia (*National Parks and Wildlife Act 1972*). Conservation Codes: CE: Critically Endangered. EN/E: Endangered. VU/V: Vulnerable. R: Rare.

Source of Information:

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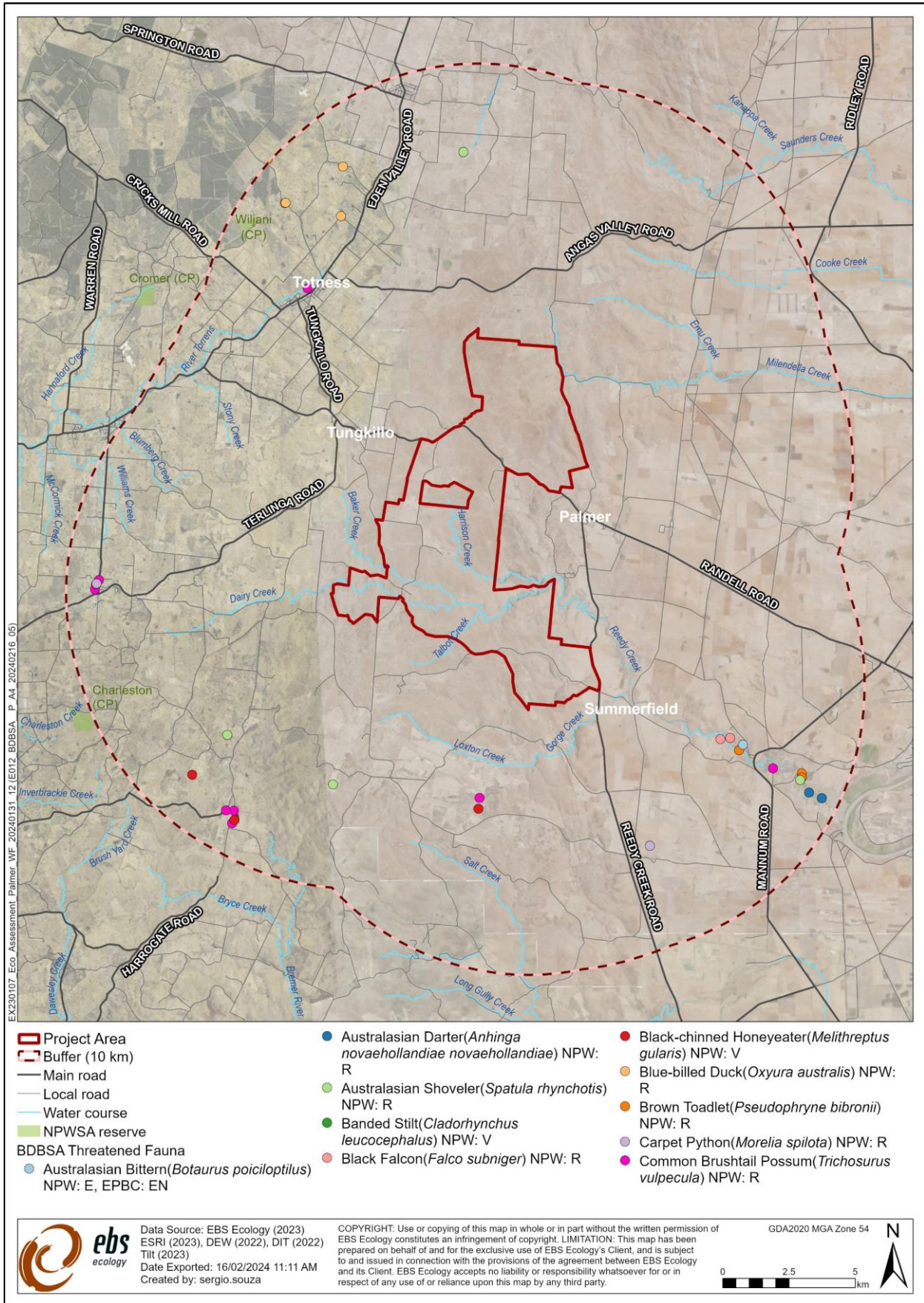


Figure 8. Nationally and State threatened fauna identified within 10 km of the Varied Project Area (DEW 2023a) (Map 1 of 4).

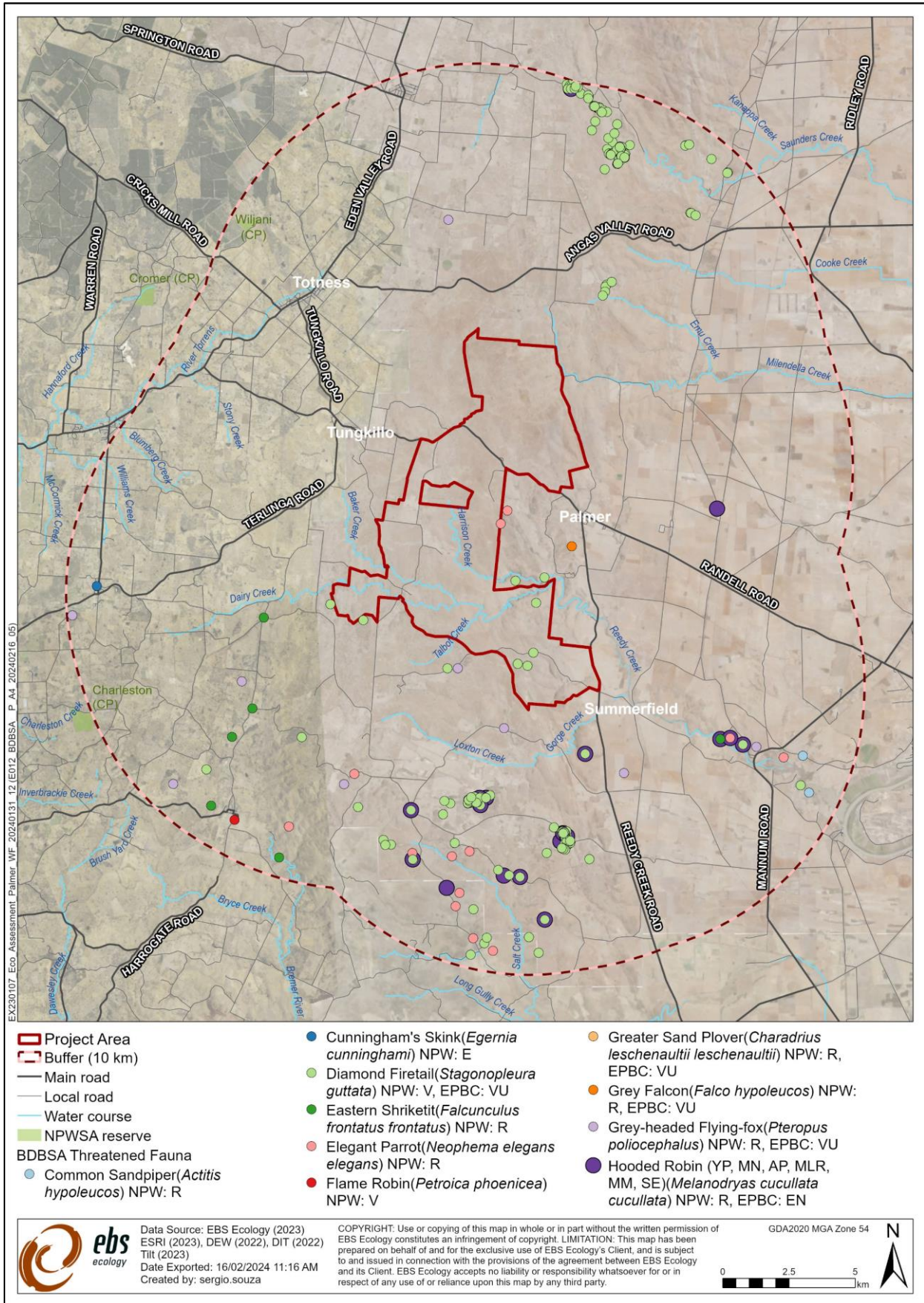


Figure 9. Nationally and State threatened fauna identified within 10 km of the Varied Project Area (DEW 2023a) (Map 2 of 4).

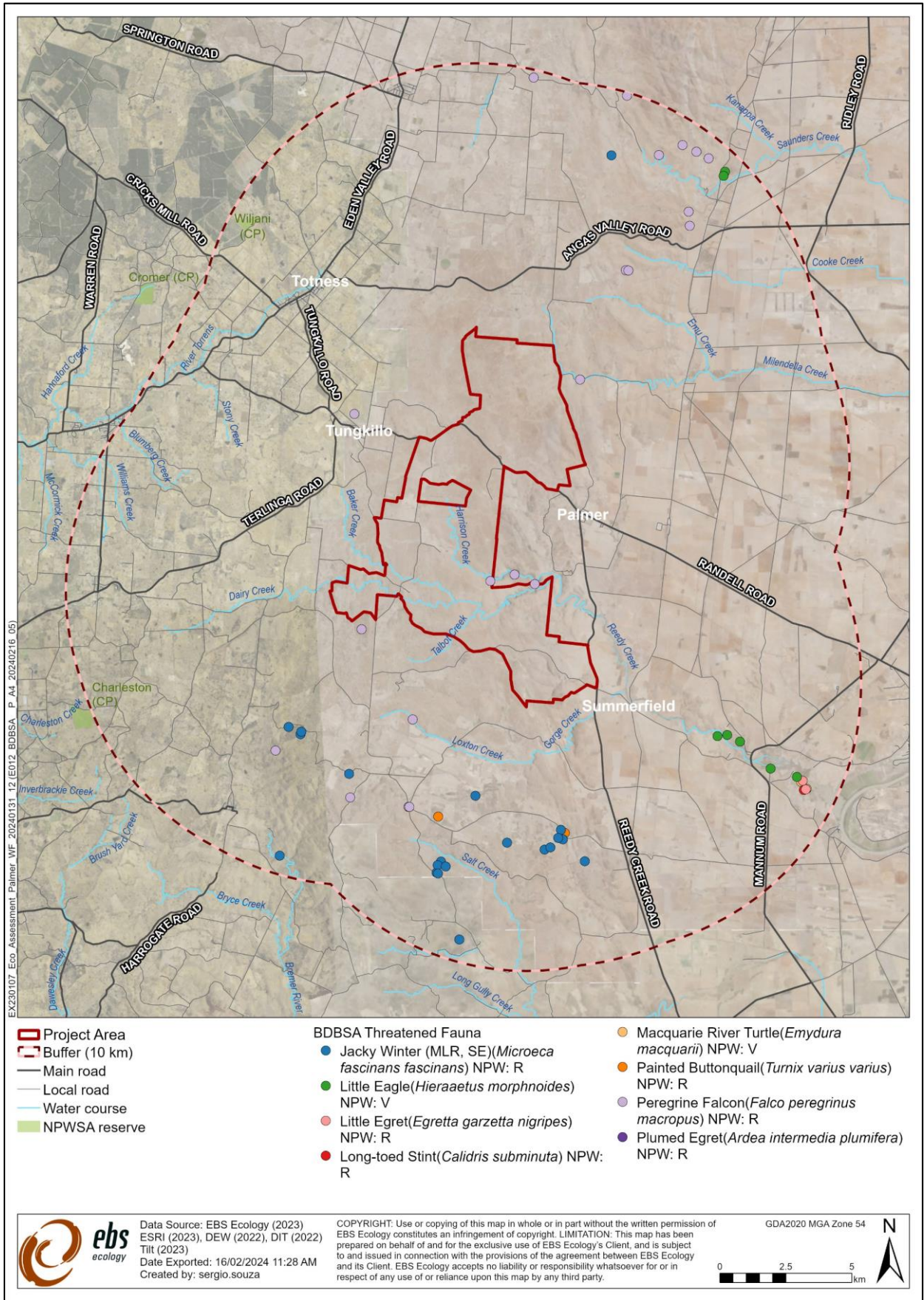


Figure 10. Nationally and State threatened fauna identified within 10 km of the Varied Project Area (DEW 2023a) (Map 3 of 4).

7 FIELD SURVEY RESULTS

7.1 Vegetation associations

Fourteen broad vegetation associations were identified across the survey area; four were associated with Area B and 10 vegetation associations were present within Area C (Table 18). *Austrostipa* sp. grassland and *Eucalyptus* spp. woodland were the most dominant vegetation associations across the Varied Project Area. These were determined by undertaking BAM surveys across the Varied Project Area to determine vegetation present across Areas B and C.

The location of the vegetation associations in Areas B and C is mapped in Figure 12.

Each of the vegetation associations is further described in Table 19-to Table 32.

Table 18. Vegetation associations identified within the Varied Project Area.

Ass. #	Vegetation association	Area		Impacted by final design
		B	C	
B1	<i>Lomandra effusa</i> with <i>Austrostipa</i> sp. grassland	✓		N
B2	<i>Austrostipa</i> sp. grassland with mixed exotic forbs and grasses	✓		Y
B3	<i>Eucalyptus camaldulensis</i> creek line with <i>Cyperus gymnocaulos</i>	✓		Y
B4	<i>Eucalyptus camaldulensis</i> and <i>Allocasuarina verticillata</i> open woodland over exotic grasses and forbs	✓		Y
C1	<i>Lomandra effusa</i> with <i>Austrostipa</i> sp. grassland and exotic mixed exotics		✓	Y
C2	<i>Austrostipa</i> sp. grassland with mixed exotic forbs and grasses		✓	Y
C3	<i>Eucalyptus camaldulensis</i> over <i>Cyperus gymnocaulos</i>		✓	Y
C4	<i>Eucalyptus camaldulensis</i> woodland over <i>Acacia pycnantha</i> shrubland and <i>Austrostipa</i> sp.		✓	Y
C5	<i>Eucalyptus fasciculosa</i> open woodland over <i>Austrostipa</i> sp.		✓	Y
C6	<i>Eucalyptus fasciculosa</i> open woodland with <i>Dodonaea viscosa</i> and <i>Acacia eithycarpa</i> shrubland over <i>Austrostipa</i> sp.		✓	Y
C7	<i>Xanthorrhoea quadrangulata</i> grassland with <i>Austrostipa</i> sp.		✓	Y
C8	<i>Ficinia nodosa</i> with <i>Juncus subsecundus</i> and <i>Cyperus gymnocaulos</i> sedgeland		✓	Y
C9	<i>Acacia eithycarpa</i> tall shrubland over <i>Austrostipa</i> sp.		✓	N
C10	<i>Eucalyptus odorata</i> mallee woodland over <i>Austrostipa</i> sp.		✓	N

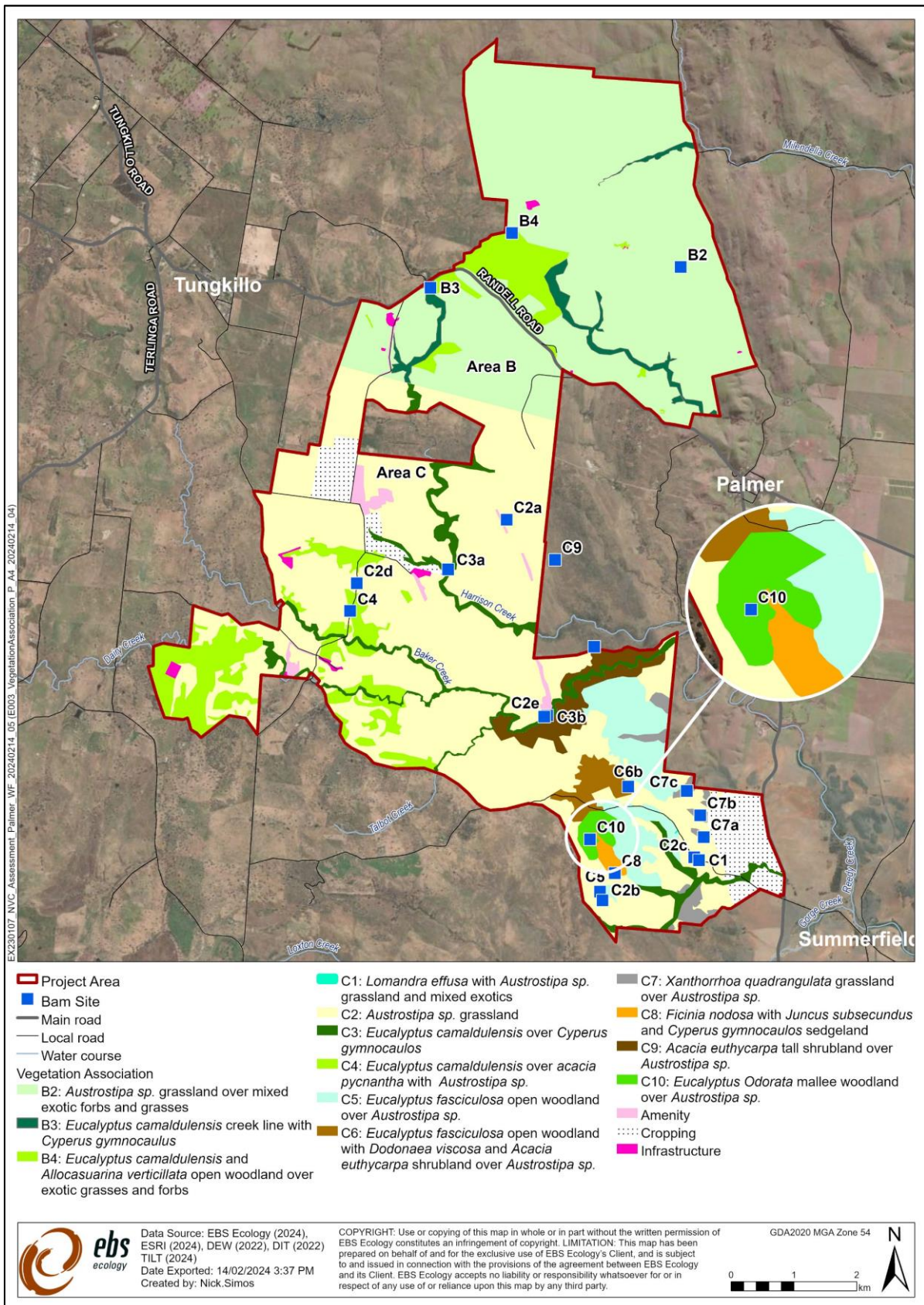


Figure 12. Locations of the BAM survey sites established across the Varied Project Area.

7.1.1 VA B1: *Lomandra effusa* with *Austrostipa* sp. grassland

Table 19. Vegetation association B1.

Area (ha)	107.86 – 0 ha impacted within final impact area. This vegetation association has been avoided.
Overstorey species	n/a
Midstorey species	<i>Atriplex</i> sp. (Saltbush) <i>Einadia nutans</i> ssp. (Climbing Saltbush) <i>Enchylaena tomentosa</i> var. (Ruby Saltbush)
Understorey species	<i>Arthropodium</i> sp. (Vanilla-lily) <i>Astroloma humifusum</i> (Cranberry Heath) <i>Austrostipa drummondii</i> . (Spear-grass) <i>Cheilanthes austrotenuifolia</i> (Annual Rock-fern) <i>Glycine</i> sp. (Glycine) <i>Lomandra effusa</i> (Scented Mat-rush) <i>Lomandra multiflora</i> ssp. <i>dura</i> (Hard Mat-rush) <i>Oxalis perennans</i> (Native Sorrel) <i>Ptilotus spathulatus</i> (Pussy-tails) <i>Rytidosperma caespitosum</i> (Common Wallaby-grass) <i>Wahlenbergia</i> sp. (Native Bluebell)
Threatened species/community	Qualifies as the Iron grass Natural Temperate Grassland TEC. Grasslands may be used by some threatened species such as the Painted buttonquail and used for foraging by Little Eagles and Peregrine Falcons. If spider burrows present, area may be suitable habitat for PBTB.
Declared or significant weeds	<i>Cynara cardunculus</i> ssp. <i>flavescens</i> (Artichoke Thistle) <i>Echium plantagineum</i> (Salvation Jane)
Other comments	N/A



7.1.2 VA B2: *Austrostipa sp.* grassland with mixed exotic forbs and grasses

Table 20. Vegetation association B2.

Area (ha)	3680.68
Overstorey species	n/a
Midstorey species	n/a
Understorey species	<i>Austrostipa sp.</i> (Spear-grass)
Threatened species	Grasslands may be used by some threatened species such as for foraging by Little Eagles and Peregrine Falcons. If spider burrows present, area may be suitable habitat for PBTL.
Declared or significant weeds	<i>Avena barbata</i> (Bearded Oat) <i>Arctotheca calendula</i> (Cape Weed) <i>Cynara cardunculus ssp. flavescens</i> (Artichoke Thistle) <i>Echium plantagineum</i> (Salvation Jane) <i>Hordeum vulgare</i> (Barley) <i>Marrubium vulgare</i> (Horehound)
Other comments	The quality of grassland fluctuates throughout the Varied Project Area with many areas dominated by exotic grasses such as Bearded Oat. These areas largely contain embedding rock.



7.1.3 VA B3: *Eucalyptus camaldulensis* creek line with *Cyperus gymnocaulos*

Table 21. Vegetation association B3.

Area (ha)	209.47
Overstorey species	<i>Eucalyptus camaldulensis</i> (River Red Gum)
Midstorey species	<i>Cyperus gymnocaulos</i> (Spiny Flat sedge) <i>Maireana aphylla</i> (Cottonbush)
Understorey species	<i>Austrostipa</i> sp. (Spear-grass) <i>Poa</i> sp. (Meadow-grass)
Threatened species	Tree lined creek lines may be used by a number of threatened fauna species including Southern Whiteface, Hooded Robin, Elegant Parrot, Diamond Firetail, raptors and Southern Bell Frog (when water is present). No threatened plant species have been observed within the creek lines. Hollows in the remnant River Red Gums may be used by Common Brushtail Possums.
Declared or significant weeds	<i>Arctotheca calendula</i> (Cape Weed) <i>Echium plantagineum</i> (Salvation Jane) <i>Hordeum vulgare</i> (Barley) <i>Lycium ferocissimum</i> (African Boxthorn) <i>Piptatherum miliaceum</i> (Rice Millet) <i>Rosa canina</i> (Dog Rose)
Other comments	Ephemeral creeks



7.1.4 VA B4: *Eucalyptus camaldulensis* and *Allocasuarina verticillata* very open woodland over exotic grasses and forbs.

Table 22. Vegetation association B4.

Area (ha)	199.37
Overstorey species	<i>Allocasuarina verticillata</i> (Drooping Sheoak) <i>Eucalyptus camaldulensis</i> ssp. (River Red Gum)
Midstorey species	<i>Cyperus gymnocaulos</i> (Spiny Flat sedge)
Understorey species	<i>Austrostipa</i> sp. (Spear-grass) <i>Rumex</i> sp. (Dock)
Threatened species	Treed areas may be used by a number of threatened fauna species including Southern Whiteface, Hooded Robin, Elegant Parrot, Diamond Firetail and raptors. Hollows in the remnant River Red Gums may be used by Common Brushtail Possums.
Declared or significant weeds	<i>Arctotheca calendula</i> (Cape Weed) <i>Echium plantagineum</i> (Salvation Jane) <i>Hordeum vulgare</i> (Barley) <i>Lycium ferocissimum</i> (African Boxthorn)
Other comments	With embedded rock



7.1.5 VA C1: *Lomandra effusa* and *Austrostipa* sp. grassland with mixed exotics

Table 23. Vegetation association C1.

Area (ha)	0.16
Overstorey species	n/a
Midstorey species	<i>Einadia nutans</i> ssp. (Climbing Saltbush) <i>Enchylaena tomentosa</i> var. (Ruby Saltbush)
Understorey species	<i>Aristida behriana</i> (Brush Wire grass) <i>Austrostipa elegantissima</i> (Feather Spear-grass) <i>Austrostipa scabra</i> (Rough Spear-grass) <i>Austrostipa</i> sp. (Spear-grass) <i>Enneapogon nigricans</i> (Black-head Grass) <i>Lomandra effusa</i> (Scented Mat-rush) <i>Lomandra multiflora</i> ssp. <i>dura</i> (Hard Mat-rush) <i>Ptilotus spathulatus</i> (Pussy-tails) <i>Rytidosperma caespitosum</i> (Common Wallaby-grass) <i>Themeda triandra</i> (Kangaroo Grass) <i>Vittadinia blackii</i> (Narrow-leaf New Holland Daisy) <i>Wahlenbergia</i> sp. (Native Bluebell)
Threatened species	Does not qualify as the Iron grass Natural Temperate Grassland TEC. Grasslands may be used by some threatened species such as the Painted buttonquail and Little Eagles and Peregrine Falcons for foraging. If spider burrows present, area may be suitable habitat for PBTL.
Declared or significant weeds	<i>Arctotheca calendula</i> (Cape Weed) <i>Avena</i> sp. (Bearded Oat) <i>Echium plantagineum</i> (Salvation Jane) <i>Marrubium vulgare</i> (Horehound) <i>Salvia verbenaca</i> var. (Wild Sage)
Other comments	N/A



7.1.6 VA C2: *Austrostipa* sp. grassland over mixed exotic forbs and grasses

Table 24. Vegetation association C2.

Area (ha)	2569.27
Overstorey species	n/a
Midstorey species	n/a
Understorey species	<p><i>Austrostipa nitida</i> (Balcarra Spear-grass) <i>Austrostipa scabra</i> (Falcate-awn Spear-grass) <i>Rytidosperma</i> sp. (Wallaby-grass) <i>Themeda triandra</i> (Kangaroo Grass) <i>Bulbine bulbosa</i> (Bulbine Lily) <i>Chloris</i> sp. (Windmill Grass) <i>Enneapogon nigricans</i> (Black-head Grass) <i>Lomandra effusa</i> (Scented Mat-rush) <i>Arthropodium strictum</i> (Chocolate lily)</p>
Threatened species	Grasslands may be used by some threatened species such as for foraging by Little Eagles and Peregrine Falcons. If spider burrows present, area may be suitable habitat for PBTL.
Declared or significant weeds	<p><i>Arctotheca calendula</i> (Cape Weed) <i>Avena</i> sp. (Bearded Oat) <i>Cynara cardunculus</i> ssp. <i>flavescens</i> (Artichoke Thistle) <i>Echium plantagineum</i> (Salvation Jane) <i>Hordeum vulgare</i> (Barley) <i>Marrubium vulgare</i> (Horehound) <i>Salvia verbenaca</i> var. (Wild Sage)</p>
Other comments	Mixture of higher quality grasslands and poor quality (minimal species diversity) grasslands throughout Area C.



Top: good quality grassland; bottom: poor quality grassland.

7.1.7 VA C3: *Eucalyptus camaldulensis* over *Cyperus gymnocaulos*

Table 25. Vegetation association C3.

Area (ha)	225.88
Overstorey species	<i>Eucalyptus camaldulensis</i> ssp. (River Red Gum)
Midstorey species	<i>Cyperus gymnocaulos</i> (Spiny Flat sedge) <i>Phragmites australis</i> (Common Reed)
Understorey species	n/a
Threatened species	Tree lined creek lines may be used by a number of threatened fauna species including Southern Whiteface, Hooded Robin, Elegant Parrot, Diamond Firetail, raptors and Southern Bell Frog (when water is present). No threatened plant species have been observed within the creek lines. Hollows in the remnant River Red Gums may be used by Common Brushtail Possums.
Declared or significant weeds	<i>Arctotheca calendula</i> (Cape Weed) <i>Avena</i> sp. (Bearded Oat) <i>Echium plantagineum</i> (Salvation Jane) <i>Hordeum vulgare</i> (Barley) <i>Romulea rosea</i> var. <i>australis</i> (Common Onion-grass)
Other comments	Ephemeral creeks



7.1.8 VA C4: *Eucalyptus camaldulensis* woodland over *Acacia pycnantha* shrubland and *Austrostipa* sp.

Table 26. Vegetation association C4.

Area (ha)	310.59
Overstorey species	<i>Eucalyptus camaldulensis</i> ssp. (River Red Gum)
Midstorey species	<i>Acacia pycnantha</i> (Golden Wattle)
Understorey species	<p><i>Acaena novae-zelandiae</i> (Biddy-biddy) <i>Arthropodium strictum</i> (Common Vanilla-lily) <i>Austrostipa puberula</i> (Fine-hairy Spear-grass) <i>Austrostipa</i> sp. (Spear-grass) <i>Bulbine bulbosa</i> (Bulbine-lily) <i>Calostemma purpureum</i> (Pink Garland-lily) <i>Drosera peltata</i> str. (Swamp Sundew) <i>Kennedia prostrata</i> (Scarlet Runner) <i>Lomandra collina</i> (Sand Mat-rush) <i>Vittadinia gracilis</i> (Woolly New Holland Daisy)</p>
Threatened species	Tree areas may be used by a number of threatened fauna species including Southern Whiteface, Hooded Robin, Elegant Parrot, Diamond Firetail and raptors. Hollows in the remnant River Red Gums may be used by Common Brushtail Possums.
Declared or significant weeds	<p><i>Arctotheca calendula</i> (Cape Weed) <i>Avena</i> sp. (Bearded Oat) <i>Echium plantagineum</i> (Salvation Jane)</p>
Other comments	N/A



Top: facing west; Bottom: facing east.

7.1.9 VA C5: *Eucalyptus fasciculosa* very open woodland over *Austrostipa* sp.

Table 27. Vegetation association C5.

Area (ha)	238.74
Overstorey species	<i>Eucalyptus fasciculosa</i> (Pink Gum)
Midstorey species	<i>Maireana aphylla</i> (Cotton-bush)
Understorey species	<i>Arthropodium</i> sp. (Vanilla-lily) <i>Austrostipa</i> sp. (Spear-grass) <i>Crassula alata</i> var. <i>alata</i> (Three-part Crassula) <i>Euphorbia drummondii</i> group (Spurge) <i>Iseilema</i> sp. (Flinder's-grass) <i>Oxalis perennans</i> (Native Sorrel) <i>Vittadinia blackii</i> (Narrow-leaf New Holland Daisy)
Threatened species	<i>Eucalyptus fasciculosa</i> (Pink Gum) (State rare). Tree areas may be used by a number of threatened fauna species including Southern Whiteface, Hooded Robin, Elegant Parrot, Diamond Firetail and raptors. Hollows in the remnant River Red Gums may be used by Common Brushtail Possums.
Declared or significant weeds	<i>Arctotheca calendula</i> (Cape Weed) <i>Avena</i> sp. (Bearded Oat) <i>Echium plantagineum</i> (Salvation Jane) <i>Hordeum vulgare</i> (Barley) <i>Marrubium vulgare</i> (Horehound)
Other comments	Rocky



7.1.10 VA C6: *Eucalyptus fasciculosa* open woodland with *Dodonaea viscosa* +/- *Acacia euthycarpa* +/- *Bursaria spinosa* over *Austrostipa* sp.

Table 28. Vegetation association C6.

Area (ha)	59.75
Overstorey species	<i>Acacia euthycarpa</i> (Wallowa) <i>Eucalyptus fasciculosa</i> (Pink Gum)
Midstorey species	<i>Dodonaea viscosa</i> ssp. (Sticky Hop-bush) <i>Enchylaena tomentosa</i> var. (Ruby Saltbush) <i>Olearia axillaris</i> (Coast Daisy-bush)
Understorey species	<i>Amyema miquelii</i> (Box Mistletoe) <i>Aristida behriana</i> (Brush Wire grass) <i>Arthropodium strictum</i> (Common Vanilla-lily) <i>Austrostipa</i> sp. (Spear-grass) <i>Cheilanthes austrotenuifolia</i> (Annual Rock-fern) <i>Convolvulus angustissimus</i> (Narrow-leaf Bindweed) <i>Drosera peltata</i> str. (Swamp Sundew) <i>Enneapogon nigricans</i> (Black-head Grass) <i>Eutaxia</i> sp. (Eutaxia) <i>Goodenia pusilliflora</i> (Small-flower Goodenia) <i>Rytidosperma</i> sp. (Wallaby-grass) <i>Scaevola</i> sp. (Fanflower) <i>Vittadinia cuneata</i> var. (Fuzzy New Holland Daisy) <i>Wahlenbergia</i> sp. (Native Bluebell)
Threatened species	<i>Eucalyptus fasciculosa</i> (Pink Gum) (State rare). Tree areas may be used by a number of threatened fauna species including Southern Whiteface, Hooded Robin, Elegant Parrot, Diamond Firetail and raptors. Hollows in the remnant River Red Gums may be used by Common Brushtail Possums.
Declared or significant weeds	<i>Arctotheca calendula</i> (Cape Weed) <i>Avena</i> sp. (Bearded Oat) <i>Echium plantagineum</i> (Salvation Jane) <i>Olea europaea</i> ssp. <i>europaea</i> (Olive) <i>Romulea rosea</i> var. <i>australis</i> (Common Onion-grass)
Other comments	N/A



7.1.11 VA C7: *Xanthorrhoea quadrangulata* shrubland with *Austrostipa* sp.

Table 29. Vegetation association C7.

Area (ha)	64.39
Overstorey species	n/a
Midstorey species	<i>Enchylaena tomentosa</i> var. (Ruby Saltbush) <i>Maireana</i> sp. (Bluebush) <i>Xanthorrhoea quadrangulata</i> (Rock Grass-tree)
Understorey species	<i>Austrostipa</i> sp. (Spear-grass) <i>Erneapogon nigricans</i> (Black-head Grass) <i>Lomandra effusa</i> (Scented Mat-rush)
Threatened species	Shrubland areas may be used by a number of threatened fauna species including Southern Whiteface, Hooded Robin and Diamond Firetail.
Declared or significant weeds	<i>Arctotheca calendula</i> (Cape Weed) <i>Avena</i> sp. (Bearded Oat) <i>Echium plantagineum</i> (Salvation Jane) <i>Marrubium vulgare</i> (Horehound)
Other comments	On steep slopes



7.1.12 VA C8: *Ficinia nodosa* with *Juncus subsecundus* and *Cyperus gymnocaulos* sedgeland

Table 30. Vegetation association C8.

Area (ha)	15.72
Overstorey species	n/a
Midstorey species	<i>Cyperus</i> sp. (Flat-sedge) <i>Cyperus gymnocaulos</i> (Flat-Sedge) <i>Ficinia nodosa</i> (Knobby Club-rush) <i>Juncus</i> sp. (Rush)
Understorey species	<i>Aristida behriana</i> (Brush Wire grass) <i>Austrostipa nitida</i> (Balcarra Spear-grass) <i>Austrostipa</i> sp. (Spear-grass) <i>Cheilanthes austrotenuifolia</i> (Annual Rock-fern) <i>Convolvulus angustissimus</i> (Narrow-leaf Bindweed) <i>Cymbopogon ambiguus</i> (Lemon-grass) <i>Enneapogon nigricans</i> (Black-head Grass) <i>Rytidosperma</i> sp. (Wallaby-grass) <i>Vittadinia blackii</i> (Narrow-leaf New Holland Daisy) <i>Vittadinia cuneata</i> var. (Fuzzy New Holland Daisy)
Threatened species	Sedgeland and associated dams may provide habitat for the Southern Bell Frog.
Declared or significant weeds	<i>Arctotheca calendula</i> (Cape Weed) <i>Avena</i> sp. (Bearded Oat) <i>Echium plantagineum</i> (Salvation Jane) <i>Marrubium vulgare</i> (Horehound) <i>Rosa canina</i> (Dog Rose) <i>Schinus molle</i> (Pepper-tree)
Other comments	Surrounding dams



7.1.13 VA C9: *Acacia euthycarpa* tall shrubland over *Austrostipa* sp.

Table 31. Vegetation association C9.

Area (ha)	105.70
Overstorey species	<i>Acacia euthycarpa</i> (Wallowa)
Midstorey species	<i>Olearia axillaris</i> (Coast Daisy-bush)
Understorey species	<i>Aristida behriana</i> (Brush Wire grass) <i>Austrostipa</i> sp. (Spear-grass) <i>Calostemma</i> sp. (Garland-lily) <i>Cheilanthes austrotenuifolia</i> (Annual Rock-fern) <i>Convolvulus angustissimus</i> (Narrow-leaf Bindweed) <i>Correa</i> sp. (Correa) <i>Oxalis perennans</i> (Native Sorrel) <i>Ptilotus spathulatus</i> (Pussy-tails) <i>Rytidosperma</i> sp. (Wallaby-grass) <i>Senecio</i> sp. (Groundsel) <i>Vittadinia gracilis</i> (Woolly New Holland Daisy)
Threatened species	Shrubland areas may be used by a number of threatened fauna species including Southern Whiteface, Hooded Robin and Diamond Firetail.
Declared or significant weeds	<i>Arctotheca calendula</i> (Cape Weed) <i>Avena</i> sp. (Bearded Oat) <i>Echium plantagineum</i> (Salvation Jane) <i>Olea europaea</i> ssp. <i>europaea</i> (Olive) <i>Salvia verbenaca</i> var. (Wild Sage)
Other comments	N/A



7.1.14 VA C10: *Eucalyptus odorata* mallee woodland over *Austrostipa* sp.**Table 32. Vegetation association C10.**

Area (ha)	29.63
Overstorey species	<i>Eucalyptus odorata</i> (Peppermint Box)
Midstorey species	n/a
Understorey species	<i>Austrostipa elegantissima</i> (Feather Spear-grass) <i>Austrostipa</i> sp. (Spear-grass) <i>Oxalis perennans</i> (Native Sorrel) <i>Ptilotus spathulatus</i> (Pussy-tails) <i>Rytidosperma</i> sp. (Wallaby-grass) <i>Vittadinia blackii</i> (Narrow-leaf New Holland Daisy)
Threatened species / threatened ecological communities	Species observed in this VA: Diamond firetail (<i>Stagonopleura guttata</i>) (EPBC Act: VU NPW Act: V); White-bellied Cuckooshrike (<i>Coracina papuensis robusta</i>) (NPW Act: R). This area qualifies as <i>Eucalyptus odorata</i> (Peppermint Box) Grassy Woodland of SA TEC. Other threatened woodland fauna may use this VA such as Hooded Robin, Southern Whiteface and Elegant Parrot.
Declared or significant weeds	<i>Arctotheca calendula</i> (Cape Weed) <i>Avena</i> sp. (Bearded Oat) <i>Cynara cardunculus</i> ssp. <i>flavescens</i> (Artichoke Thistle) <i>Echium plantagineum</i> (Salvation Jane) <i>Lycium ferocissimum</i> (African Boxthorn) <i>Romulea rosea</i> var. <i>australis</i> (Common Onion-grass)
Other comments	N/A



7.2 Threatened Ecological Communities observed

7.2.1 Peppermint Box (*Eucalyptus odorata*) Grassy Woodland of South Australia

During the October 2022 survey PBGW was recorded within the south-western corner of the Varied Project Area in Area C and assessed as Class B (Figure 13) as it met the criteria for this class, as described in DEW 2007 (Table 31).

Table 33. Assessment of woodland communities containing *E. odorata* (Peppermint Box).

Location (Long, Lat)	Area	Size	Diversity of native plant species	No. of broad-leaved herbaceous species [^]	No. of native perennial grass species	Tussock count (per m)	Condition class rating
139.13144, -34.90324	C	29.62	19	7	3	>1	B

[^] in addition to identified disturbance resistant species

7.2.2 Iron-grass Natural Temperate Grassland of South Australia

During the October 2022 spring survey this TEC was assessed within the north-eastern corner of the survey area in Area B (Figure 13) and it qualified as the EPBC Act Threatened Ecological Community – condition Class B (Table 34). Another small patch was assessed in the south-eastern corner of the Varied Project Area in Area C as condition class C as it did not meet the criteria for the TEC as described in DEW 2007.

The Varied Project Area was refined to avoid the B class INTG entirely and as such it will not be impacted by the Project. The class C *Lomandra* grassland is within the Varied Project Area but is currently outside of the impact area. Condition class C areas are not included as the listed ecological community and therefore do not trigger the ‘significant test’ of the EPBC Act. Condition Class C areas are still considered to be amenable to rehabilitation through measures such as weed control, natural regeneration and protection from grazing.

The remainder of the vegetation with *Lomandra* spp. within the Varied Project Area did not have the tussock density or native species diversity required to classify as Class C, therefore no further assessment in those areas was undertaken.

Table 34. Assessment of grassland communities containing *Lomandra* sp. (Iron-grass).

Location	Area	Size	Diversity of native plant species	No. of broad-leaved herbaceous species [^]	No. of native perennial grass species	Tussock count (per m)	Condition class rating
139.19592, -34.79089	B	107.86	16	7	4	>1	B
139.15036, -34.906518	C	0.16	17	3	7	>1	C – does not reach the required patch size for B grade

[^] in addition to identified disturbance resistant species

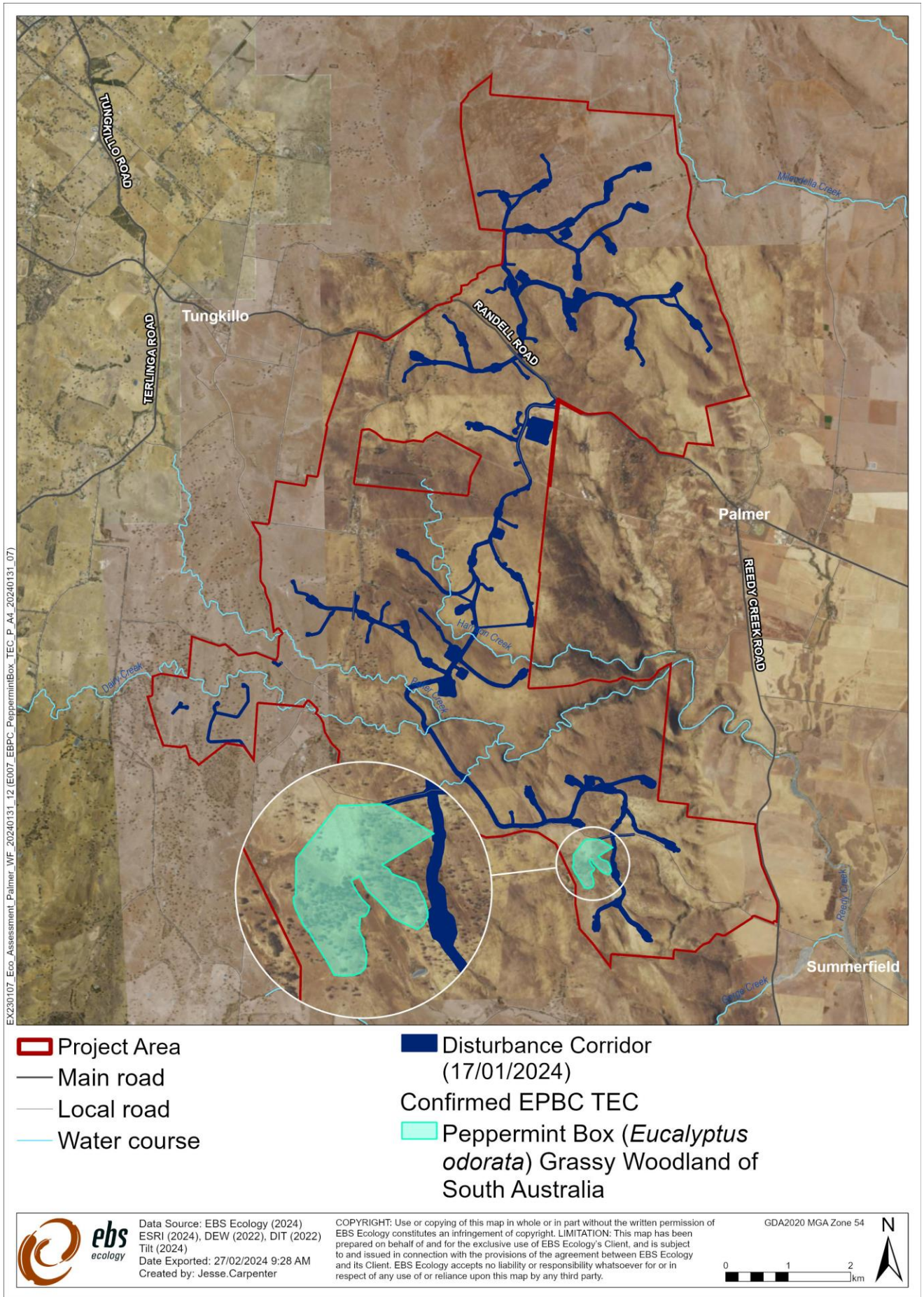


Figure 13. Location of PBGW TEC within the Varied Project Area.

7.3 Flora

A total of 131 flora species were recorded within the Varied Project Area across 14 vegetations associations during the October 2022 spring survey (Appendix 11.2). This includes 85 native species and 46 exotic species. From the 2013 survey results, 249 flora species were recorded, only within Areas B and C. These included 155 native species and 94 introduced species (Appendix 11.2). Note that flora records may have been collected in Area A and records include areas of planted vegetation which was not recorded in 2022.

7.3.1 Threatened flora

One NPW Act Rare threatened flora species was observed within the Varied Project Area during the spring 2022 survey:

- Pink Gum (*Eucalyptus fasciculosa*) (NPW Act: Rare).

In the 2013 survey, three threatened flora species were observed within the Approved Project Area:

- Pink Gum (*Eucalyptus fasciculosa*);
- Slender Mint (*Mentha diemenica*) (NPW Act: Rare); and
- Hairy-tails (*Ptilotus erubescens*) (NPW Act: Rare).

Of these, Pink Gum and Hairy-tails were recorded within the current Varied Project Area. Targeted surveys have not yet been completed to confirm if Hairy-tails are still present within the Varied Project Area.

7.3.2 Weeds

Forty-six exotic plant species were observed within the Varied Project Area during the 2022 survey. Seven of these species are classed as Declared or Weeds of National Significance under (WoNS) the LSA Act and a further 18 are considered environmental weeds (Table 35).

Landholders are obliged to control declared weeds on their property, as they are known to cause significant economic, social and environmental impacts. Environmental weeds have the potential to cause significant environmental impacts, however, their control is not legislated.

Table 35. Declared and environmental weeds located within the Varied Project Area.

Scientific name	Common name	Weeds
<i>Aizoon pubescens</i>	Coastal Galenia	E
<i>Arctotheca calendula</i>	Cape Weed	E
<i>Avena barbata</i>	Bearded Oat	E
<i>Briza maxima</i>	Large Quaking-grass	E
<i>Briza minor</i>	Lesser Quaking-grass	E
<i>Cynara cardunculus</i> ssp. <i>flavescens</i>	Artichoke Thistle	D
<i>Dactylis glomerata</i>	Cocksfoot	E
<i>Disa bracteata</i>	South African Weed Orchid	E
<i>Echium plantagineum</i>	Salvation Jane	D
<i>Ehrharta calycina</i>	Perennial Veldt Grass	E
<i>Hordeum vulgare</i>	Barley	E
<i>Hypochaeris glabra</i>	Smooth Cat's Ear	E

Scientific name	Common name	Weeds
<i>Hypochaeris radicata</i>	Rough Cat's Ear	E
<i>Lolium sp.</i>	Ryegrass	E
<i>Lycium ferocissimum</i>	African Boxthorn	WoNS
<i>Marrubium vulgare</i>	Horehound	D
<i>Olea europaea ssp. europaea</i>	Olive	D
<i>Piptatherum miliaceum</i>	Rice Millet	E
<i>Reichardia tingitana</i>	False Sowthistle	E
<i>Romulea rosea var. australis</i>	Common Onion-grass	E
<i>Rosa canina</i>	Dog Rose	D
<i>Salvia verbenaca var.</i>	Wild Sage	E
<i>Schinus molle</i>	Pepper-tree	E
<i>Sonchus oleraceus</i>	Common Sow-thistle	E
<i>Ulex europaeus</i>	Gorse	WoNS

WoNS = Weed of National Significance; D = Declared weed; E = Environmental weed

7.4 Fauna

A total of 63 fauna species were identified during the October 2022 spring survey, this included three amphibians, 49 birds, six mammals and five reptiles (Table 36). Of these, four species were introduced. In 2013, 87 fauna species were identified which included 10 species of bat, observed during targeted bat surveys. Methods for the fauna surveys undertaken in 2013 are described in EBS Ecology 2014.

7.4.1 Threatened fauna

Of the 103 fauna species observed across the two survey periods, three of the observed fauna species are listed as threatened under the EPBC Act (Table 36):

- Diamond Firetail (*Stagonopleura guttata*) (EPBC Act: Vulnerable; NPW Act: Vulnerable);
- Hooded Robin (*Melanodryas cucullata cucullata*) (EPBC Act: Endangered; NPW Act: Rare); and
- Southern Whiteface (*Aphelocephala leucopsis*) (EPBC Act: Vulnerable).

Three Hooded Robin (*Melanodryas cucullata cucullata*) were recorded in 2013 all records were outside of the Varied Project Area (two records near Area A and 1 record north of Area B). The Hooded Robin has not been recorded within the Varied Project Area in any of the subsequent surveys including the six bird surveys which have been undertaken.

Four additional species observed during both surveys are listed as threatened under the NPW Act (Table 36):

- Peregrine Falcon (*Falco peregrinus*) (NPW Act: Rare);
- White-winged Chough (*Corcorax melanorhamphos*) (NPW Act: Rare);
- Elegant Parrot (*Neophema elegans*) (NPW Act: Rare); and
- White-bellied Cuckooshrike (*Coracina papuensis robusta*) (NPW Act: Rare).

Table 36. Fauna species observed within the Approved Project Area (2013) and Varied Project Area (2022-2024).

Scientific Name	Common Name	Observed		Conservation status	
		2022-2024	2013^	EPBC	SA
AMPHIBIANS					
<i>Crinia signifera</i>	Common Eastern Froglet		✓		
<i>Limnodynastes dumerilii</i>	Pobblebonk Frog	✓			
<i>Limnodynastes tasmaniensis</i>	Spotted Marsh Frog	✓			
<i>Litoria ewingii</i>	Brown Tree Frog	✓			
AVES					
<i>Acanthagenys rufogularis</i>	Spiny-cheeked Honeyeater		✓		
<i>Acanthiza chrysorrhoa</i>	Yellow-rumped Thornbill	✓	✓		
<i>Acanthiza reguloides</i>	Buff-rumped Thornbill	✓			
<i>Accipiter cirrocephalus</i>	Collared sparrowhawk	✓			
<i>Accipiter fasciatus fasciatus</i>	Brown Goshawk	✓			
<i>Aegotheles cristatus</i>	Australian Owlet-nightjar	✓	✓		
<i>Alauda arvensis</i>	Eurasian Skylark*	✓	✓		
<i>Anas gracilis</i>	Grey Teal	✓	✓		
<i>Anas superciliosa</i>	Pacific Black Duck	✓	✓		
<i>Anthochaera carunculata</i>	Red Wattlebird	✓	✓		
<i>Anthus novaeseelandiae</i>	Australasian Pipit	✓	✓		
<i>Aphelocephala leucopsis</i>	Southern Whiteface	✓	✓	VU	
<i>Aquila audax</i>	Wedge-tailed Eagle	✓	✓		
<i>Artamus cinereus</i>	Black-faced Woodswallow	✓			
<i>Artamus cyanopterus</i>	Dusky Woodswallow	✓			
<i>Barnardius zonarius</i>	Australian Ringneck	✓	✓		
<i>Cacatua galerita</i>	Sulphur-crested Cockatoo	✓	✓		
<i>Cacatua sanguinea</i>	Little Corella	✓	✓		
<i>Carduelis carduelis</i>	European Goldfinch*	✓			
<i>Chalcites basalís</i>	Horsfield's Bronze Cuckoo	✓	✓		
<i>Chenonetta jubata</i>	Australian Wood Duck	✓	✓		
<i>Cincloramphus cruralis</i>	Brown Songlark	✓	✓		
<i>Cincloramphus mathewsi</i>	Rufous Songlark	✓	✓		
<i>Circus assimilis</i>	Spotted Harrier	✓			
<i>Climacteris picumnus</i>	Brown Treecreeper	✓	✓		
<i>Colluricincla harmonica</i>	Grey Shrike-thrush	✓	✓		
<i>Coracina novaehollandiae</i>	Black-faced Cuckooshrike	✓	✓		
<i>Coracina papuensis robusta</i>	White-bellied Cuckooshrike	✓			R
<i>Corcorax melanorhamphos</i>	White-winged Chough		✓		R
<i>Corvus coronoides</i>	Australian Raven	✓	✓		
<i>Corvus mellori</i>	Little Raven	✓	✓		
<i>Corvus sp.</i>	Crows	✓			
<i>Coturnix pectoralis</i>	Stubble Quail	✓	✓		
<i>Dacelo novaeguineae</i>	Laughing Kookaburra	✓	✓		
<i>Daphoenositta chrysoptera</i>	Varied Sittella	✓	✓		
<i>Dicaeum hirundinaceum</i>	Mistletoebird	✓	✓		
<i>Egretta novaehollandiae</i>	White-faced Heron	✓	✓		

Palmer Wind Farm Variation Application - Flora and Fauna Impact Assessment

Scientific Name	Common Name	Observed		Conservation status	
		2022-2024	2013 [^]	EPBC	SA
<i>Elanus axillaris</i>	Black-shouldered Kite	✓	✓		
<i>Eolophus roseicapilla</i>	Galah	✓	✓		
<i>Epthianura albifrons</i>	White-fronted Chat	✓			
<i>Falco berigora</i>	Brown Falcon	✓	✓		
<i>Falco cenchroides</i>	Nankeen Kestrel	✓	✓		
<i>Falco longipennis murchisonianus</i>	Australian Hobby	✓			
<i>Falco peregrinus</i>	Peregrine Falcon	✓	✓		R
<i>Falco subniger</i>	Black Falcon	✓			
<i>Gavicalis vireescens</i>	Singing Honeyeater	✓	✓		
<i>Geopelia striata</i>	Peaceful Dove	✓			
<i>Glossopsitta concinna</i>	Musk Lorikeet	✓	✓		
<i>Glossopsitta porphyrocephala</i>	Purple-crowned Lorikeet	✓	✓		
<i>Grallina cyanoleuca</i>	Magpie-lark	✓	✓		
<i>Gymnorhina tibicen</i>	Australian Magpie	✓	✓		
<i>Hieraaetus morphnoides</i>	Little Eagle		✓		
<i>Hirundo neoxena</i>	Welcome Swallow	✓	✓		
<i>Malurus cyaneus</i>	Superb Fairywren	✓	✓		
<i>Malurus lamberti</i>	Variiegated Fairywren	✓	✓		
<i>Melanodryas cucullata</i>	Hooded Robin		✓	EN	R
<i>Manorina flavigula</i>	Yellow-throated miner	✓			
<i>Manorina melanocephala</i>	Noisy Miner	✓	✓		
<i>Merops ornatus</i>	Rainbow Bee-eater	✓	✓		
<i>Microcarbo melanoleucos</i>	Little Pied Cormorant		✓		
<i>Mirafra javanica</i>	Horsfield's Bushlark	✓			
<i>Milvus migrans</i>	Black Kite		✓		
<i>Neophema elegans</i>	Elegant Parrot	✓	✓		R
<i>Numida meleagris</i>	Helmeted Guineafowl*		✓		
<i>Ocyphaps lophotes</i>	Crested Pigeon	✓	✓		
<i>Pachycephala rufiventris</i>	Rufous Whistler	✓	✓		
<i>Pardalotus punctatus</i>	Spotted Pardalote	✓			
<i>Pardalotus striatus</i>	Striated Pardalote	✓	✓		
<i>Passer domesticus</i>	House Sparrow*	✓	✓		
<i>Pelecanus conspicillatus</i>	Australian Pelican	✓	✓		
<i>Petrochelidon ariel</i>	Fairy Martin	✓	✓		
<i>Petrochelidon nigricans</i>	Tree Martin	✓	✓		
<i>Petroica goodenovii</i>	Red-capped robin	✓			
<i>Phalacrocorax carbo</i>	Great Cormorant		✓		
<i>Phalacrocorax sulcirostris</i>	Little Black Cormorant	✓			
<i>Phalacrocorax varius</i>	Pied Cormorant	✓			
<i>Phylidonyris novaehollandiae</i>	New Holland Honeyeater	✓	✓		
<i>Platycercus elegans</i>	Crimson Rosella	✓	✓		
<i>Podargus strigoides</i>	Tawny Frogmouth		✓		
<i>Pomatostomus superciliosus</i>	White-browed Babbler	✓	✓		
<i>Psephotus haematonotus</i>	Red-rumped Parrot	✓	✓		
<i>Ptilotula penicillata</i>	White-plumed Honeyeater	✓	✓		

Palmer Wind Farm Variation Application - Flora and Fauna Impact Assessment

Scientific Name	Common Name	Observed		Conservation status	
		2022-2024	2013^	EPBC	SA
<i>Rhipidura albiscapa</i>	Grey Fantail	✓			
<i>Rhipidura leucophrys</i>	Willie Wagtail	✓	✓		
<i>Smicronis brevirostris</i>	Weebil	✓	✓		
<i>Stagonopleura guttata</i>	Diamond Firetail	✓	✓	VU	V
<i>Strepera versicolor</i>	Grey Currawong	✓	✓		
<i>Sturnus vulgaris</i>	Common Starling*	✓	✓		
<i>Tachybaptus novaehollandiae</i>	Australian Grebe	✓	✓		
<i>Tadorna tadornoides</i>	Australian Shelduck	✓			
<i>Threskiornis molucca</i>	Australian White Ibis	✓			
<i>Threskiornis spinicollis</i>	Straw-necked Ibis	✓			
<i>Trichoglossus moluccanus moluccanus</i>	Rainbow Lorikeet	✓			
<i>Turdus merula</i>	Common Blackbird*	✓	✓		
<i>Vanellus miles</i>	Masked Lapwing	✓			
<i>Vanellus tricolor</i>	Banded Lapwing	✓			
MAMMALS					
<i>Capra hircus</i>	Goat*	✓	✓		
<i>Chalinolobus gouldii</i>	Gould's Wattled Bat		✓		
<i>Chalinolobus morio</i>	Chocolate Wattled Bat		✓		
<i>Chalinolobus gouldii</i> or <i>Chalinolobus morio</i>	Bat		✓		
<i>Lasiornis latifrons</i>	Southern Hairy-nosed Wombat		✓		
<i>Macropus fuliginosus</i>	Western Grey Kangaroo	✓			
<i>Macropus robustus</i>	Euro	✓			
<i>Mormopterus species 4 "big dick"</i>	Southern Freetail-bat		✓		
<i>Mormopterus sp.</i>	Bat		✓		
<i>Nyctophilus geoffroyi</i>	Lesser Long-eared Bat		✓		
<i>Oryctolagus cuniculus</i>	European Rabbit*	✓	✓		
<i>Phascolarctos cinereus</i>	Koala	✓			
<i>Tadarida australis</i>	White-striped Freetail-bat		✓		
<i>Vespadelus darlingtoni</i>	Large Forest Bat		✓		
<i>Vespadelus regulus</i>	Southern Forest Bat		✓		
<i>Vespadelus sp.</i>	Bat		✓		
<i>Vulpes vulpes</i>	Fox (Red Fox)*	✓	✓		
REPTILES					
<i>Chelodina longicollis</i>	Long-necked Turtle	✓			
<i>Ctenophorus decresii</i>	Tawny Dragon	✓	✓		
<i>Ctenopus robustus</i>	Eastern Striped Skink		✓		
<i>Egernia striolata</i>	Eastern Tree Skink		✓		
<i>Morethia adelaidensis</i>	Adelaide Snake-eye		✓		
<i>Pogona Barbata</i>	Eastern Bearded Dragon	✓	✓		
<i>Pseudechis porphyriacus</i>	Red-bellied Black Snake		✓		
<i>Pseudonaja textilis</i>	Eastern Brown Snake	✓			
<i>Strophurus intermedius</i>	Southern Spiny-tailed Gecko		✓		
<i>Tiliqua rugosa</i>	Sleepy Lizard	✓	✓		

Conservation status

Aus: Australia (*Environment Protection and Biodiversity Conservation Act 1999*). SA: South Australia (*National Parks and Wildlife Act 1972*). Conservation Codes: VU/V: Vulnerable. R: Rare. * = introduced.

^species listed as observed in 2013 also include those recorded in Area A which has now been removed from the Varied Project Area. Survey methods are described in EBS Ecology 2014.

7.4.2 Birds

Seventy-three (73) bird species have been observed in the Varied Project Area across the two survey periods. Of these, seven are listed as threatened species (as highlighted in section 7.4.1) (Table 36). Five species of bird observed were non-native.

Bird Utilisation Survey

Seventy-two (72) bird species have been observed in the Varied Project Area during the six bird utilisation surveys from spring 2022 to spring 2024. Of these, four species are listed as threatened species: Diamond Firetail, Elegant Parrot, White-winged Chough and Southern Whiteface.

Table 37. Bird species observed during the Bird Utilisation Surveys from Spring 2022 to Summer 2024.

Scientific name	Common name	Conservation status		Spring 2022	Summer 2023	Autumn 2023	Winter 2023	Spring 2023	Summer 2024
		EPBC Act	NPW Act						
<i>Acanthiza chrysorrhoa</i>	Yellow-rumped Thornbill			3	40	12	66	34	38
<i>Acanthiza reguloides</i>	Buff-rumped Thornbill				2				
<i>Accipiter cirrocephalus</i>	Collared sparrowhawk			55		1			
<i>Accipiter fasciatus fasciatus</i>	Brown Goshawk			1				1	1
<i>Aegotheles cristatus</i>	Australian Owlet nightjar							1	
<i>Alauda arvensis</i>	Eurasian skylark*			1		19	22	3	
<i>Anas gracilis gracilis</i>	Grey Teal			9				1	5
<i>Anas superciliosa</i>	Pacific black duck			1	12			1	9
<i>Anthochaera carunculata</i>	Red wattlebird			18	1	4	11	10	5
<i>Anthus australis</i>	Australasian Pipit			18	15	23	3	2	11
<i>Aphelocephala leucopsis leucopsis</i>	Southern Whiteface	VU		5	10		13	10	27
<i>Aquila audax</i>	Wedge-tailed eagle			70	5	3	5	4	3
<i>Artamus cinereus</i>	Black-faced Woodswallow				2				
<i>Artamus cyanopterus</i>	Dusky Woodswallow					6			4
<i>Barnardius zonarius</i>	Australian Ringneck			54					2
<i>Cacatua galerita</i>	Sulphur-crested Cockatoo			17	9	10	97	42	40
<i>Cacatua sanguinea gymnopsis</i>	Little Corella			29			9	28	
<i>Carduelis carduelis</i>	European Goldfinch*						21		5
<i>Chalcites basalis</i>	Horsfield's Bronze Cuckoo							3	
<i>Chenonetta jubata</i>	Australian Wood Duck			123			37	15	84
<i>Cincloramphus cruralis</i>	Brown Songlark			18	17		4	31	
<i>Cincloramphus mathewsi</i>	Rufous Songlark			2				1	
<i>Circus assimilis</i>	Spotted Harrier								1
<i>Climacteris picumnus picumnus</i>	Brown Treecreeper			6	8	3	6	6	7
<i>Colluricincla harmonica</i>	Grey Shrike-thrush			8	5	4		8	6
<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike			103		19	2	7	1

Scientific name	Common name	Conservation status		Spring 2022	Summer 2023	Autumn 2023	Winter 2023	Spring 2023	Summer 2024
		EPBC Act	NPW Act						
<i>Corvus coronoides</i>	Australian Raven			14				2	32
<i>Corvus mellori</i>	Little Raven			2	34	69	80	44	7
<i>Corvus sp.</i>	Crows								2
<i>Coturnix pectoralis</i>	Stubble quail			1	3	24	9	2	
<i>Dacelo novaeguineae</i>	Laughing Kookaburra				3		2	2	2
<i>Daphoenositta chrysoptera</i>	Varied sittella				10				
<i>Dicaeum hirundinaceum</i> <i>hirundinaceum</i>	Mistletoebird			1				1	
<i>Egretta novaehollandiae</i>	White-faced Heron			38	3	2	3	1	1
<i>Elanus axillaris</i>	Black-shouldered Kite					3	1		
<i>Eolophus roseicapilla</i>	Galah			17	84	100	200	283	107
<i>Epthianura albifrons</i>	White-fronted Chat						9		
<i>Falco berigora</i>	Brown Falcon			12	4	1	4	1	5
<i>Falco cenchroides</i>	Nankeen Kestrel			20	4	5	6	3	17
<i>Falco longipennis murchisonianus</i>	Australian Hobby								1
<i>Falco peregrinus macropus</i>	Peregrine Falcon		R	6					1
<i>Falco subniger</i>	Black Falcon								1
<i>Geopelia striata</i>	Peaceful Dove				1				
<i>Glossopsitta concinna</i>	Musk Lorikeet						10	8	
<i>Glossopsitta porphyrocephala</i>	Purple-crowned lorikeet			2					4
<i>Grallina cyanoleuca</i>	Magpielark			76	4		3	2	7
<i>Gymnorhina tibicen</i>	Australian Magpie			26	69	112	108	62	108
<i>Hirundo neoxena</i>	Welcome swallow			6	17	10	28	11	
<i>Lichenostomus virescens</i>	Singing Honeyeater			2	4	2	12	7	7
<i>Malurus cyaneus leggei</i>	Superb fairywren			426	6	3			
<i>Malurus lamberti</i>	Variegated fairywren			20					
<i>Manorina flavigula</i>	Yellow-throated miner				20	1		3	
<i>Manorina melanocephala</i>	Noisy Miner							3	

Scientific name	Common name	Conservation status		Spring 2022	Summer 2023	Autumn 2023	Winter 2023	Spring 2023	Summer 2024
		EPBC Act	NPW Act						
<i>Merops ornatus</i>	Rainbow bee-eater			2	23			4	10
<i>Microcarbo melanoleucos melanoleucos</i>	Little Pied Cormorant					1		5	7
<i>Mirafra javanica</i>	Horsfield's Bushlark						2		
<i>Neophema elegans elegans</i>	Elegant Parrot		R	14	7	13	8	2	4
<i>Ocyphaps lophotes</i>	Crested Pigeon			1	3	2	6	1	3
<i>Pachycephala rufiventris rufiventris</i>	Rufous Whistler					1			
<i>Pardalotus punctatus</i>	Spotted Pardalote				2				
<i>Pardalotus striatus</i>	Striated Pardalote			17	9	7	9	27	19
<i>Passer domesticus</i>	House sparrow							2	
<i>Pelecanus conspicillatus</i>	Australian Pelican			136	22		1		15
<i>Petrochelidon ariel</i>	Fairy martin			30	77	5			
<i>Petrochelidon nigricans</i>	Tree martin			50	108	16	12	94	19
<i>Petroica goodenovii</i>	Red-capped robin						9		
<i>Phalacrocorax varius</i>	Pied Cormorant							4	
<i>Phalacrocorax sulcirostris</i>	Little Black Cormorant								1
<i>Phylidonyris novaehollandiae</i>	New Holland Honeyeater			7	5	9	2	4	4
<i>Platycercus elegans</i>	Crimson rosella			12	51	46	55	36	36
<i>Pomatostomus superciliosus</i>	White-browed Babbler			33				2	
<i>Psephotus haematonotus</i>	Red-rumped parrot			24	11	23	39	28	29
<i>Ptilotula penicillata</i>	White-plumed Honeyeater			556	40	49	35	49	18
<i>Rhipidura albiscapa</i>	Grey Fantail								1
<i>Rhipidura leucophrys</i>	Willie Wagtail			13	20	22	26	19	15
<i>Smicromnis brevirostris</i>	Weebill					11	2	2	
<i>Stagonopleura guttata</i>	Diamond Firetail	VU	V	3	9	1			6
<i>Strepera versicolor</i>	Grey Currawong								1
<i>Sturnus vulgaris</i>	Common Starling*			12	18	183	22	40	5
<i>Tachybaptus novaehollandiae</i>	Australasian Grebe						1		

Scientific name	Common name	Conservation status		Spring 2022	Summer 2023	Autumn 2023	Winter 2023	Spring 2023	Summer 2024
		EPBC Act	NPW Act						
<i>Tadorna tadornoides</i>	Australian Shelduck			2					
<i>Threskiornis molucca</i>	Australian White Ibis							3	
<i>Threskiornis spinicollis</i>	Straw-necked Ibis							1	
<i>Turdus merula</i>	Common Blackbird							1	
<i>Trichoglossus moluccanus moluccanus</i>	Rainbow Lorikeet								16
<i>Vanellus miles</i>	Masked Lapwing						2		
<i>Vanellus tricolor</i>	Banded Lapwing						3		
Total				2136	799	826	2136	970	760

7.4.3 Bats

During the 2013 surveys, targeted bat surveys were undertaken using harp netting and acoustic surveys using AnaBat monitors (as described in EBS Ecology 2014). Ten bat species were recorded within the Varied Project Area. None of the bats recorded are protected under the EPBC or NPW Act.

EBS Ecology (2014) determined that the only threatened bat that could occur in the Varied Project Area is the Yellow-bellied Sheath tail Bat (*Saccolaimus flaviventris*) which is listed as Rare under the NPW Act and may occur as a visitor in low numbers in the summer months. Acoustic bat monitoring (using Anabats) has been undertaken during the Winter 2023, Spring 2023 and Summer 2024 bat surveys. A summary of bats detected in the Varied Project Area will be provided in the final bird and bat monitoring report.

7.4.4 Raptor nests and habitat

A total of 10 WTE nests and four Peregrine Falcon nests were originally found during the 2013 surveys within the Approved Project Area. The nests in Area B and C were re-checked in 2022 where possible. Of the 10 WTE nests in or near the Varied Project Area, all WTE nests, with the exception of Nest 12 (Table 38 and Figure 14), are located outside the Varied Project Area. Attempts were made to gain access in 2024 to recheck the status of some of the nests close to but outside of the Varied Project Area, however either a response was not received, or access was not granted. The Varied Project design has ensured that a 1km buffer has been applied from turbines to WTE nests. The Varied Project Area also avoids two Peregrine Falcon nests compared to the Approved Project Area and the two remaining nest sites within the Varied Project Area are between 1 km and 1.5 km from the nearest turbine.

In spring 2022, one new WTE nest and one new Peregrine Falcon nest were found (WTE 13 and Peregrine Falcon 4), however the WTE nest is now outside of the Varied Project Area (>1.5 km) and the Peregrine Falcon nest is within the vicinity of a previous nesting site.

Table 38. WTE and Peregrine Falcon nests observed within the Varied Project Area.

Nest ID	Location	Survey observed	Active/ Inactive	Status
WTE 4	northern extent Area B	February 2013	Inactive 2013	Still intact.
WTE 5	Central extent Area B	November 2013	Inactive 2013	Active in 2021 according to landowner, unable to access in 2022 surveys.
WTE 6	South west of Area B	February 2013	Inactive 2013	Now outside of Varied Project Area, unable to access
WTE 7	Harrisons Gorge Area C	November 2013	Inactive 2013	Unknown. Outside of Varied Project Area, unable to access.
WTE 8	Harrisons Gorge Area C	November 2013	Inactive 2013	Unknown. Outside of Varied Project Area, unable to access.
WTE 9	Harrisons Gorge Area C	November 2013	Inactive 2013	Unknown. Outside of Varied Project Area, unable to access.
WTE 10	Harrisons Gorge Area C	November 2013	Inactive 2013	Unknown. Outside of Varied Project Area, unable to access.

Palmer Wind Farm Variation Application - Flora and Fauna Impact Assessment

Nest ID	Location	Survey observed	Active/ Inactive	Status
WTE 11	Harrisons Gorge Area C	November 2013	Inactive 2013	Unknown. Outside of Varied Project Area, unable to access.
WTE 12	Access road Area C	January 2014	Inactive	Inactive in 2022 surveys. Two nests within one <i>E camaldulensis</i> tree.
WTE 13	Gap road Area B	October 2022	Active	Two Chicks in nest.
Peregrine Falcon 1	Nth section of Area B	August 13 2022	Inactive	Possible nesting location still present.
Peregrine Falcon 2	Gap Road Area B	Feb & Nov 13 2022	Inactive	Possible nesting location still present.
Peregrine Falcon 3	Bakers Gorge Area C	October 13 2022	Inactive	Possible nesting location still present.
Peregrine Falcon 4	Bakers Gorge Area C	October 2022	Active	Nesting observed

Note: the WTE nest numbers are not listed sequentially, as the numbering would have begun from Area A (which is no longer part of the Varied Project Area).

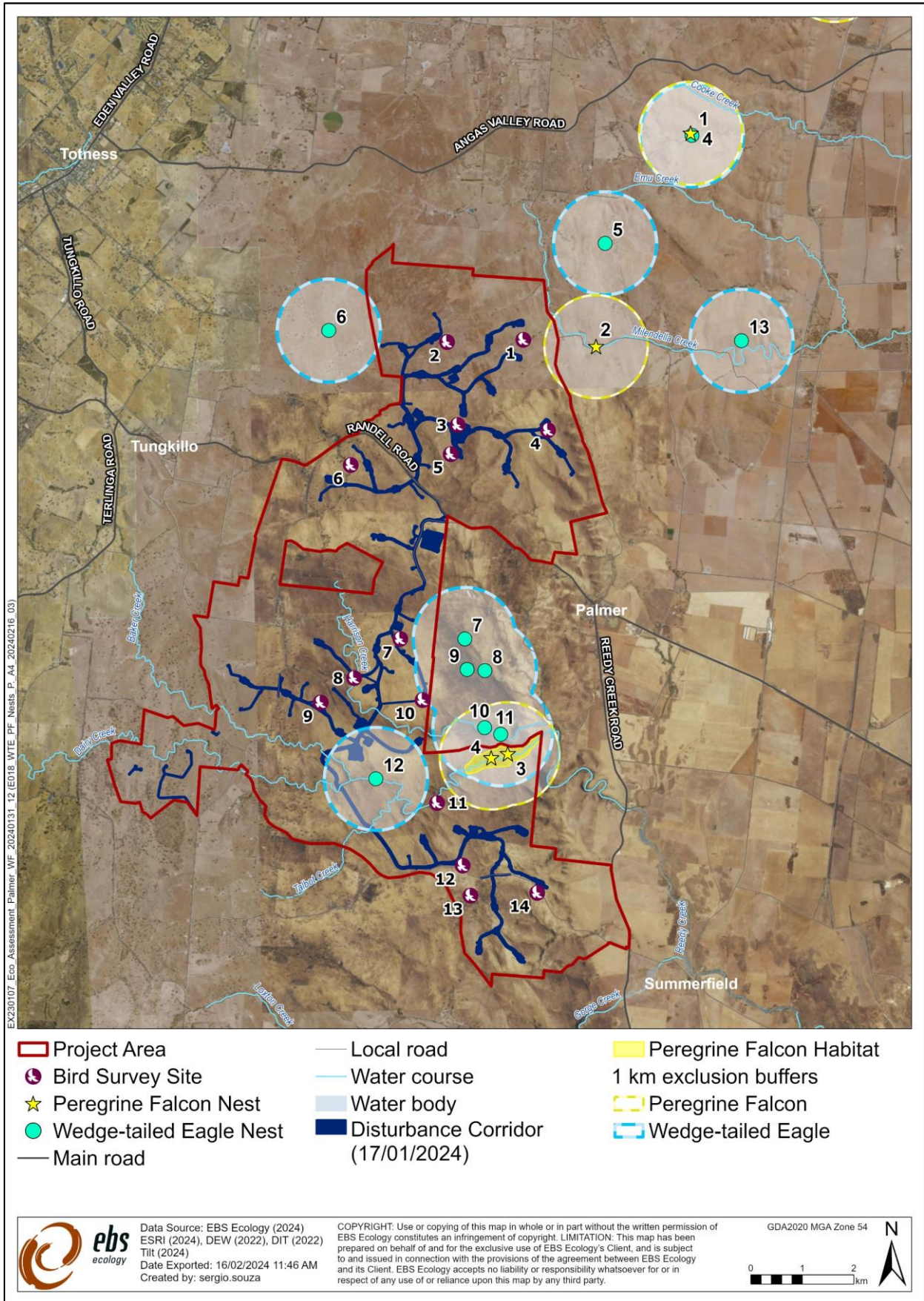


Figure 14. Location of WTE nests and Peregrine nests and suitable habitat within and nearby the Varied Project Area with a 1 km turbine exclusion buffer.

7.4.5 Exotic fauna

Eight (8) exotic fauna species were observed within the Varied Project Area in the 2022 and 2013 surveys (Table 36). Three mammals were recorded: Red Fox, Rabbit and Goats. Five birds were recorded: Common Blackbird, Common Starling, House Sparrow, Helmeted Guineafowl, and Eurasian Skylark.

8 CONSTRAINTS ANALYSIS DISCUSSION

8.1 Native Vegetation

The Varied Project Area contains native vegetation that must be cleared to develop the Palmer Wind Farm. Clearance of native vegetation will require approval under the NV Act and NV Regulations.

Approval of any clearance will only be granted subject to any offset obligations (or Significant Environmental Benefit) being met by the proponent. The proponent must also demonstrate that the mitigation hierarchy, as defined below, has been applied.

8.1.1 Mitigation Hierarchy

The principles of the mitigation hierarchy are as listed below:

- a) **Avoidance** – measures should be taken to avoid clearance of native vegetation wherever possible.
- b) **Minimisation** – if clearance cannot be avoided, measures should be taken to minimise the extent, duration and intensity of impacts of the clearance on biological diversity to the fullest possible extent (whether the impact is direct, indirect or cumulative).
- c) **Rehabilitation or restoration** – measures should be taken to rehabilitate ecosystems that will be degraded, and to restore ecosystems that will be destroyed, due to impacts of clearance that cannot be avoided or minimised.
- d) **Offset** – any adverse impact on native vegetation or ecosystems that cannot be avoided or minimised should be offset by implementing a Significant Environmental Benefit that outweighs that impact.

8.2 Identification of EPBC Act threatened habitat and species

8.2.1 Threatened Ecological Communities

Iron-grass Natural Temperate Grassland (INTG) of South Australia (Critically Endangered)

INTG of South Australia is known to occur near the Varied Project Area, however the Project design has been varied to avoid this community (B1). The northeastern location of *Lomandra* ssp. grassland observed outside the Varied Project Area to the north-east qualifies as Condition Class B (and therefore constitute a TEC).

The southern location of *Lomandra* spp. grassland observed within the Varied Project Area qualifies as Condition Class C, which are areas that are typically significantly degraded (low condition), are not included as the listed TEC and therefore do not trigger the 'significant test' of the EPBC Act. Condition Class C areas are still considered to be amenable to rehabilitation through measures such as weed control, natural regeneration and protection from grazing (DEWR 2007a). *Lomandra effusa* grasslands that do not qualify as the TEC are considered endangered under the Provisional list of threatened ecosystems of South

Australia (DEH In progress), however, these are not formally protected but do incur a loading as part of the Significant Environmental Offset.

INTG of South Australia has suffered a severe decline in distribution and ongoing loss of integrity. The key threats to the community include clearing, grazing and weed invasion. Other threats include road maintenance activities and the effects of fragmentation (DEWR 2007a). All threats are relevant to the Project.

Peppermint Box (*Eucalyptus odorata*) Grassy Woodland of South Australia (Critically Endangered)

An area of Condition Class B was recorded in the south-western corner of Area C. The key threats to this community are clearing, grazing and invasion by weeds. Other threats include road maintenance activities and the effects of fragmentation (DEWR 2007b). All threats are relevant to the Palmer Wind Farm area. All impacts to the Peppermint Box (*Eucalyptus odorata*) Grassy Woodland of South Australia have been avoided during the design process.

8.2.2 EPBC listed threatened flora

No nationally listed threatened flora species are considered likely/known to occur within the Varied Project Area or have been recorded in previous surveys and are therefore not discussed further.

8.2.3 Nationally listed threatened fauna

Nationally listed threatened fauna species that are considered likely/known to occur within the Varied Project Area or have been recorded in previous surveys include:

Diamond Firetail (*Stagonopleura guttata*) (Nationally Vulnerable and State Vulnerable)

Diamond Firetails are ground-feeders that predominantly eat ripe and half-ripe seeds of various grasses but are also known to feed on seeds of herbs, bushes and trees as well as insects and worms (Immlermann 1982, Read 1994).

The conservation advice for Diamond Firetail (DCCEEW 2023b) defines critical habitat for this species as follows:

- Eucalypt, acacia or casuarina woodlands, open forests and other lightly timbered habitats;
- Areas with low tree density, few large logs, and little litter cover but high grass cover for foraging, roosting and breeding; and
- Drooping she-oak (*Allocasuarina verticillata*) within the Mt Lofty Ranges.

The Diamond Firetail was observed during the 2013 surveys, with seven individuals observed. A further four individuals were also observed during the October 2022 surveys and one individual was observed opportunistically in March.

Southern Whiteface (*Aphelocephala leucopsis*) (Nationally Vulnerable)

The conservation advice for the Southern Whiteface (DCCEEW 2023c) defines critical habitat for the species as follows:

- Relatively undisturbed open woodlands and shrublands with an understorey of grasses or shrubs or both;
- Habitat with low tree densities and an herbaceous understorey litter cover which provides essential foraging habitat; and
- Living and dead trees with hollows and crevices which are essential for roosting and nesting.

The Southern Whiteface has been observed in the Varied Project Area during surveys in the southeast and northeast of the Varied Project Area in areas of open woodland and scattered trees in grassland and shrubland. Areas such as open grassland are not the preferred habitat of this species, except where this vegetation association has larger shrubs, scattered trees or features that create that structure such are areas with African Boxthorn (*Lycium ferocissimum*). As such most of the vegetation within the Varied Project Area is considered suitable habitat for the Southern Whiteface.

Hooded Robin (*Melanodryas cucullata cucullata*) (Nationally Endangered and State Rare)

The conservation advice for Hooded Robin (DCCEEW 2023d) defines critical habitat for this species as follows:

- Dry eucalypt and acacia woodlands and shrublands remnants with an open understorey, some grassy areas and a complex ground layer, often in or near clearings or open areas;
- Structurally diverse habitats featuring: mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses;
- Standing dead or live trees and tree stumps are also essential for nesting, roosting and foraging; and
- Moderately deep to deep soils, rocks and fallen timber which provides essential foraging habitat.

A single Hooded Robin was observed within the Approved Project Area during the 2013 surveys in Area A, which has now been removed from the Varied Project Area. Suitable woodland habitat for this species occurs in Area C of the Varied Project Area, however no other individuals have been recorded during the follow up surveys conducted by EBS in 2022.

Grey-headed Flying-fox (*Pteropus poliocephalus*) (Nationally Vulnerable and State Vulnerable)

Grey-headed Flying-foxes (GHFF) forage over extensive areas, as far as 40 km in a day, returning to roost at camp the same night (DAWE 2022). The nearest known camp of this species is within the Adelaide Botanic Gardens approximately 40-45 km from the Varied Project Area.

This species is a canopy-feeding frugivore and nectarivore, which utilises vegetation communities including rainforests, open forests, closed and open woodlands, Melaleuca swamps and Banksia woodlands. The primary food source is blossoms from Eucalyptus and related genera. This species has not been observed during surveys within the Varied Project Area to date, however there are recent records near the Varied Project Area and there is suitable foraging and roosting habitat.

Nationally listed threatened fauna species that are considered possible to occur within the Varied Project Area include:

- Southern Bell Frog (*Litoria raniformis*) (EPBC Act: Vulnerable; NPW Act: Vulnerable);

- Grey Falcon (*Falco hypoleucos*) (EPBC Act: Vulnerable; NPW: Rare); and
- White-throated Needletail (*Hirundapus caudacutus*) (EPBC Act: Vulnerable, Migratory – terrestrial);
- Blue-winged Parrot (*Neophema chrysostoma*) (EPBC Act: Vulnerable; NPW Act: Vulnerable);
- Flinders Ranges Worm-lizard (*Aprasia pseudopulchella*) (EPBC Act: Vulnerable);
- Pygmy Blue-tongue Lizard (*Tiliqua adelaidensis*) (EPBC Act: Endangered; NPW Act: Endangered).

These species are listed as possibly occurring in the Varied Project Area as suitable habitat is present. Records situated nearby are old, as well as other records being greater than 10 km from the Varied Project Area.

Southern Bell Frog

This species has been recorded as scattered nearby records within dams. As such there is the potential that this species may occur in the Varied Project Area, although unconnected waterbodies (such as the dams or ephemeral watercourses on site) are unlikely to be considered preferred habitat for this species.

Grey Falcon, Blue-winged Parrot and White-throated Needletail

Suitable habitat for these species occurs on site and as such, may provide habitat for these species. These species have not been observed on site and have historical or distant records in the surrounding area. However, critical habitat for these species is breeding habitat and as none of these species have been observed breeding within the Varied Project Area (despite two separate spring surveys), the Varied Project Area is unlikely to be considered critical habitat for these species.

Pygmy Blue-tongue Lizard and Flinders Ranges Worm-lizard

For both species most records of the species occur further north of the site, with the closest records 37 km north of the northern extent of the Varied Project Area for PBTL and 30 km from the nearest known population for FRWL. General soil structure and topography indicates that the species occurrence is unlikely. Targeted surveys for these species were undertaken in July 2023 in areas considered suitable habitat for these species. The majority of the Varied Project Area did not contain suitable habitat for PBTL. The north of the Varied Project Area contained embedded rock and very few spider holes. In the south of the Varied Project Area, one location was assessed as potential habitat due to the presence of spider holes. These were checked in transects and no PBTL found. This area was approximately 65 km from known PBTL records and as this species is relatively sedentary, it is unlikely that PBTL occur in the area.

The area was assessed as being unlikely FRWL habitat as the site largely consists of embedded rock rather than surface rocks.

8.2.4 Threatened migratory fauna

Fork-tailed Swift (*Apus pacificus*) (Migratory Marine)

Widespread but almost exclusively aerial. Mostly occur over inland plains, over cliffs and beaches and sometimes well out to sea or in dry or open habitats (DCCEEW 2023). This species has not been observed during surveys within the Varied Project Area to date.

Migratory wetland species

Migratory fauna species that are considered as potentially occurring within the Varied Project Area include:

- Common Sandpiper (*Actitis hypoleucos*);
- Sharp-tailed Sandpiper (*Calidris acuminata*);
- Pectoral Sandpiper (*Calidris melanotos*);
- Red-necked Stint (*Calidris ruficollis*);
- Long-toed Stint (*Calidris subminuta*);
- Double-banded Plover (*Charadrius bicinctus bicinctus*);
- Oriental Plover (*Charadrius veredus*);
- Latham's Snipe (*Gallinago hardwickii*); and
- Common Greenshank (*Tringa nebularia*).

None of the nine species have been recorded in the Varied Project Area. Five species have been recorded within 10 km of the Varied Project Area: the Common Sandpiper, Red-necked Stint, Long-toed Stint, Oriental Plover and Double-banded Plover. All the closest records for these species are at the Reedy Creek Swamp, approximately 9-10 km from the Varied Project Area.

Reedy Creek is a large stream located in the south-eastern corner of the Varied Project Area, which flows east and discharges into the Murray River. Reedy Creek Swamp provides habitat to a varied population of breeding and migrant birds including waders and waterfowl. It is unlikely that these bird species will be impacted by the Project, as although the migratory bird species may fly over the Varied Project Area, it will be at a great height (well beyond the height of the wind turbines) (EBS Ecology 2020).

Ephemeral creeks such as Baker Creek and Harrison Creek represent potential habitat for these species. In wet years, these creeks have water in them throughout the year (EBS Ecology *pers. obs.*) and some lower lying areas may capture and hold water for a period of time.

8.3 Identification of NPW Act threatened species

8.3.1 State listed threatened flora

State listed threatened flora species that are considered likely/known to occur within the Varied Project Area or have been recorded in previous surveys include:

- ***Eucalyptus fasciculosa* (Pink Gum) (State Rare)** - This species was observed in VA C5 and C6 in Area C of the Varied Project Area in the October 2022 spring survey.

- ***Maireana rohrlachii* (Rohrlach's Bluebush) (State Rare)** - This species has not been observed during surveys within the Varied Project Area to date but targeted surveys for this species have not been conducted.
- ***Mentha diemenica* (Slender Mint) (State Rare)** – This species was observed during previous surveys in Area A, as outlined in EBS Ecology (2014). It has not been observed in the Varied Project Area but targeted surveys for this species have not been conducted.
- ***Ptilotus erubescens* (Hairy tails) (State Rare)** – This species was observed during previous surveys in 2013 in Area C, as outlined in EBS Ecology (2014).

Where *Eucalyptus fasciculosa* woodlands occur, impact should be minimised where possible. An appropriate way to address possible impacts to this flora species is to follow the mitigation hierarchy, as outlined in Section 8.1.1. Where known individuals of *Ptilotus erubescens* occur, avoidance is the best approach to limiting impacts to this species.

Targeted surveys of NPW Act listed threatened species have not been undertaken and are recommended to form part of pre-clearance surveys for Palmer Wind Farm.

8.3.2 State listed threatened fauna

Based on the vegetation associations mapped and the flora and fauna species recorded, all native vegetation in the Varied Project Area is suitable habitat for the NPW Act listed species either recorded during field surveys or assessed as at least likely to occur.

Given the extent of native vegetation, fauna species are unlikely to be restricted to the discrete locations where they were recorded. An appropriate way to address possible impacts to these fauna species is to follow the mitigation hierarchy, as outlined in Section 8.1.1.

Raptors are known to be directly impacted by wind energy developments through mortality caused by turbine strikes, particularly species that are nesting in the area. As such, impacts to Peregrine Falcons should be considered. Previous wind projects in South Australia have required that mitigation strategies be implemented as a condition of native vegetation clearance approval.

Dependant on project-specific circumstances, this may include measures such as the following:

- Buffers placed around Wedge-tailed Eagle nests in which no vegetation clearance or construction of infrastructure can occur; and
- Implementation of nest monitoring and bird strike monitoring programmes.

8.4 Wedge-tailed Eagles

Wedge-tailed Eagles are known to be directly impacted by wind energy developments through mortality caused by turbine strikes. Previous wind projects in South Australia have required that mitigation strategies be implemented as a condition of native vegetation clearance approval.

Dependant on project-specific circumstances, this may include measures such as the following:

- Buffers placed around Wedge-tailed Eagle nests in which no vegetation clearance or construction of infrastructure can occur; and

- Implementation of nest monitoring and bird strike monitoring programmes.

8.5 Additional constraints

8.5.1 Declared weeds

During construction and operation of the Palmer Wind Farm, the proponent and any contractors undertaking works will need to consider the legislative responsibilities that apply to plants Declared under the LSA Act. Declared plants that are relevant to the Varied Project Area have been discussed in Section 7.3.2.

8.5.2 Proximity to watercourses

Whilst minor streams with no permanent water or ephemeral creeks occur in the Varied Project Area, they can be subject to heavy, unexpected flows following rainfall. Removal of stream-side vegetation has potential to destabilise banks, leading to severe erosion during flow events. Crossing structures such as culverts may also alter flows to the extent that erosion becomes problematic.

8.5.3 Wind farm impacts on avifauna

The potential impacts of wind farms on avifauna include:

Rotor strikes

Bird species that regularly fly at heights swept by turbine rotors are prone to rotor strike. This includes raptors, which are one of the most at-risk groups of bird from wind farms due to their flight height and low fecundity and long lifespans (Beston *et al.* 2016), which means that the replacement of struck individuals within the population takes considerable time and population declines may occur (Dahl *et al.* 2012). Impacts of wind farms on WTEs may be particularly severe, with 18 individuals struck over one year of operation of the Ararat Wind Farm, Victoria (BL&A 2018).

Barotrauma

Bats succumb to barotrauma at wind farm turbines whereby the rapid air-pressure reduction near moving turbines causes tissue damage to air-containing structures (Baerwald *et al.* 2008). The number of bat mortalities at wind farms is expected to be substantial, with 44 bat carcasses identified within one year of monthly monitoring over 25 turbines at Ararat Wind Farm, Victoria (BL&A 2018). The true number of bat mortalities across these 25 turbines would be significantly higher than 44 deaths as scavenging rates and surveyor error (failed detection during searches) was not accounted for. Bat monitoring at McArthur Wind Farm in south-western Victoria found annual bat mortality per turbine to be 1.41 ± 0.65 and 3.08 ± 1.68 in 2013 and 2014, respectively (AERS 2015).

Clearance and degradation of habitat

The Project is likely to result in the direct clearance of habitat for hardstands and tracks. Clearance and fragmentation of habitat is likely to be unfavourable to small passerine species with specific habitat preferences and favourable to large generalist species (Szabo *et al.* 2011). In addition to this, hollows, which provide nesting and roosting locations for birds and bats may be cleared and where native vegetation

borders the infrastructure footprint, it is expected to become degraded from weed invasion, erosion and other edge effects. As such, mitigation measures should be considered.

Acoustic masking

The noise associated with a wind farm may have adverse impacts on songbirds (Zwart *et al.* 2016). Acoustic masking caused by wind farm noise may affect the ability of individuals with established territories to deter a rival (Zwart *et al.* 2016). As such, increased time and energy would need be spent for maintaining their territory, which could reduce breeding success (Zwart *et al.* 2016). In South Australia, acoustic masking is thought to be one of the key drivers of reduced songbird abundance in areas within 500 m of mining activity (Read *et al.* 2015).

Behavioural avoidance

Raptors are known to substantially reduce their presence within an area following the construction of a wind farm; while this reduces the number of individuals that succumb to rotor strike it may displace pairs from their established territories, which can reduce breeding success. The impact of rotor strike and displacement of individuals is considered to have reduced the breeding success of White-tailed Eagles (*Haliaeetus albicilla*) within occupied territories from 48% before wind farm construction to 22% post construction (Dahl *et al.* 2012). Displacement of raptors at a wind farm also occurred in Wisconsin, United States of America, where a 47% reduction in raptor abundance was recorded following wind farm construction (Garvin *et al.* 2011).

Refer to the following previous report for more information and advice on impacts to avifauna from wind farms:

Palmer Wind Farm Advice Letter – Potential impact on birds and bats, from a change in wind turbine size at Palmer Wind Farm (EBS Ecology 2020)

9 RECOMMENDATIONS

The following recommendations in Table 39 were made to Tilt Renewables in January 2023 to address the ecological constraints discussed in Section 8. Amendments have been made to the table to demonstrate the implementation of the recommendations to date.

Table 39. Recommendations to address ecological constraints and implementation of recommendations to date.

Constraint Summary	Constraint Details	Recommendations	Implementation of recommendation
Native vegetation	<ul style="list-style-type: none"> 14 vegetation associations occur in the Varied Project Area. 	<ul style="list-style-type: none"> Consider the mitigation hierarchy at all stages of the Project design phase. Utilise existing disturbed areas for Project infrastructure where possible. Retain high value vegetation where possible, particularly high habitat fauna value Woodland and Mallee Vas B3, B4, C3, C4, C5, C6, C9 and C10 and consider Project design that avoids this constraint. Seek native vegetation clearance approval under the NV Act. This includes the preparation of a Clearance Data Report and calculation of offset requirements. Prior to the commencement of construction, develop a Construction Environmental Management Plan (CEMP) that implements measures to minimise, rehabilitate and offset unavoidable impacts to native vegetation. 	<ul style="list-style-type: none"> 301.28 ha of the 350.93 ha proposed to be cleared occurs in poor quality grassland habitat (VA B2 and C2). VA C10 is being avoided. VA C9 will be avoided through micro-siting. The proposed disturbance footprint avoids impacts to approximately 99 % of VA C3. The proposed disturbance footprint avoids impacts to approximately 99 % of VA C4. A Clearance Data Report has been prepared and the report will be updated following an approval of the Varied Project.
EPBC Act listed species and habitat	<ul style="list-style-type: none"> Southern Whiteface Hooded Robin Grey-headed Flying-fox Diamond Firetail Migratory bird species. 	<ul style="list-style-type: none"> Minimise impact to native vegetation by applying the mitigation hierarchy during the project design phase and implementing a CEMP. Avoid areas identified as the INTG and Peppermint Box woodland TECs. Undertake an assessment of potential impacts against the EPBC Act <i>Significant Impact Guidelines</i> and refer the Project to Department of Climate Change, Energy, the Environment and Water (DCCEEW) for assessment. Undertake further bird surveys to meet the requirements of the <i>Onshore Wind Farms – interim guidance on bird and bat management</i> (draft), issued by DCCEEW. Develop and implement a bird strike monitoring programme prior to and during the Palmer Wind Farms operational phase. 	<ul style="list-style-type: none"> Varied Project Area has been adjusted to avoid INTG TEC. Peppermint Box woodland TEC is being avoided. A significant Impact Self-Assessment has been undertaken and a referral is being prepared. Six bird surveys have been undertaken to meet the relevant requirements. A further two surveys will be undertaken to ensure surveys have been undertaken in each season for two years.
Wedge-tailed Eagle and Peregrine Falcon nests	<ul style="list-style-type: none"> 10 WTE nests and 4 Peregrine Falcon nests have been located by field surveys. 	<ul style="list-style-type: none"> Avoid impact to nests by implementing 1 km protection buffers around each nest location. Develop and implement a nest monitoring programme prior to and during the Palmer Wind Farm's operational phase. Develop and implement a bird strike monitoring programme prior to and during the Palmer Wind Farms operational phase. 	<ul style="list-style-type: none"> 1 km WTG exclusion buffers have been placed around each nest location and around area considered to be suitable nesting habitat for the Peregrine Falcon. Exclusion buffers have been maintained even where nests were not able to be accessed to validate their use.

Constraint Summary	Constraint Details	Recommendations	Implementation of recommendation
NPW Act listed fauna	<ul style="list-style-type: none"> • White-winged Chough • White-bellied Cuckooshrike • Peregrine Falcon • Eastern Shrikeitit • Little Eagle • Purple-gaped Honeyeater • Jacky Winter • Elegant Parrot • Painted Buttonquail • Common Brushtail Possum 	<ul style="list-style-type: none"> • Consider the mitigation hierarchy at all stages of the project design phase. • Prior to the commencement of construction, develop a CEMP that implements measures to minimise unavoidable impacts to native vegetation that provides habitat to NPW threatened species. 	<ul style="list-style-type: none"> • More than 20 iterations of the design have been undertaken, many of which with the aim of avoiding known impacts to flora and fauna including micro-siting the area and disturbance footprint to avoid known constraints such as the WTE and Peregrine Falcon buffers.
NPW Act listed flora	<ul style="list-style-type: none"> • <i>Eucalyptus fasciculosa</i> • <i>Ptilotus erubescens</i> • <i>Mentha diemenica</i> • <i>Maireana rohrlachii</i> 	<ul style="list-style-type: none"> • Avoid/minimise works in the southern extent of the Varied Project Area to avoid potential impacts on identified NPW Act Rare Pink Gum woodland (VA C5 and C6). • Survey proposed project impact footprint for NPW Act listed threatened flora. • Microsite infrastructure to avoid threatened flora and maintain 20 m protection buffers as far as practicable. 	<ul style="list-style-type: none"> • More than 20 iterations of the design have been undertaken, many of which with the aim of avoiding known impacts to flora and fauna. This has included minimising impacts to VA C5 and C6 as far as practicable. The proposed disturbance footprint avoids impacts to approximately 93 % of VA C5. The proposed disturbance footprint avoids impacts to approximately 84 % of VA C6.
Declared weeds	<ul style="list-style-type: none"> • African Boxthorn • Gorse • Artichoke Thistle • Salvation Jane • Horehound. • Olive • Dog Rose 	<ul style="list-style-type: none"> • Any CEMP or Operational Environmental Management Plan (OEMP) should include biosecurity measures. • Comply with any legislative requirements during Palmer Wind Farm construction and operation. 	
Watercourses	<ul style="list-style-type: none"> • Erosion in ephemeral watercourses. 	<ul style="list-style-type: none"> • Avoid clearing vegetation within 10 m of a watercourse where practicable. 	<ul style="list-style-type: none"> • Impacts to water courses have been minimised where possible with consideration of topographical, design and landholder constraints.

Constraint Summary	Constraint Details	Recommendations	Implementation of recommendation
Other	<ul style="list-style-type: none"> • Risk assessment • EPBC Act species listed as possibly occurring in the Varied Project Area. 	<ul style="list-style-type: none"> • Undertake a risk assessment to determine the potential impact of the proposed wind farm on bird species where the risk element of concern was collision. Species to be assessed include raptor species and threatened bird species known from the site and those species determined as likely to occur from the BDBSA search. • Once designs have been finalised, a targeted fauna survey for the PBTL and FRWL should be conducted in grassland habitat suitable for PBTL with the design footprint, or as per instructions from DCCEEW. • A general discussion with DCCEEW on EPBC concerns regarding fulfilling the obligatory number of bird and bat surveys (2 years) required for the Project as more surveys may need to be conducted if past surveys are not taken into account. 	<ul style="list-style-type: none"> • Tilt Renewables have consulted with DCCEEW on the bird and bat survey requirements for Palmer Wind Farm. • An Avian and Bat Risk Assessment has been undertaken. • Surveys for PBTL and FRWL and habitat were undertaken within the proposed design route. No PTBL or FRWL were found and as a result of the surveys, the likelihood of these species occurring was downgraded to “unlikely”. • Six bird surveys have been undertaken to meet the relevant requirements. A further two surveys will be undertaken to ensure that surveys have been undertaken in each season for 2 years.

9.1 Approval requirements

For the Palmer Wind Farm to gain approvals under the NV Act and EPBC Act, the following will be required, at a minimum:

- Referral of the Project to DCCEEW for approval under the EPBC Act.
- Two years of bird and bat utilisation surveys seasonally, to inform the referral process. Survey timing and effort has been confirmed in discussions with DCCEEW.
- Preparation of a *Native Vegetation Data Report* that considers all impact to native vegetation resulting from the Palmer Wind Farm. This is required to support an application to clear native vegetation under the NV Act.

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11 APPENDICES

- 11.1 Appendix 1. Assessment of likelihood of National (EPBC Act) and State (NPW Act) listed threatened flora and fauna identified by the PMST (DCCEEW, 2023) and BDBSA (DEW, 2023a) to occur in the Varied Project Area (marine and migratory marine species omitted).**

Scientific Name	Common Name	Conservation Status		PMST likelihood of occurrence within 10 km	Last sighting within 10 km (year)*	Habitat Description and Distribution	Likelihood of Occurrence within Varied Project Area
		Aus.	SA				
PLANTS							
<i>Acacia iteaphylla</i>	Flinders Ranges Wattle		R		2021	Naturally occurs in the Flinders Ranges, across to the Gawler Ranges, and on the Eyre Peninsula. Naturalised beyond its native range in some parts of south-eastern and southern SA (SSCC 2018).	Possible - Recent records but no individuals identified during the field survey.
<i>Acacia menzeli</i>	Menzel's Wattle	VU	V	Known to occur	1980	Endemic to SA, the species is confined to localised areas around Monarto and Murray Bridge, Mount Lofty Ranges and Flinders Ranges (around Brachina). It occurs as scattered shrubs; either on roadsides, or in low open shrubby woodland on more rocky sites and found in open Eucalyptus scrub where associated species include <i>Eucalyptus socialis</i> (Beaked-red Mallee), <i>E. incrassata</i> (Ridge-fruited Mallee), <i>Callitris gracilis</i> (Southern Cypress Pine) and <i>E. odorata</i> (Peppermint Box) on calcareous loamy earths (DEWHA 2008a).	Possible - Suitable <i>E. odorata</i> habitat present but no individuals identified during the field surveys.
<i>Acacia rhotinocarpa</i>	Neat Wattle	VU	V	Known to occur	1989	Endemic to South Australia and found scattered in a few small areas near the east coast of EP, east coast of Yorke Peninsula, southern Mount Lofty Ranges and in the Murray region, growing in open scrub vegetation associated with <i>Eucalyptus gracilis</i> , <i>E. socialis</i> and <i>E. incrassata</i> on calcareous sand and loamy soil (SSCC 2018). Normally associated with <i>Eucalyptus</i> spp. such as <i>Eucalyptus dumosa</i> (DotE, 2013b).	Possible – Older record and some habitat in the Varied Project Area is suitable, but no individuals identified during the field surveys.
<i>Amphibromus archeri</i>	Pointed Swamp Wallaby-grass		R		1998	Grows in damp areas such as lagoons, waterholes, and swamps, often on predominantly sandy soils. Found in KI, in the Mount Lofty Ranges and in the southeast of SA (SSCC 2018).	Possible - older records but some swamps are present in the Varied Project Area (to the north).
<i>Amphibromus macrorhinus</i>	Long-nosed Swamp Wallaby-grass		R		2004	In SA, occurs in the EP, SL and SE regions (eFloraSA 2007). Found in permanent or temporarily damp areas on clay, sand or sandy	Possible – recent record and some swamps are present in

Scientific Name	Common Name	Conservation Status		PMST likelihood of occurrence within 10 km	Last sighting within 10 km (year)*	Habitat Description and Distribution	Likelihood of Occurrence within Varied Project Area
		Aus.	SA				
						loams on Eyre Peninsula, Mount Lofty Ranges and the lower Southeast (Seeds of SA).	the Varied Project Area (to the north).
<i>Aristida australis</i>			R		1992	Restricted to 3 localised regions of South Australia. Occurs in sandy soil, limited other information available (AusGrass2, 2015).	Possible – old records south of the Varied Project Area, suitable habitat present.
<i>Austrostipa densiflora</i>	Fox-tail Spear-grass		R		2003	Found in the Flinders Ranges, southern Mount Lofty Ranges and Kangaroo Island, growing in rocky site on sandy, shallow rock or low-fertility soils. Has a distinct dense flower head (SSCC 2018).	Possible – recent records and suitable habitat in the Varied Project Area.
<i>Austrostipa gibbosa</i>	Swollen Spear-grass		R		2013	Occurs in the southern Flinders Ranges, Mount Lofty Ranges and the South-east in SA growing on rich loamy soil along creeks and seasonally wet areas in woodland and grassland (SSCC 2018).	Possible – recent records and some suitable habitat within the Varied Project Area.
<i>Austrostipa oligostachya</i>	Fine-head Spear-grass		E		2010	Found in the southern Mount Lofty Ranges and the upper South-east in South Australia, growing in ephemerally wet areas, along riverbanks and loamy flats in grassy woodland and grassland (SSCC 2018).	Possible – recent records, some suitable habitat in the Varied Project Area.
<i>Austrostipa tenuifolia</i>			R		1985	Found on the EP, MLR, MU and the upper SE, growing in sandy soils in grassland or grassy woodland associated with Callitris or Allocasuarina (SSCC 2018).	Possible – older records but some suitable habitat in the Varied Project Area near the gorges.
<i>Bothriochloa macra</i>	Red-leg Grass		R		2022	Mainly found in open grassy woodland communities and is often found in disturbed sites. More common in the SE of SA (SSCC 2018).	Possible – recent records and some suitable habitat within the Varied Project Area.

Scientific Name	Common Name	Conservation Status		PMST likelihood of occurrence within 10 km	Last sighting within 10 km (year)*	Habitat Description and Distribution	Likelihood of Occurrence within Varied Project Area
		Aus.	SA				
<i>Caladenia argocalla</i>	White-beauty Spider-orchid	EN	E	Known to occur	2022	Endemic to the Mount Lofty Ranges Region of SA. Occurs in intact grassy woodlands often with <i>E. leucoxyton</i> (South Australian Blue Gum) and <i>Allocasuarina verticillata</i> (Drooping Sheoak). Usually grows on a gentle slope with a southerly aspect and in clay loam soils. Flowering from late September to October (Quarmby 2010).	Possible - Blue gum woodland is present, and aspect ideal for this species. Recent records nearby. However, the area is highly degraded and contains a majority of exotic grassy species.
<i>Caladenia behrii</i>	Pink-lip Spider Orchid	EN	E	May occur	No records	Occurs on the Fleurieu Peninsula of SA. Grows in fertile, shallow loams, amongst <i>Eucalyptus gonioacalyx</i> / <i>E. fasciculosa</i> woodland and amongst <i>E. obliqua</i> / <i>E. microcarpa</i> / <i>E. leucoxyton</i> woodland. The understorey is usually open and shrubby. Also recorded amongst <i>E. fasciculosa</i> & <i>Xanthorrhoea semiplana</i> . Generally found in quartzite-derived soils on steep south facing slopes but also on ridge tops and occasionally near creek beds. Often grows alongside bushwalking paths, vehicle tracks or roads due to the openness of these locations (TSSC 2021a).	Unlikely – no recent records, habitat within Varied Project Area is not preferred.
<i>Caladenia leptochila</i> ssp. <i>leptochila</i>	Narrow-lip Spider-orchid		R		2001	Found growing in clay or gravelly soils in shrubby forest in the Mount Lofty Ranges (Jones, 2006).	Unlikely – recent records, but outside of the known range of this species (which is closer to the central hills).
<i>Caladenia pusilla</i>	Pigmy Caladenia		R		2001	This species occurs mostly in coastal and near-coastal areas up to 200 m elevation in heathland, shrubland, woodland and open eucalypt forest on sandy loam, sandy peat, granite gravel and rocky ground (TSS 2023). Usually grows in moist coastal heath, sometimes in forests further inland (ALA 2023). Occurs in clumps or small groups in clay or gravel soils in exposed sites in open forest, often in	Unlikely – recent record, but habitat in Varied Project Area not preferred and species typically occurs closer to the central hills.

Scientific Name	Common Name	Conservation Status		PMST likelihood of occurrence within 10 km	Last sighting within 10 km (year)*	Habitat Description and Distribution	Likelihood of Occurrence within Varied Project Area
		Aus.	SA				
						soils which are boggy in winter but bake hard in summer (eFloraSA, 2007).	
<i>Caladenia reticulata</i>	Veined Spider-orchid		R		2009	Occurs singly or in small groups in clay or gravelly soils on forested slopes in the southern MLR and on KI in SA.	Unlikely – no suitable habitat within the Varied Project Area. This species typically occurs closer to the central hills.
<i>Caladenia rigida</i>	Stiff White Spider-orchid	EN	E	Known to occur	2017	Inhabits ridge tops and hillslopes in grey-brown loam often associated with coarse quartzite gravel or sandstone pebbles. Vegetation is usually an open-forest with a relatively open understorey of low shrubs and sedges (Quarmby 2010). found on ridge tops and hillslopes in grey-brown loam often associated with coarse quartzite gravel or sandstone pebbles. Vegetation is usually an open forest dominated by <i>Eucalyptus obliqua</i> , <i>E. goniocalyx</i> , <i>E. leucoxyton</i> , <i>E. fasciculosa</i> and <i>E. microcarpa</i> (TSSC 2021b).	Possible - Blue gum woodland is present, and aspect ideal for this species. However this species typically occurs closer to the central hills and the area is highly degraded and contains a majority of exotic grassy species.
<i>Caladenia stellata</i>	Star Spider-orchid		R		1995	Grows in Callitris-dominated woodland in gravelly soils or red sandy loams (PlantNet, 2023)	Unlikely – older record, minimal suitable habitat in Varied Project Area except in gorges which will not be impacted.
<i>Caladenia tensa</i>	Greencomb Spider-orchid	EN		Known to occur	No records	Aeolian sand deposits in Callitris, <i>E. leucoxyton</i> Woodland and <i>Melaleuca uncinata</i> mallee in Murray-Darling Depression bioregion. Winter active geophyte, with long narrow leaf emerging, followed by 1-2 flowers (TSSC 2016a).	Possible - known from several disjunct populations within reserves and conservation parks. Woodland and soil type present across Varied Project Area,

Scientific Name	Common Name	Conservation Status		PMST likelihood of occurrence within 10 km	Last sighting within 10 km (year)*	Habitat Description and Distribution	Likelihood of Occurrence within Varied Project Area
		Aus.	SA				
							however majority of site is highly disturbed and unlikely to have this species.
<i>Calotis scapigera</i>	Tufted Burr-daisy		R		1990	Found mainly along the River Murray in South Australia with some scattered records further north, growing chiefly in saltbush and river red gum communities, on damp clay soils in flood-prone areas (SSCC 2018).	Possible - records present nearby and some habitat within Varied Project Area.
<i>Centrolepis cephaliformis</i> ssp. <i>cephaliformis</i>	Cushion Centrolepis		R		2010	In mallee and disturbed communities on sand and other infertile soils, also on the margins of clay pans and salt marshes. SA: FR EP NL MU YP SL SE.	Unlikely - unsuitable habitat within Varied Project Area.
<i>Crassula sieberiana</i>	Sieber's Crassula		E		2021	Found only in southern Mount Lofty Ranges in South Australia growing on rock ledges and in crevices and on seasonally inundated ground (SSCC 2018).	Possible – suitable habitat on site, record nearby.
<i>Dianella longifolia</i> var. <i>grandis</i>	Pale Flax-lily		R		2015	Occurs under a variety of overstorey Eucalypt species but is a grassy woodland specialist, e.g., Blue Gum, Candlebark, Manna Gum, Stringybark and Grey Box.	Unlikely – no suitable habitat within the Varied Project Area.
<i>Diuris behrii</i>	Behr's Cowslip Orchid		V		1964	Found in the southern Flinders Ranges and the Mount Lofty Ranges with a few records from Eyre Peninsula growing in native grassland, open woodland and grassy forest; grows on more fertile soils, especially amongst <i>Themeda</i> sp. (Kangaroo Grass) and <i>Triodia</i> on gentle slopes and flats (SSCC 2018).	Unlikely – no recent records and no suitable habitat in the Varied Project Area.
<i>Dodonaea procumbens</i>	Trailing Hop-bush	VU	V	Likely to occur	No records	Occurs in low-lying, often winter-wet areas in woodland, low open forests, health land and grasslands, on sands and clays. Recorded in open River Red Gum (<i>Eucalyptus camaldulensis</i>), Pink Gum (<i>Eucalyptus fasciculosa</i>) and Blue Gum (<i>Eucalyptus leucoxylon</i>) woodlands in low lying areas and in native grasslands (Duretto 1999; State Herbarium of South Australia 2008).	Possible – <i>E. camaldulensis</i> and <i>E. leucoxylon</i> present in the Varied Project Area, although no recent records and Project is outside of known distribution for

Scientific Name	Common Name	Conservation Status		PMST likelihood of occurrence within 10 km	Last sighting within 10 km (year)*	Habitat Description and Distribution	Likelihood of Occurrence within Varied Project Area
		Aus.	SA				
							this species. This species has not identified within the Project Area in past surveys.
<i>Dodonaea subglandulifera</i>	Peep Hill Hop-bush	EN	E	Known to occur	No records	<i>Dodonaea subglandulifera</i> is endemic to South Australia and has a restricted and disjunct distribution within the state. It has been recorded from semi-arid mallee areas of the Murray Darling Basin, Northern and Yorke Region and the Flinders Ranges. <i>Dodonaea subglandulifera</i> occurs in native vegetation associated with rock outcrops including low open woodland, open shrubland and mallee. Habitat records include <i>Eucalyptus porosa</i> +/- <i>Callitris gracilis</i> +/- <i>Acacia calamifolia</i> ; <i>E. dumosa</i> +/- <i>Allocasuarina verticillata</i> ; <i>E. oleosa</i> ; <i>E. phenax</i> with <i>C. gracilis</i> and <i>Beyeria lechenaultii</i> ; <i>C. gracilis</i> with <i>Alectryon oleifolius</i> and <i>B. lechenaultii</i> ; <i>Acacia argyrophylla</i> ; and <i>A. hakeoides</i> (Moritz & Bickerton 2010a)	Possible – scattered records near Mannum, but unsuitable habitat within the Varied Project Area.
<i>Duma horrida</i> ssp. <i>horrida</i>	Spiny Lignum		R		1964	Occurs in the GT, MU, SE regions of SA. Typically in silt in and beside dry inland lakes (PlantNet, 2023). Majority of records in SA follow the Murray River (ALA 2023).	Possible – old record and some suitable habitat within the Project Area, but current known distribution closer to the Murray River.
<i>Elatine gratioloides</i>	Waterwort		R		1960	Grows in wet places and fresh water usually less than 30 cm deep (eFloraSA 2007)	Possible – some suitable habitat in ephemeral creeks, but old records.
<i>Eragrostis lacunaria</i>	Purple Love-grass		R		1992	Typically occurs within the vicinity of the River Murray (ALA 2023). Widespread on clay soils of inland (PlantNet 2023).	Unlikely – older record and no suitable habitat within the Varied Project Area.

Scientific Name	Common Name	Conservation Status		PMST likelihood of occurrence within 10 km	Last sighting within 10 km (year)*	Habitat Description and Distribution	Likelihood of Occurrence within Varied Project Area
		Aus.	SA				
<i>Eremophila gibbifolia</i>	Coccid Emubush		R		1994	<i>E. gibbifolia</i> occurs in a few parts of the EP, Southern Lofty, South East and Murray botanical regions in South Australia. SA populations are associated with mallee associations on stony hills. Recorded in Melaleuca shrubland <i>Eucalyptus phenax</i> ssp. <i>phenax</i> , <i>Melaleuca acuminata</i> and <i>M. uncinata</i> mallee.	Unlikely – older records, no suitable habitat in the Varied Project Area.
<i>Eryngium ovinum</i>	Blue Devil		V		2013	Found in the wetter parts of the Mount Lofty Ranges and a few sites in the lower South-East in South Australia, growing in open woodland on damp clay and sandy soils (SSCC 2018).	Possible – recent record and some suitable habitat within the Varied Project Area.
<i>Eucalyptus dalrympleana</i> ssp. <i>dalrympleana</i>	Candlebark Gum	0	R		2021	SA: SL. In SA, the species is mainly restricted to the Onkaparinga River catchment from Gumeracha to Parawa, but most common in Lobethal to Mylor area. Grows in deep well-watered, but well-drained soils and commonly associated with <i>Eucalyptus obliqua</i> (Nicolle 2013).	Unlikely – no suitable habitat within the Varied Project Area. Not observed during surveys.
<i>Eucalyptus fasciculosa</i>	Pink Gum		R		2022	Pink gum grows in woodland or as an emergent low shrubland on soil of low fertility. It is mainly found in the south-east of South Australia, in the Mount Lofty Ranges, Barossa Valley and on Kangaroo Island (ALA 2023).	Highly Likely/Known - Recent records and identified during field survey
<i>Eucalyptus leucoxylon</i> ssp. <i>megalocarpa</i>	Large-fruit Blue Gum		R		1992	SA: SE. Almost restricted to SA where it occurs in coastal areas from Robe to Glenelg River in Victoria. Grows in coastal shrubland or low woodland, on undulating low hill, in slight depression and often over limestone. Associated with other eucalypts including <i>E. diversifolia</i> ssp. <i>diversifolia</i> , <i>E. ovata</i> ssp. <i>ovata</i> (Nicolle 2013).	Unlikely – outside of known range of this species and not observed during surveys.
<i>Eucalyptus viminalis</i> ssp. <i>viminalis</i>	Manna Gum		R		2003	Generally recorded as growing in mallee scrubland but has also been found growing in coastal heathlands, sclerophyll forests and woodlands. It is also found in heathy openings in wet sclerophyll	Unlikely – associated species not present and species not present in the Varied Project Area.

Scientific Name	Common Name	Conservation Status		PMST likelihood of occurrence within 10 km	Last sighting within 10 km (year)*	Habitat Description and Distribution	Likelihood of Occurrence within Varied Project Area
		Aus.	SA				
						forest and in a swamp at Mt Compass (Nicolle 2013).	
<i>Euphrasia collina</i> ssp. <i>osbornii</i>	Osborn's Eyebright	EN	E	May occur	No records	Confined to SA. Has been collected in the Upper SE (Yumali-Meningie Road), on eastern KI. (Dudley Peninsula-W of Cape Willoughby), Eyre Peninsula (Venus Bay), Yorke Peninsula, Northern Lofty region (Clare, Burra), Southern Lofty region (inc. Fleurieu Peninsula and Mt Compass) and the Flinders Ranges. Generally recorded as growing in mallee scrubland but has also been found growing in coastal heathlands, sclerophyll forests and woodlands. It is also found in heathy openings in wet sclerophyll forest and in a swamp at Mt Compass (Moritz and Bickerton 2010b).	Unlikely – No recent records, known range outside of the Varied Project Area.
<i>Gastrodia sesamoides</i>	Potato Orchid		R		2005	Wet sclerophyll forests, dry sclerophyll forests, dry sclerophyll woodlands and riparian areas. Occurs in shady, well forested places in high rainfall areas (>800 mm per year), near decaying tree stumps, especially along creeks (DEW 2008a).	Possible – may occur along ephemeral creeks.
<i>Glycine latrobeana</i>	Clover Glycine	VU	V	Known to occur	2009	Inhabits native grasslands, dry sclerophyll forests, woodlands and low open woodlands, typically with a grassy ground layer, and growing on undulating plains. Prefers gentle south-west facing ridge slopes and lower south facing river valley slopes (Carter and Sutter 2010).	Possible -Woodland community present. This species was not identified during the field survey.
<i>Hypericum japonicum</i>	Matted St John's Wort		R		2017	Found on Kangaroo Island, southern Mount Lofty Ranges and the lower South-east in South Australia, growing in cool, moist, often shaded sites in swampy heathland (SSCC 2018).	Possible - Swamp community present. This species was not identified during the field survey.
<i>Juncus homalocalis</i>	Wiry Rush		V		2004	Found in moist grassland or woodland (ALA 2023)	Possible – suitable habitat in the Varied Project Area.
<i>Juncus prismatocarpus</i>	Branching Rush		E		1990	Grows in damp places. SA.: MU SL. (eFlora SA 2007).	Possible – old record, but some swamp and

Scientific Name	Common Name	Conservation Status		PMST likelihood of occurrence within 10 km	Last sighting within 10 km (year)*	Habitat Description and Distribution	Likelihood of Occurrence within Varied Project Area
		Aus.	SA				
							watercourse areas in the Varied Project Area.
<i>Lachnagrostis robusta</i>	Tall Blown-grass		R		2003	Occurs around margins of salt lakes, sandy flats and saline depressions.	Possible - Recent records and damp low-lying habitat present within Project Area although no individuals observed within Varied Project Area.
<i>Leptorhynchus elongatus</i>	Lanky Buttons		E		1980	Found in the southern Flinders Ranges, the Mount Lofty Ranges and the northern Yorke Peninsula in South Australia, growing in woodland and grassland on sandy to sandy-loam soils (SSCC 2018).	Possible – old records, but some suitable habitat within the Varied Project Area.
<i>Luzula ovata</i>	Clustered Wood-rush		R		2004	Occurs in the Mount Lofty Ranges and the lower South-east in South Australia, growing in swampy areas (SSCC 2018).	Possible – some low-lying winter inundated swamp habitat present in the Varied Project Area, although this is not preferred habitat.
<i>Maireana excavata</i>	Bottle Fissure-plant		V		1994	Red-brown clay loam soils in open grasslands and shrublands (Cunningham <i>et al</i> , 1981).	Possible – old record but some suitable habitat in the Varied Project Area.
<i>Maireana rohrlachii</i>	Rohrlach's Bluebush		R		2022	Species occurs from few locations on EP, but mainly YP, Mid North, Fleurieu Peninsula, Murraylands and western Victoria. Preferred habitat includes heavy clay and calcareous loam soil often fringing lakes in seasonally wet areas (Royal Botanic Gardens Victoria 2020).	Likely/known - Recent sighting and identified within previous survey (EBS Ecology 2014).
<i>Mentha diemenica</i>	Slender Mint		R		2009	Grows in dry forest, woodland, grassy areas, and seasonally damp places (PlantNet 2023).	Possible – some suitable habitat within

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		Aus.	SA				
							the Varied Project Area.
<i>Microtis eremaea</i>	Slender Onion-orchid		E		1992	SA: FR EA EP MU. Grows on rock outcrops and along ephemeral watercourses where it may form dense colonies (ALA 2023)	Possible – some suitable habitat in the Varied Project Area, but old record.
<i>Olearia pannosa</i> ssp. <i>pannosa</i>	Silver Daisy-bush	VU	V	Known to occur	2016	Endemic to SA, scattered throughout agricultural areas. Occurring in sandy flat areas and in hilly rocky areas in woodland or mallee, including overlapping with Peppermint Box Grassy Woodland of SA (DotE 2013c).	Possible -Woodland community present. This species was not identified during the field survey.
<i>Olearia passerinoides</i> ssp. <i>glutescens</i>	Sticky Daisy-bush		R		2010	Found in the wetter parts of South Australia, on the tip of Yorke Peninsula, southern Mount Lofty Ranges and in the Murray (SSCC 2018).	Possible -Woodland community present. This species was not identified during the field survey.
<i>Pentapogon quadrifidus</i> var. <i>quadrifidus</i>	Five-awn Spear-grass		R		2009	Grows in woodland and moist shady situations (PlantNet 2023).	Possible – some suitable habitat in the Varied Project Area.
<i>Pilularia novae-hollandiae</i>	Austral Pillwort		R		1960	Austral Pillwort grows in shallow swamps and waterways, often among grasses and sedges. It is most often recorded in drying mud as this is when it is most conspicuous (OEH 2022).	Possible – some suitable habitat within the Varied Project Area, but old record and not observed during field surveys.
<i>Potamogeton ochreatus</i>	Blunt Pondweed		R		1960	Occurs in still to strongly flowing fresh water, in agricultural dams, swamps, creeks and rivers, on muddy to gravelly substrates.	Possible – some suitable habitat within the Varied Project Area, but old record and not observed during field surveys.
<i>Prasophyllum pallidum</i>	Pale Leek-orchid	VU	R	Known to occur	2022	Pale Leek-orchid is known singly or in groups in better soils of woodland and grassy open forest. Recorded in woodlands and forests dominated by <i>Eucalyptus leucoxylon</i> , <i>E. goniocalyx</i> , <i>E.</i>	Possible -Woodland community present. This species was not

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		Aus.	SA				
						<i>fasciculosa</i> , <i>E. microcarpa</i> , <i>Callitris gracilis</i> / <i>Eucalyptus fasciculosa</i> , and <i>Allocasuarina verticillata</i> (Bates 2009).	identified during the field survey.
<i>Prasophyllum pruinosum</i>	Plum Leek-orchid	EN	E	May occur	No records	It has been recorded in the Adelaide and MLR region from eight geographically isolated and distinct locations, which extend from the Barossa Valley to Belair NP. Preferred habitat includes open woodland and grassy forest, in the open or in the shelter of broom-like shrub growing in fertile loams, usually with other leek-orchids (Bates 2009).	Unlikely – no suitable habitat in the Varied Project Area and no recent records within 10 km of Project Area.
<i>Prostanthera chlorantha</i>	Green Mintbush		R		1965	Forms small populations of a few scattered plants. Commonly associated with Banksia, Daviesia and Leptospermum shrubland. Sparse records from Hale CP, Para Wirra RP, Mount Crawford Forest, Mark Oliphant CP and Myponga CP (DEH 2008a).	Unlikely – no recent records, and no suitable habitat in the Varied Project Area.
<i>Pterostylis cucullata</i>	Leafy Greenhood	VU	E	Likely to occur	No records	In South Australia, populations have been recorded in Brown Stringybark/Messmate Stringybark (<i>Eucalyptus baxteri</i> / <i>Eucalyptus obliqua</i>) forest and Blue Gum/Manna Gum (<i>E. leucoxyton</i> / <i>E. viminalis</i>) woodland in the Mount Lofty Ranges. Also, coastal sand dunes under open to closed scrub dominated by Coast Tea-tree (<i>Leptospermum laevigatum</i>), and/or Moonah (<i>Melaleuca lanceolata</i>), with an open ground stratum (TSSC 2016b).	Unlikely – no recent records, habitat in Varied Project Area not suitable.
<i>Pterostylis xerophila</i>	Desert Greenhood	VU	V	May occur	No records	The Desert Greenhood is a small, deciduous, terrestrial orchid endemic to inland South Australia and Victoria. It occurs in generally remote locations in semi-desert environments, growing mostly on rock outcrops under low shrubs (Duncan 2010).	Unlikely – no recent records and unsuitable habitat in the Varied Project Area.
<i>Ptilotus erubescens</i>	Hairy-tails		R		2014	Occurs in SA in FR, NL, MU, SL and SE where it occurs in fertile soils in grassland, woodland and scrubland communities but not in mallee (Royal Botanic Gardens Victoria 2020).	Likely – recent records and some suitable habitat in the Varied Project Area.

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		Aus.	SA				
<i>Rytidosperma laeve</i>	Smooth Wallaby-grass		R		1999	Ecologically variable, from alpine moorland to open grassland or light woodland, often in seasonally damp habitats (AusGrass2 2015).	Possible – older record but some suitable habitat in the Varied Project Area.
<i>Schoenus latelaminatus</i>	Medusa Bog-rush		V		1993	Occurs in freshwater boggy, swampy areas and drainage lines and temporarily wet places, including swampy valley sites under River Red Gum with <i>Myriophyllum amphibium</i> and damp depressions amongst <i>Juncus holoschoenus</i> , <i>Gratiola pumila</i> and <i>Myriophyllum sp.</i>	Possible – older records but some suitable habitat in the Varied Project Area.
<i>Schoenus tesquorum</i>	Grassy Bog-rush		R		2017	Moist to wet soils on swamp margins and heathlands (PlantNet, 2023).	Possible – recent records and some suitable habitat on site, however, low-lying swamp habitat is winter inundated, not permanent.
<i>Senecio macrocarpus</i>	Large-fruit Fireweed	VU	V	May occur	No records	Currently distributed as one very large population in Messent Conservation Park in SA and small populations at Daly Head on the Yorke Peninsula and Yulkiri Station, Tarcowie Parklands and Gum Lagoon Conservation Park, SA. Occurs most commonly in depressions in low lying closed sedgeland but may occur in sedgeland, herbland, low shrubland to low open woodland where competition from understorey plants is low. The soils range from clay to loamy sand. Known from a variety of habitats including grasslands, sedgelands, shrublands and woodlands generally on sparsely vegetated sites on sandy loam to heavy clay soils, often in winter wet depressions (Sinclair 2010).	Unlikely – Although habitat relevant, no recent records and no nearby known populations. This species was not identified during the field survey.
<i>Senecio megaglossus</i>	Superb Groundsel	VU	E	Likely to occur	1984	Endemic to SA where it is Confined to the Northern Mt Lofty Ranges and Southern Flinders Ranges of SA. Found in rocky creek banks and rocky	Unlikely – No recent records and vegetation in Varied

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		Aus.	SA				
						gorge/valley slopes (Jessop & Toelken 1986) but also in sandhills and in arid hills (Davies 1986). One herbarium record mentions an arid sand hill habitat (Davies 1986). Associated with herblands or grassland with <i>Lomandra effusa</i> , <i>Triodia irritans</i> or <i>Austrostipa sp</i> ; tall open-shrubland with <i>Pittosporum phylliraeoides</i> , <i>Heterodendrum oleaefolium</i> , <i>Cassinia laevis</i> , <i>Eremophila longifolia</i> , <i>Acacia calamifolia</i> and <i>Bursaria spinosa</i> and <i>Triodia irritans</i> and <i>Callitris columellaris</i> and <i>Eucalyptus camaldulensis</i> woodlands (DEWHA 2008b).	Project Area is not preferred for this species.
<i>Sphaerolobium minus</i>	Leafless Globe-pea		R		1995	SA: EP MU SL KI SE. Widespread in heathlands, but prefers swamps (PlantNet 2023)	Possible – recent records and some suitable habitat on site, however, low-lying swamp habitat is winter inundated, not permanent.
<i>Swainsona behriana</i>	Behr's Swainson-pea		V		1968	Once found in the Mount Lofty Ranges and the lower South-east, growing on light or occasionally heavy soils in moist grassland and woodland. Now only found in the northern and eastern side of the Mount Lofty Ranges (SSCC 2018).	Possible – although no recent records, some suitable habitat may occur in the north of the Varied Project Area, however, area has been heavily modified.
<i>Swainsona pyrophila</i>	Yellow Swainson-pea	VU	R	Likely to occur	No records	Found in Mallee vegetation communities on a variety of soil types including well-drained sands, sandy loams and heavier clay loams. It is usually found after fire growing in association with <i>Eucalyptus incrassata</i> (Ridge-fruited Mallee), <i>E. socialis</i> (Beaked Red Mallee), <i>E. brachycalyx</i> (Gilja), <i>E. gracilis</i> (Yorrell), and <i>E. oleosa</i> (Red Mallee) mid mallee woodland over <i>Melaleuca</i>	Unlikely – no recent records. Scattered and very sparse historical records in the broader area (ALA, 2023). No suitable habitat in the Varied Project Area.

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						<i>uncinata</i> (Broombush) tall shrubland (Tonkin and Robertson 2010).	
<i>Thelymitra epipactoides</i>	Metallic Sun-orchid	EN	E	May occur	No records	Coastal heathlands, grasslands and woodlands, but may also be found in drier inland heathlands, open forests and woodlands (Department of Climate Change, Energy, the Environment and Water, 2023c).	Unlikely – no recent records and unsuitable habitat in Project Area. Known distribution of this species outside of Varied Project Area. Range of this species typically further south of the Varied Project Area.
<i>Thelymitra hygrophila</i>	Blue Star Sun-orchid	CE	E	Likely to occur	No records	Found in seasonally wet habitats such as margins of vernal pools, ephemeral ponds and mossy-edged seepage areas associated with the rich soils of <i>Eucalyptus camaldulensis</i> (river red gum) grassy flats in the higher regions of the Mount Lofty Ranges (TSSC 2016c).	Unlikely – no recent records and unsuitable habitat in Project Area. Known distribution of this species outside of Varied Project Area.
<i>Thelymitra matthewsii</i>	Spiral Sun-orchid	VU	E	Likely to occur	No records	Favours open forests and woodlands in well-drained sand and clay loams. It is a post-disturbance coloniser that is usually found in open areas around old quarries and gravel pits, on road verges, disused tracks and animal trails. In SA, it is known from three fairly old collections from KI and in SW of Keith. It has recently been found to occur south of Meningie, and on western KI. Open ground layer is common (Duncan 2010). In SA it is known from three fairly old collections from Kangaroo I. and SW of Keith. It favours open forests and woodlands in well-drained sand and clay loams (Department of Climate Change, Energy, the Environment and Water 2023c).	Unlikely – no recent records, unsuitable habitat in the Varied Project Area and Project is outside of the known range of this species.
<i>Veronica decorosa</i>	Showy Speedwell		R		2005	Found in rocky gorges and gullies and on ridge-tops (eFloraSA 2007).	Possible – recent records and some suitable habitat in the

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							Varied Project Area, however, scattered, very sparse records in this area, generally found from the mid north and further north.
<i>Veronica derwentiana subsp. homalodonta</i>	Mount Lofty Speedwell	CE	E	Likely to occur	No records	Grows beside streams and waterfalls or associated with limestone caverns. Occurs in moist sites in gullies or near creeks in high rainfall areas (DEWHA 2009)	Unlikely – outside of known distribution of this species, no recent records and unsuitable habitat.
AMPHIBIAN							
<i>Emydura macquarii</i>	Macquarie River Turtle		V		2012	Prefers long pools with a rocky substrate and sheltering features such as snags, overhanging banks or clumps of vegetation such as Hydrilla (<i>Hydrilla verticillata</i>). They are often found in shallow waters of such pools (Spencer <i>et al.</i> 2007) and they utilise partially submerged logs as basking platforms (NSW NPWS 2001f).	Unlikely – ephemeral rivers in the Project Area, however the habitat requirements of this species are specific and do not occur in the Varied Project Area.
<i>Litoria Raniformis</i>	Southern Bell Frog	VU	V	Likely to occur	1980	Three distinct groups of records in SA. One group is located in the far south-east of the state (to near Keith) and adjoining Victorian populations, one group along the Murray River from Victoria to the coast, and a small group in the Mt Lofty Ranges. The group in the Mount Lofty Ranges probably represents an unintentionally introduced population originating from captive stock and is likely to have now died out. This species is found mostly amongst emergent vegetation, including <i>Typha sp.</i> (bullrush), <i>Phragmites sp.</i> (reeds) and	Possible - Swamp community present with <i>Phragmites sp.</i> Records for this species generally along the Murray River, unlikely to be in ephemeral creeks. This species was not

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		Aus.	SA				
						<i>Eleocharis</i> sp. (sedges), in or at the edges of still or slow-flowing water bodies such as lagoons, swamps, lakes, ponds and farm dams. Additionally, this species occurs in; clays or well-watered sandy soils; open grassland, open forest, and ephemeral and permanent non-saline marshes and swamps; montane eucalypt forest, dry sclerophyll forest in coastal Victoria; steep-banked water edges (like ditches and drains) and gently graded edges containing fringing plants; and formerly, areas of high altitudes (Clemann & Gillespie 2012).	identified during the field survey.
<i>Pseudophryne bibronii</i>	Brown Toadlet		R		2016	In SA, it occurs in the SE, KI, MLR and FR regions. Found in damp areas with cover provided by logs and stones. Occupies forests, heathlands and grasslands. Occasionally utilizes small temporary dams and vegetated roadside drainage lines and ditches which are characterized by leaf litter and grassy debris (Wilson and Bignall 2009).	Possible – scattered and sparse records for this species near the Project Area, general range is generally along the central and western hills. Some possible habitat in the Varied Project Area in creeks.
AVES							
<i>Actitis hypoleucos</i>	Common Sandpiper	Mi (W)	R	Known to occur	No records, 2006	Varied coastal and interior wetlands: narrow muddy edges of billabongs, river pools, mangroves, among rocks reefs and rocky beaches (Morcombe 2021). Habitat is banks, rocks and sandy beaches near water. Found in coastal or inland wetlands, both saline or fresh (Birdlife Australia 2023).	Unlikely - unsuitable habitat present in the Varied Project Area.
<i>Anhinga novaehollandiae novaehollandiae</i>	Australasian Darter		R		2016	This species prefers smooth, open waters, for feeding, with tree trunks, branches, stumps or posts fringing the water, for resting and drying its wings. Most often seen inland, around permanent and temporary water bodies at least half a metre deep,	Possible - some suitable habitat within the Varied Project Area (creek areas), recent records nearby.

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		Aus.	SA				
						but may be seen in calm seas near shore, fishing (Birdlife Australia 2023).	
<i>Aphelocephala leucopsis leucopsis</i>	Southern Whiteface	VU		Known to occur	2022	Occurs in semi-arid woodlands, mallee, mulga, dry-country scrublands." Southern Whiteface favour habitat with low tree densities and a herbaceous understory litter cover. They live in a wide range of open woodlands and shrublands which are dominated by acacia, mallee, mulga and eucalyptus species (Higgins & Peter 2002)	Known / Highly likely - species observed within the Varied Project Area.
<i>Apus pacificus</i>	Fork-tailed Swift	Mi (M)		Likely to occur	No records	Widespread but almost exclusively aerial. Mostly occur over inland plains, over cliffs and beaches and sometimes well out to sea or in dry or open habitats (DCCEEW 2023).	Unlikely – species aerial, therefore unlikely to use the Varied Project Area, may occur as flyover only however, there are no recent records nearby for this species.
<i>Ardea intermedia plumifera</i>	Plumed Egret		R		2017	Frequents freshwater wetlands, pastures, croplands and tidal mudflats and floodplains (Pizzey and Knight 2013).	Unlikely - wetland habitat within the Varied Project Area is not preferred for this species.
<i>Botaurus poiciloptilus</i>	Australasian Bittern	EN	E	Known to occur	2004	Occurs in coastal and sub coastal SE South Australia in or over water in tall reedbeds, sedges, rushes, lignum and occasionally in saltmarsh (Pizzey and Knight 2013).	Unlikely - no suitable habitat within the Varied Project Area.
<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	Mi (W)		Known to occur	No records	Movements occur during the non-breeding period where birds appear to be dispersive, moving to temporary or flooded wetlands and leaving them when they dry. On migration, they forage and roost on rocky and sandy beaches, freshwater habitats and inland saltwater habitats (DCCEEW 2023).	Unlikely - no suitable habitat within the Varied Project Area.

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<i>Calidris ferruginea</i>	Curlew Sandpiper	CR, Mi	E	Likely to occur	No records	In Australia, Curlew Sandpipers occur around the coasts and are also quite widespread inland, though in smaller numbers. Curlew Sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They occur in both fresh and brackish waters. Occasionally they are recorded around floodwaters (DotE 2015a).	Unlikely - no suitable habitat within the Varied Project Area.
<i>Calidris melanotos</i>	Pectoral Sandpiper	Mi (W)	R	Known to occur	No records	This species prefers shallow fresh to saline wetlands. The species is found at coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands (DCCEEW 2023).	Unlikely - no suitable habitat within the Varied Project Area.
<i>Calidris ruficollis</i>	Red-necked Stint	Mi (W)			2012	Occurs on tidal mudflats, saltmarshes, sandy or shelly beaches, saline and freshwater wetlands, coastal and inland. Also on salt fields and sewerage ponds (Pizzey and Knight 2013).	Possible – records 10-20 years old, may use fridges of waterways when inundated.
<i>Calidris subminuta</i>	Long-toed Stint	Mi (W)	R		1977	They prefer shallow freshwater or brackish wetlands including lakes, swamps, river floodplains, streams, lagoons and sewage ponds. The species is also fond of areas of muddy shoreline, growths of short grass, weeds, sedges, low or floating aquatic vegetation, reeds, rushes and occasionally stunted samphire. It has also been observed at open, less vegetated shores of larger lakes and ponds and is common on muddy fringes of drying ephemeral lakes and swamps (Higgins & Davies 1996).	Unlikely - no suitable habitat within the Varied Project Area.
<i>Charadrius bicinctus bicinctus</i>	Double-banded Plover	Mi (W)			2014	Occurs on wide beaches, tidal mudflats, saltmarsh, wide, sparsely vegetation margins of shallow saline and freshwater wetlands; paddocks with sparse vegetation (Pizzey and Knight 2013).	Unlikely - no suitable habitat within the Varied Project Area.

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<i>Charadrius leschenaultii</i>	Greater Sand Plover	VU, Mi	R		1969	Occupies wide, sandy or shelly beaches, tidal mudflats, salt marsh; seldom far inland (Pizzey and Knight 2013).	Unlikely – no suitable habitat within the Project Area.
<i>Charadrius veredus</i>	Oriental Plover	Mi (W)			1987	Occurs on open plains, bare rolling country, often far from water. Also in muddy or sandy wastes near inland swamps or tidal mudflats, bare claypans, margins of coastal marshes and artificially grassed areas (Pizzey and Knight 2013).	Unlikely – no suitable habitat within the Varied Project Area.
<i>Cinlosoma castanotum</i>	Chestnut-backed Quailthrush		R		2014	Endemic to arid and semi-arid southern Australia, reaching its northern extent in the south of the Northern Territory. Throughout its distribution it occurs in a wide range of arid and semi-arid habitats; mainly in the low shrubs and undergrowth of mallee scrub, but also in Acacia scrubs, dry sclerophyll woodland, heath, and native pine (OEH 2017a).	Possible – Although scattered records nearby, the distribution of this species is generally further east and there is no suitable habitat within the Varied Project Area.
<i>Cladorhynchus leucocephalus</i>	Banded Stilt		V		2012	Endemic to Australia, mainly in the south and inland. Found mainly in saline and hypersaline (very salty) waters of the inland and coast, typically large, open and shallow (Birds in Backyards 2023).	Unlikely - no suitable habitat within the Varied Project Area.
<i>Coracina papuensis</i> ssp. <i>robusta</i>	White-bellied Cuckooshrike		R	-	2022 (EBS record)	Scattered records near Project Area, uncommon in South Australia (ALA 2023). Migrant. Occurs in forests and woodlands with River red gums, open grasslands, mangroves, plantations and gardens (Pizzey and Knight 2013).	Highly likely/known – observed within the Varied Project Area.
<i>Corcorax melanorhamphos</i>	White-winged Chough		R		2022	Prefers drier forests, woodlands of <i>Eucalyptus</i> sp., crops and pastures (Pizzey and Knight 2013).	Highly likely/known - recent records and identified nearby within previous surveys (EBS Ecology 2014).

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<i>Coturnix ypsilophora australis</i>	Brown Quail		V		2018	Prefers dense grasslands, often on the edges of open forests, and bracken (Birdlife Australia 2023).	Possible – some suitable habitat in the north, recent records.
<i>Egretta garzetta nigripes</i>	Little Egret		R		2017	Found in tidal mudflats, saltmarshes, mangroves and freshwater wetlands (Pizzey and Knight 2013).	Possible – recent records and some suitable habitat within the Varied Project Area.
<i>Falco hypoleucos</i>	Grey Falcon	VU	R	Known to occur	1964	The species occurs in arid and semi-arid Australia, including the Murray-Darling Basin, Eyre Basin, central Australia and WA. Preferred habitat includes lightly treed inland plains, sand ridges and pastoral plains. (Pizzey and Knight 2013).	Possible – some suitable habitat but no recent records within 10 km of the Varied Project Area.
<i>Falco peregrinus</i>	Peregrine Falcon		R		2020	Found everywhere from woodlands to open grasslands and coastal cliffs - though less frequently in desert regions. This species prefers open habitats such as grasslands, tundra and meadows and nests on cliff faces and in crevices (Pizzey and Knight 2013).	Highly likely/Known - Recent records and suitable habitat present within Varied Project Area. Observed during survey.
<i>Falco subniger</i>	Black Falcon		R		2010	Occurs on plains, grasslands, foothills, timbered watercourses and crops (Pizzey and Knight 2013).	Possible - suitable habitat within the Varied Project Area and recent records.
<i>Falcunculus frontatus</i> ssp. <i>frontatus</i>	Eastern Shrike-tit		R		2021	Eucalyptus woodlands and forest, within a wide range of woodland/forest communities. Prefers dense grasslands, often on the edges of open forests, and bracken (Birdlife Australia 2023).	Likely - suitable habitat within the Varied Project Area and recent records.

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<i>Gallinago hardwickii</i>	Latham's Snipe	VU, Mi (W)		Likely to occur	No records	Latham's Snipe is a non-breeding visitor to south-eastern Australia, including the Adelaide plains, MLR and EP. They usually inhabit open, freshwater wetlands with low, dense vegetation (DCCEEW 2023d).	Unlikely - no suitable habitat within the Varied Project Area.
<i>Grantiella picta</i>	Painted Honeyeater	VU	R	Likely to occur	No records	Sparsely distributed from southern Victoria and south-eastern SA to far northern QLD and eastern Northern Territory Forest, woodland, dry scrub, often with abundant mistletoe. (Birdlife Australia 2023). Occur in forest, woodland, dry scrub, often with abundant mistletoe. Dependent on mistletoe berries (Morcombe 2021).	Unlikely - vagrant to this area and habitat within the Varied Project Area not preferred.
<i>Hieraaetus morphnoides</i>	Little Eagle		V		2018	Widespread over diverse habitats; forest, woodland, open scrub, tree-lined watercourses of interior Australia such as the Murray River. Prefers areas where open country intermixes with wooded or forested hills, as in farmland, irrigated land (Morcombe 2021).	Likely - suitable habitat within the Varied Project Area and recent records.
<i>Hirundapus caudacutus</i>	White-throated Needletail	VU, Mi (T)	V	Likely to occur	No records	In SA they are mostly recorded from the Yorke Peninsula and the Mount Lofty Ranges. Almost exclusively ariel, most often above wooded areas, including open forest and rainforest (TSSC 2019).	Possible - as a flyover only
<i>Leipoa ocellata</i>	Malleefowl	VU	V	Likely to occur	No records	In SA, the Malleefowl is distributed from the south-east, north to the Murray-Mallee region and west to Streaky Bay. Occupies 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, or coastal heathlands (Benshemesh 2007).	Unlikely - Although there is some suitable habitat, there are no recent records within 10 km of the Project Area and known distribution for this species is typically east of the Murray River (although scatter records occur to the west further north and

Scientific Name	Common Name	Conservation Status		PMST likelihood of occurrence within 10 km	Last sighting within 10 km (year)*	Habitat Description and Distribution	Likelihood of Occurrence within Varied Project Area
		Aus.	SA				
							south of the Varied Project Area).
<i>Lichenostomus cratitius occidentalis</i>	Purple-gaped Honeyeater		R		2018	Occurs in fragmented areas in mallee from south and central WA to central Vic. Prefers Mallee, open woodlands with shrubby understorey, broombush, heathlands (OEH 2017b).	Likely - suitable habitat within the Varied Project Area and recent records.
<i>Lophochroa leadbeateri leadbeateri</i>	Major Mitchell's Cockatoo	EN	R	May occur	No records	The Major Mitchell's Cockatoo occurs only in Australia, where it usually inhabits semi-arid and arid regions, mainly inland, but in some coastal areas. They usually inhabit dry woodlands in arid and semi-arid areas, where eucalypts or acacias dominate the vegetation. They require old trees which support hollows that are large enough to be suitable for nesting in (Birdlife Australia 2023).	Unlikely - no recent records and outside of known distribution.
<i>Lophoictinia isura</i>	Square-tailed Kite		E		2013	The Square-tailed Kite ranges along coastal and subcoastal areas from south-western to northern Australia, Queensland, NSW and Victoria. Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses (Pizzey and Knight 2013).	Possible - older record but some suitable woodland habitat present throughout Varied Project Area.
<i>Melanodryas cucullata cucullata</i>	Hooded Robin	EN	R	Known to occur	2022	Utilises woodland of eucalypt, mallee, mulga; coastal heath; semi cleared farmland. Sub-populations in SA are recorded from the Barossa, Monarto, Onkaparinga River, Ashbourne, Port Willunga areas as well as isolated records from elsewhere in the hills and Fleurieu. Requires large remnants (>50 ha) with open areas, young eucalypts or shrubs for nesting and numerous perches for foraging (DEH, 2008). South-eastern subspecies found in Eucalypt woodland and mallee and Acacia shrubland (Wilson and Bignall 2009).	Likely - recent records, Eucalypt woodland and Acacia shrubland exist within the Varied Project Area.

Scientific Name	Common Name	Conservation Status		PMST likelihood of occurrence within 10 km	Last sighting within 10 km (year)*	Habitat Description and Distribution	Likelihood of Occurrence within Varied Project Area
		Aus.	SA				
<i>Melithreptus gularis</i>	Black-chinned Honeyeater		V		2014	The Black-chinned Honeyeater is found in the upper levels of open eucalypt forests and woodlands dominated by box and ironbark eucalypts. It is often found along waterways, especially in arid and semi-arid areas and in northern Australia. It is occasionally seen in gardens and street trees (Birdlife Australia 2023).	Possible - older record and some suitable habitat, but on the edge of known distribution of this species.
<i>Microeca fascians fascians</i>	Jacky Winter (MLR, SE)		R		2022	Widely distributed throughout mainland Australia. Prefer open woodland (Eucalypt and mallee) with an open shrub layer and bare ground. Often seen in farmland and parks (Morcombe 2021).	Likely - suitable habitat within the Varied Project Area and recent records.
<i>Motacilla cinerea</i>	Grey Wagtail	Mi (T)		May occur	No records	European and Asian species. Migrates south in winter, usually to Indonesia and New Guinea. Rarely reaches Australia, but when it does, favours habitat near freshwater streams, also mown grass, ploughed land or near sewage ponds (Morcombe 2021).	Unlikely - vagrant to Australia.
<i>Motacilla flava</i>	Yellow Wagtail	Mi (T)		May occur	No records	Open country near swamps, salt marshes, sewage ponds, grassed surrounds to airfields, bare ground. Occasionally on drier inland plans (Morcombe 2021).	Unlikely - vagrant to the area, no suitable habitat within the Varied Project Area.
<i>Myiagra cyanoleuca</i>	Satin Flycatcher	Mi	E	Likely to occur	No records	Known inhabitant of forest, woodland, mangroves and coastal heath scrub. Prefers dense, wet gullies of heavy eucalypt forest in breeding season (Morcombe 2021).	Unlikely - some suitable habitat within the Varied Project Area, vagrant to area.
<i>Myiagra inquieta</i>	Restless Flycatcher		R		2018	Found throughout northern and eastern mainland Australia, as well as in south-western Australia. The Restless Flycatcher is found in open forests and woodlands (Birdlife Australia 2023). Occupies open forests, woodlands and mallee, inland coastal scrubs (Pizzey and Knight 2013).	Possible - recent records and suitable habitat, however species known to require large connected patches of mallee vegetation

Scientific Name	Common Name	Conservation Status		PMST likelihood of occurrence within 10 km	Last sighting within 10 km (year)*	Habitat Description and Distribution	Likelihood of Occurrence within Varied Project Area
		Aus.	SA				
							which is limited in the Varied Project Area.
<i>Neophema chrysostoma</i>	Blue-winged Parrot	VU, Ma	V	Known to occur	1999	This species mainly occurs in Tasmania and Victoria, particularly in southern Victoria and the midlands and eastern areas of Tasmania however sparser populations are also found in western New South Wales and eastern South Australia. Prefers grasslands and grassy woodlands but will inhabit a range of habitats from coastal, sub-coastal and inland areas, right through to semi-arid zones (Birdlife Australia 2023).	Possible - some suitable habitat within the Varied Project Area and older record, but habitat unlikely to be preferred by this species.
<i>Neophema elegans elegans</i>	Elegant Parrot		R		2021	The Elegant Parrot occurs in eastern parts of South Australia, north to the Flinders Ranges and west to the Eyre Peninsula. It can be found in a wide variety of habitats, including grasslands, shrublands, mallee, woodlands and thickets, bluebush plains, heathlands, saltmarsh and farmland (Birdlife Australia 2023).	Highly likely/Known - Recent records and suitable woodland habitat present within Varied Project Area. Observed during October 2022 survey.
<i>Numenius madagascariensis</i>	Eastern Curlew	CE, Mi (W)	E	May occur	No records	Coastal shorebird most commonly associated with sheltered coasts, especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sandflats, often with beds of seagrass. (Birdlife Australia 2023).	Unlikely - no suitable habitat within the Varied Project Area.
<i>Oxyura australis</i>	Blue-billed Duck		R		2016	Prefers large dams and lakes and well-vegetated freshwater swamps (Pizzey and Knight 2013).	Unlikely - no suitable habitat within the Varied Project Area.
<i>Pandion haliaetus</i>	Osprey	Mi (W)		Likely to occur	No records	Known inhabitant of forest, woodland, mangroves and coastal heath scrub. Prefers dense, wet gullies of heavy Eucalypt forest in breeding season (Morcombe 2021). Eastern Ospreys occur in littoral and coastal habitats and terrestrial wetlands of	Unlikely - no suitable habitat within the Varied Project Area.

Scientific Name	Common Name	Conservation Status		PMST likelihood of occurrence within 10 km	Last sighting within 10 km (year)*	Habitat Description and Distribution	Likelihood of Occurrence within Varied Project Area
		Aus.	SA				
						tropical and temperate Australia and offshore islands (DotE 2022).	
<i>Pedionomus torquatus</i>	Plains-wanderer	CE	E	May occur	No records	The Plains-wanderer occurs at scattered sites in NSW and Victoria and more marginal habitat in QLD and SA. Inhabits sparse, treeless, lowland native grasslands with approximately 50% bare ground, most vegetation less than 5 cm in height, with some widely-spaced plants up to 30 cm high (DotE 2015b).	Unlikely - no recent records, outside of known distribution.
<i>Petroica boodang boodang</i>	Scarlet Robin		R		2016	This species occurs in foothill forests, woodlands and watercourses. In autumn-winter, they occur in more open habitats such as river red gum woodlands, golf courses, parks, orchards and gardens (Birdlife Australia 2023). Occur in eucalypt woodlands and forests. Breeds in Eucalypt forest, but not in adjacent grasslands even though individuals occupy this habitat during the non-breeding season (DEW 2008b).	Possible - vegetation within Varied Project Area not preferred but recent records within the last 10 years.
<i>Petroica phoenicea</i>	Flame Robin		V		2015	Endemic to south-eastern Australia, and ranges from near the Queensland border to southeast South Australia and also in Tasmania. Breeds in eucalypt forests and woodlands, with access to open areas, such as subalpine woodland, recently burnt forest, recently logged forest and pine plantations (Birdlife Australia 2023).	Unlikely - although there is a recent record, this species typically occurs in the SE of SA and habitat within the Varied Project Area not preferred.
<i>Pezoporus occidentalis</i>	Night Parrot	EN	E	May occur	No records	Habitat preference includes seeding spinifex, shrubby glasswort, chenopods, saltbush and or bluebush. Distribution unclear due to the lack of reliable records in the near past. (Pizzey and Knight, 2013). Occurs in <i>Triodia</i> (Spinifex) grasslands and/or shrubby samphire and chenopod shrublands in the arid and semi-arid zones. The	Unlikely - no recent records. Outside of known distribution and habitat not suitable for this species.

Scientific Name	Common Name	Conservation Status		PMST likelihood of occurrence within 10 km	Last sighting within 10 km (year)*	Habitat Description and Distribution	Likelihood of Occurrence within Varied Project Area
		Aus.	SA				
						distribution of the Night Parrot is very poorly understood. Inhabits arid and semi-arid areas that are characterised by having dense, low vegetation. Based on accepted records, the habitat of the Night Parrot consists of <i>Triodia</i> grasslands in stony or sandy environments, and of sapphire and chenopod shrublands, including genera such as <i>Atriplex</i> , <i>Bassia</i> and <i>Maireana</i> , on floodplains and claypans, and on the margins of saltlakes, creeks or other sources of water (TSSC 2016d).	
<i>Plectorhyncha lanceolata</i>	Striped Honeyeater		R		2003	The Striped Honeyeater is found in eastern Australia, mainly inland, from the Yorke Peninsula, South Australia to the coast of New South Wales, around Toukley, and north to Charters Towers, Queensland. The Striped Honeyeater is found in forests and woodlands, often along rivers, as well as mangroves and in urban gardens (Birds in Backyards 2023).	Possible - older records, some suitable habitat within the Varied Project Area but species is uncommon in area.
<i>Polytelis anthopeplus monarchoides</i>	Regent Parrot	VU	V	Likely to occur	No records	The eastern Regent Parrot occurs in the lower Murray-Darling basin region of South Australia, New South Wales and Victoria. The Regent Parrot breeds almost entirely in River Red Gum forest and woodland, and all known breeding colonies are located along the Murray River. Typically occur within 100 km of the River in non-breeding season and can forage in mallee habitats (Baker-Gabb & Hurley 2011).	Unlikely - although some non-breeding habitat suitable for this species occurs within the Varied Project Area, this is outside of the general range for this species and there are not recent nearby records.
<i>Rhipidura rufifrons</i>	Rufous Fantail	Mi (T)		May occur	No records	Mainly inhabits wet sclerophyll forests, often in gullies dominated by eucalypts such as <i>Eucalyptus Microcorys</i> , <i>E. cypellocarpa</i> , <i>E. radiata</i> , <i>E. regnans</i> , <i>E. delegatensis</i> , <i>E. pilularis</i> or <i>E. resinifera</i> ; usually with a dense shrubby understorey often including ferns (Higgins et al 2006).	Unlikely – no recent records, is a vagrant to South Australia.

Scientific Name	Common Name	Conservation Status		PMST likelihood of occurrence within 10 km	Last sighting within 10 km (year)*	Habitat Description and Distribution	Likelihood of Occurrence within Varied Project Area
		Aus.	SA				
<i>Rostratula australis</i>	Australian Painted Snipe	EN	E	Likely to occur	No records	Occurs in shallow freshwater (occasionally brackish) wetlands, both ephemeral and permanent, such as lakes, swamps, claypans, inundated or waterlogged grassland/saltmarsh, dams, rice crops, sewage farms and bore drains, rushes and reeds, low scrub, Muehlenbeckia spp. (lignum), open timber or samphire (DSSEWPC 2013).	Unlikely – no suitable habitat within the Varied Project Area.
<i>Spatula rhynchotis</i>	Australasian Shoveler		R		2017	Prefers fresh and saline lakes and well-vegetated freshwater wetlands. Also occurs in coastal inlets, floodwaters and sewage ponds (Morcombe 2021). Wetlands with areas of open water and dense aquatic vegetation such as swamps, freshwater lakes ephemeral floodwaters. They also inhabit estuaries and tidal flats, with brackish to saline water (Mdahlem 2022).	Possible – some suitable habitat in the ephemeral creek lines.
<i>Stagonopleura guttata</i>	Diamond Firetail	VU	V	Known to occur	2020	Diamond firetails occur in eucalypt, acacia or casuarina woodlands, open forests and other lightly timbered habitats, including farmland and grassland with scattered trees (Higgins et al. 2007). They prefer areas with relatively low tree density, few large logs, and little litter cover but high grass cover (Antos et al. 2008).	Highly Likely/Known - recent records and observed during field survey in March 2022 and October 2022.
<i>Tringa nebularia</i>	Common Greenshank	EN, Mi		Likely to occur	2006	This species is found in a wide variety of inland wetlands and sheltered coastal habitats of varying salinity. It occurs in sheltered coastal habitats, typically with large mudflats and saltmarsh, mangroves or seagrass. Habitats include embayments, harbours, river estuaries, deltas and lagoons and are recorded less often in round tidal pools, rock-flats and rock platforms (Higgins & Davies, 1996).	Unlikely - no suitable habitat within the Varied Project Area.

Scientific Name	Common Name	Conservation Status		PMST likelihood of occurrence within 10 km	Last sighting within 10 km (year)*	Habitat Description and Distribution	Likelihood of Occurrence within Varied Project Area
		Aus.	SA				
<i>Turnix varius</i> ssp. <i>varius</i>	Painted Buttonquail		R		2018	These birds range almost continuously, in appropriate habitat, from about the Atherton Tableland in Qld, round the coast to the EP and north to the southern Flinders Ranges in SA, avoiding only the driest regions of Qld and NSW. Temperate and eastern tropical forests and woodlands form the habitats of this species (Morcombe 2021).	Likely - some suitable habitat within the Varied Project Area, recent records nearby.
<i>Tyto novaehollandiae</i> <i>novaehollandiae</i>	Masked Owl		E		1900	The Australian masked owl inhabits timbered areas, often with a shrub understorey. In Australia they are seldom found more than 300 km inland. They roost and nest in large tree hollows near foraging areas (ALA 2023).	Unlikely - no recent records and outside of known distribution.
<i>Zanda funerea</i> <i>whiteae</i>	Yellow-tailed Black Cockatoo		V		2020	Occurs in coastal heath, woodland and forest. Increasingly recorded in pine plantations and trees in urban and rural areas (Birds SA 2023).	Possible - some suitable habitat in the Varied Project Area, recent records nearby.
<i>Zoothera lunulata</i> ssp. <i>halmaturina</i>	South Australian Bassian Thrush Southern FR, MLR, KI	EN	V	Likely to occur	2012	The subspecies mostly inhabits damp eucalypt forest or woodland. Its habitat consists of densely forested areas and gullies, usually with a thick canopy overhead, a thick understorey of small trees and tall shrubs, and leaf-litter below (DAWE 2022).	Unlikely - no suitable habitat within the Varied Project Area, recent record is closer to the ranges.
MAMMALS							
<i>Isodon obesulus</i> ssp. <i>obesulus</i>	Southern Brown Bandicoot	EN	V	May occur	No records	This species prefers dense ground cover, tall grass and low shrubbery. They live near swamps and rivers as well as in thick scrub in drier areas. They make their nests on the ground and in logs. The nests consist of sticks, leaves, grass, and soil (TSSC 2016e).	Unlikely - no suitable habitat within the Varied Project Area, no recent records.
<i>Nyctophilus corbeni</i>	Corben's Long-eared Bat, South-eastern Long-eared Bat	VU	V	May occur	No records	Most of this species range in the Murray Darling Basin. The species is uncommon within this distribution and is rarely recorded. In South Australia the species occurs in the far east of the state, with records north of the Murray River, and	Unlikely - No recent records and outside of known range of this species.

Scientific Name	Common Name	Conservation Status		PMST likelihood of occurrence within 10 km	Last sighting within 10 km (year)*	Habitat Description and Distribution	Likelihood of Occurrence within Varied Project Area
		Aus.	SA				
						south of the Barrier Highway. Found in a wide range of inland woodland vegetation types. These include box / ironbark / cypress pine woodlands, Buloke woodlands, Brigalow woodland, Belah woodland, smooth-barked apple woodland, river red gum forest, black box woodland, and various types of tree mallee (TSSC 2015).	
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	VU	R	Likely to occur	2020	Grey-headed Flying-foxes forage up to 40 km from their roost at Botanic Park each night. Food plants are typically planted trees, both native and exotic, that provide fruit or a rich source of nectar (DAWE 2021).	Likely - flowering and fruiting trees and shrubs in the Varied Project Area may provide foraging habitat for this species. Recent nearby records.
<i>Trichosurus vulpecula</i>	Common Brushtail Possum		R		2002	Utilises various woodland habitats and suburban environs. Feeds on flowers, fruit, buds and leaves of native vegetation. Requires hollows (within dead or alive tree) or on ground for daytime nesting (Strahan & van Dyck 2008). Anywhere where trees with suitable hollows occur, including open forests and woodlands but also urban areas and cities. The species can be common in urban areas (Strahan, 2004).	Likely – older records, but some suitable habitat within the Varied Project Area.
REPTILES							

Scientific Name	Common Name	Conservation Status		PMST likelihood of occurrence within 10 km	Last sighting within 10 km (year)*	Habitat Description and Distribution	Likelihood of Occurrence within Varied Project Area
		Aus.	SA				
<i>Aprasia pseudopulchella</i>	Flinders Ranges Worm-lizard	VU		May occur	No records	Known from the FR of SA, extending south to the western slopes and northern and central MLR. The species inhabits open woodland, native tussock grassland, riparian habitats, and rocky isolates, preferring stony or clay soils with a stony / rocky surface, but has also been found sheltering in soil beneath stones and rotting stumps (Commonwealth Government, 2008). It occurs in open woodland, native tussock grassland, riparian habitats and rocky isolates (DEWHA 2008c).	Possible - suitable rocky habitat exists within Varied Project Area, however outside of known distribution by approximate 25-30 km, although survey effort in area may not be adequate to detect this species.
<i>Egernia cunninghami</i>	Cunningham's Skink		E		2021	Found in rocky outcrops with large crevices in higher rainfall open woodland. Within the Mount Lofty Ranges the preferred broad vegetation groups are Grassy Woodland, Coastal and Heathy Forest (DEH 2008b).	Possible – generally outside of known distribution of the species, however recent record approximately 10 km from site.
<i>Morelia spilota</i>	Carpet Python		R		2020	Occurs in the semi-desert areas of SA. Prefers dry sclerophyll forests and areas with ground cover and logs (Willson and Bignall 2009).	Possible – recent records, some suitable habitat within the Varied Project Area.
<i>Tiliqua adelaidensis</i>	Pygmy Blue-tongue Lizard	EN	E	May occur	No records	Fragmented populations known from across the mid-north of SA, with unknown population size. Occurs in a variety of habitats, ranging from highly degraded grasslands to grasslands of high biodiversity, sparse to moderate coverage, preferably on lower slopes. The species uses empty spider burrows (trapdoor, wolf spider) as refuges and basking sites and requires these to occur in moderate abundance in the landscape. Historically (pre-1992), the species was found in chenopod and mallee scrublands with compacting or crusty sand soils associated with hollow mallee lignotubers and near surface limestone sheets (Duffy et al. 2012).	Possible - <i>Lomandra</i> spp. and grassland habitat located within Varied Project Area. However, no individuals observed during previous field survey.

Green shading = known / highly likely or likely to occur, orange shading = possible to occur

Conservation status:

Aus: Australia (EPBC Act). **SA:** South Australia (NPW Act). **Conservation Codes:** CE: Critically Endangered. EN/E: Endangered. VU/V: Vulnerable. R: Rare.

PMST result: Likelihood of species or species habitat to occur within 5 km of the Varied Project Area.

Source of Information:

1: PMST (DCCEEW 2023a) – 5 km buffer applied to Varied Project Area;

2: BDBSA (DEW 2023b) – 5 km buffer applied to Varied Project Area;

11.2 Appendix 2. Flora species identified within the Varied Project Area in 2013 and 2022.

Scientific name	Common name	Conservation rating		Exotic	Year of survey	
		EPBC	NPW		2013	2022
<i>Acacia argyrophylla</i>	Silver Mulga-bush				✓	
<i>Acacia cyclops</i>				Y	✓	
<i>Acacia euthycarpa</i>	Wallowa				✓	✓
<i>Acacia ligulata</i>	Umbrella Bush				✓	
<i>Acacia oswaldii</i>	Umbrella Wattle				✓	
<i>Acacia paradoxa</i>	Kangaroo Thorn				✓	✓
<i>Acacia pycnantha</i>	Golden Wattle				✓	✓
<i>Acacia salicina</i>	Willow Wattle				✓	
<i>Acacia</i> sp.	Wattle					✓
<i>Acaena echinata</i>	Sheep's Burr				✓	✓
<i>Acaena novae-zelandiae</i>	Biddy-biddy					✓
<i>Acetosella vulgaris</i>	Sorrel			Y	✓	
<i>Acrotriche patula</i>	Prickly Ground-berry				✓	
<i>Adiantum aethiopicum</i>	Common Maiden-hair				✓	
<i>Aira</i> sp.	Hair-grass			Y	✓	✓
<i>Aizoon pubescens</i>	Coastal Galenia			Y		✓
<i>Alectryon oleifolius</i> ssp. <i>canescens</i>	Bullock Bush				✓	
<i>Allocasuarina verticillata</i>	Drooping Sheoak				✓	✓
<i>Amyema miquelii</i>	Box Mistletoe					✓
<i>Arctotheca calendula</i>	Cape Weed			Y	✓	✓
<i>Aristida behriana</i>	Brush Wire-grass				✓	✓
<i>Aristida contorta</i>	Curly Wire-grass				✓	
<i>Aristida holathera</i> var. <i>holathera</i>	Tall Kerosene Grass				✓	
<i>Arthropodium</i> sp.	Vanilla-lily					✓
<i>Arthropodium strictum</i>	Common Vanilla-lily				✓	✓
<i>Arundo donax</i>	Giant Reed			Y	✓	
<i>Asparagus asparagoides</i> f. <i>asparagoides</i>				Y	✓	
<i>Asperula conferta</i>	Common Woodruff				✓	
<i>Asphodelus fistulosus</i>	Onion Weed			Y	✓	
<i>Asplenium flabellifolium</i>	Necklace Fern				✓	
<i>Atriplex semibaccata</i>	Berry Saltbush				✓	✓
<i>Austrostipa blackii</i>	Crested Spear-grass				✓	
<i>Austrostipa drummondii</i>	Cottony Spear-grass				✓	
<i>Austrostipa elegantissima</i>	Feather Spear-grass				✓	✓
<i>Austrostipa nitida</i>	Balcarra Spear-grass					✓
<i>Austrostipa nodosa</i>	Tall Spear-grass				✓	
<i>Austrostipa puberula</i>	Fine-hairy Spear-grass					✓
<i>Austrostipa pubinodis</i>	Long-shaft Spear-grass				✓	
<i>Austrostipa scabra</i> group	Falcate-awn Spear-grass				✓	✓
<i>Austrostipa scabra</i> ssp.	Rough Spear-grass					✓

Palmer Wind Farm Variation Application - Flora and Fauna Impact Assessment

Scientific name	Common name	Conservation rating		Exotic	Year of survey	
		EPBC	NPW		2013	2022
<i>Austrostipa setacea</i>	Corkscrew Spear-grass				✓	
<i>Austrostipa</i> sp.	Spear-grass				✓	✓
<i>Avena barbata</i>	Bearded Oat			Y	✓	✓
<i>Beyeria lechenaultii</i>	Pale Turpentine Bush				✓	
<i>Boerhavia</i> sp.	Tar-vine				✓	
<i>Bolboschoenus medianus</i>	Marsh Club-rush				✓	
<i>Boronia coerulescens</i> ssp. <i>coerulescens</i>	Blue Boronia				✓	
<i>Bougainvillea</i> sp.				Y	✓	
<i>Brachychiton</i> sp.				Y		✓
<i>Brachypodium distachyon</i>	False Brome			Y		✓
<i>Brachyscome ciliaris</i> var.	Variable Daisy				✓	
<i>Brachyscome</i> sp.	Native Daisy					✓
<i>Brassica tournefortii</i>				Y	✓	
<i>Briza maxima</i>	Large Quaking-grass			Y	✓	✓
<i>Briza minor</i>	Lesser Quaking-grass			Y		✓
<i>Bromus diandrus</i>	Great Brome			Y	✓	✓
<i>Bromus hordeaceus</i> ssp. <i>hordeaceus</i>	Soft Brome			Y	✓	
<i>Bromus rubens</i>	Red Brome			Y	✓	✓
<i>Bulbine bulbosa</i>	Bulbine-lily					✓
<i>Burchardia umbellata</i>	Milkmaids					✓
<i>Bursaria spinosa</i> ssp. <i>spinosa</i>	Sweet Bursaria				✓	✓
<i>Caesia calliantha</i>	Blue Grass-lily					✓
<i>Callistemon rugulosus</i>					✓	
<i>Callitris gracilis</i>	Southern Cypress Pine				✓	
<i>Calostemma purpureum</i>	Pink Garland-lily				✓	✓
<i>Calostemma</i> sp.	Garland-lily					✓
<i>Carduus</i> sp.	Thistle			Y	✓	
<i>Carex</i> sp.	Sedge				✓	
<i>Carrichtera annua</i>	Ward's Weed			Y	✓	
<i>Carthamus lanatus</i>	Saffron Thistle			Y	✓	
<i>Cassinia laevis</i>	Curry Bush				✓	
<i>Cassinia uncata</i>					✓	
<i>Chamaecytisus palmensis</i>				Y	✓	
<i>Cheilanthes austrotenuifolia</i>	Annual Rock-fern				✓	✓
<i>Cheilanthes</i> sp.	Rock-fern					✓
<i>Chenopodium album</i>	Fat Hen					✓
<i>Chloris truncata</i>	Windmill Grass				✓	✓
<i>Chloris virgata</i>	Feather-top Rhodes Grass					✓
<i>Chondrilla juncea</i>	Skeleton Weed			Y	✓	
<i>Chrysocephalum</i> sp.	Everlasting				✓	
<i>Clematis microphylla</i>	Old Man's Beard				✓	
<i>Convolvulus angustissimus</i>	Narrow-leaf Bindweed				✓	✓
<i>Convolvulus arvensis</i>	Field Bindweed			Y	✓	

Palmer Wind Farm Variation Application - Flora and Fauna Impact Assessment

Scientific name	Common name	Conservation rating		Exotic	Year of survey	
		EPBC	NPW		2013	2022
<i>Convolvulus erubescens</i> complex					✓	
<i>Convolvulus remotus</i>	Grassy Bindweed				✓	
<i>Correa glabra</i> var.					✓	
<i>Correa</i> sp.	Correa					✓
<i>Cotula coronopifolia</i>	Water Buttons			Y	✓	
<i>Crassula alata</i> var. <i>alata</i>	Three-part Crassula					✓
<i>Crassula colorata</i> var.	Dense Crassula				✓	
<i>Crassula</i> sp.	Crassula/Stonecrop					✓
Cruciferae sp.	Cress Family				✓	
<i>Cucumis myriocarpus</i>	Paddy Melon			Y	✓	
<i>Cullen australasicum</i>	Tall Scurf-pea				✓	
<i>Cupressus macrocarpa</i>	Monterey Cypress			Y	✓	
<i>Cymbopogon ambiguus</i>	Lemon-grass				✓	✓
<i>Cymbopogon oblectus</i>	Silky-head Lemon-grass				✓	
<i>Cynara cardunculus</i> ssp. <i>flavescens</i>	Artichoke Thistle			Y	✓	✓
<i>Cynodon dactylon</i> var. <i>dactylon</i>	Couch			Y	✓	
<i>Cyperus gymnocaulos</i>	Spiny Flat-sedge				✓	✓
<i>Cyperus</i> sp.	Flat-sedge					✓
<i>Cyperus vaginatus</i>	Stiff Flat-sedge				✓	✓
<i>Dactylis glomerata</i>	Cocksfoot			Y	✓	✓
<i>Dianella brevicaulis</i>	Short-stem Flax-lily				✓	
<i>Dianella revoluta</i> var.					✓	
<i>Dichondra repens</i>	Kidney Weed				✓	
<i>Disa bracteata</i>	South African Weed Orchid			Y		✓
<i>Dissocarpus biflorus</i> var. <i>biflorus</i>	Two-horn Saltbush				✓	
<i>Dodonaea viscosa</i> ssp.	Sticky Hop-bush				✓	✓
<i>Drosera peltata</i>	Pale Sundew				✓	✓
<i>Echium plantagineum</i>	Salvation Jane			Y	✓	✓
<i>Ehrharta calycina</i>	Perennial Veldt Grass			Y		✓
<i>Ehrharta longiflora</i>	Annual Veldt Grass			Y	✓	
<i>Einadia nutans</i> ssp.	Climbing Saltbush				✓	✓
<i>Elymus scaber</i> var. <i>scaber</i>	Native Wheat-grass				✓	
<i>Enchylaena tomentosa</i> var. <i>tomentosa</i>	Ruby Saltbush				✓	✓
<i>Enneapogon nigricans</i>	Black-head Grass				✓	✓
<i>Eremophila alternifolia</i>	Narrow-leaf Emubush				✓	
<i>Eremophila longifolia</i>	Weeping Emubush				✓	
<i>Erodium botrys</i>	Long Heron's-bill			Y	✓	✓
<i>Eucalyptus brachycalyx</i>	Gilja				✓	
<i>Eucalyptus camaldulensis</i> ssp. <i>camaldulensis</i>	River Red Gum				✓	✓
<i>Eucalyptus cladocalyx</i>	Sugar Gum				✓	
<i>Eucalyptus falcata</i>				Y	✓	
<i>Eucalyptus fasciculosa</i>	Pink Gum		R		✓	✓

Palmer Wind Farm Variation Application - Flora and Fauna Impact Assessment

Scientific name	Common name	Conservation rating		Exotic	Year of survey	
		EPBC	NPW		2013	2022
<i>Eucalyptus gomphocephala</i>				Y	✓	
<i>Eucalyptus gracilis</i>	Yorrell				✓	
<i>Eucalyptus incrassata</i>					✓	
<i>Eucalyptus leucoxylon</i> ssp.	South Australian Blue Gum				✓	
<i>Eucalyptus maculata</i>				Y	✓	
<i>Eucalyptus odorata</i>	Peppermint Box				✓	✓
<i>Eucalyptus phenax</i> ssp. <i>phenax</i>	White Mallee				✓	
<i>Eucalyptus porosa</i>	Mallee Box				✓	
<i>Eucalyptus socialis</i> ssp.	Red Mallee				✓	
<i>Euphorbia drummondii</i> group					✓	✓
<i>Eutaxia microphylla</i>	Common Eutaxia				✓	✓
<i>Festuca</i> sp.	Fescue			Y	✓	
<i>Ficinia nodosa</i>	Knobby Club-rush				✓	✓
<i>Ficus macrophylla</i>	Moreton Bay Fig			Y	✓	
<i>Foeniculum vulgare</i>	Fennel			Y	✓	
<i>Fraxinus angustifolia</i> ssp. <i>angustifolia</i>	Desert Ash			Y	✓	
<i>Fumaria muralis</i> ssp.	Wall Fumitory			Y	✓	
<i>Fumaria officinalis</i> ssp. <i>officinalis</i>	Common Fumitory			Y		✓
<i>Fumaria</i> sp.	Fumitory			Y		✓
<i>Gahnia lanigera</i>	Black Grass Saw-sedge				✓	
<i>Geranium dissectum</i>	Cut-leaf Geranium					✓
<i>Glycine canescens</i>	Silky Glycine				✓	
<i>Glycine</i> sp.	Glycine					✓
<i>Gomphocarpus cancellatus</i>	Broad-leaf Cotton-bush			Y	✓	✓
<i>Gonocarpus elatus</i>	Hill Raspwort				✓	✓
<i>Goodenia ovata</i>	Hop Goodenia				✓	
<i>Goodenia pusilliflora</i>	Small-flower Goodenia					✓
<i>Goodenia</i> sp.	Goodenia					✓
<i>Hedypnois rhagadioloides</i> ssp.				Y	✓	
<i>Helichrysum leucopsideum</i>	Satin Everlasting				✓	
<i>Helichrysum scorpioides</i>	Button Everlasting				✓	
<i>Holcus lanatus</i>	Yorkshire Fog			Y	✓	✓
<i>Hordeum vulgare</i>	Barley			Y	✓	✓
<i>Hypericum perforatum</i>				Y	✓	
<i>Hypochaeris glabra</i>	Smooth Cat's Ear			Y	✓	✓
<i>Hypochaeris radicata</i>	Rough Cat's Ear			Y		✓
<i>Iseilema</i> sp.	Flinder's-grass					✓
<i>Juncus kraussii</i>	Sea Rush				✓	
<i>Juncus pallidus</i>	Pale Rush				✓	
<i>Juncus</i> sp.	Rush					✓
<i>Juncus subsecundus</i>	Finger Rush				✓	
<i>Kennedia prostrata</i>	Scarlet Runner				✓	✓
<i>Lagurus ovatus</i>	Hare's Tail Grass			Y	✓	✓

Palmer Wind Farm Variation Application - Flora and Fauna Impact Assessment

Scientific name	Common name	Conservation rating		Exotic	Year of survey	
		EPBC	NPW		2013	2022
<i>Lasiopetalum baueri</i>	Slender Velvet-bush				✓	
<i>Lepidium africanum</i>	Common Peppercross			Y	✓	✓
<i>Leptorhynchos squamatus</i> ssp. <i>squamatus</i>	Scaly Buttons				✓	
<i>Lobelia anceps</i>	Angled Lobelia				✓	
<i>Lolium</i> sp.	Ryegrass			Y	✓	✓
<i>Lomandra collina</i>	Sand Mat-rush					✓
<i>Lomandra effusa</i>	Scented Mat-rush				✓	✓
<i>Lomandra multiflora</i> ssp.	Many-flower Mat-rush					✓
<i>Lomandra multiflora</i> ssp. <i>dura</i>	Hard Mat-rush				✓	
<i>Lycium ferocissimum</i>	African Boxthorn			Y	✓	✓
<i>Lysiana exocarpi</i> ssp. <i>exocarpi</i>	Harlequin Mistletoe				✓	
<i>Maireana brevifolia</i>	Short-leaf Bluebush				✓	
<i>Maireana enchylaenoides</i>	Wingless Fissure-plant				✓	
<i>Maireana</i> sp.	Bluebush/Fissure-plant					✓
<i>Maireana trichoptera</i>	Hairy-fruit Bluebush				✓	
<i>Malva arborea</i>	Tree Mallow			Y	✓	
<i>Malva</i> sp.	Mallow			Y	✓	
<i>Marrubium vulgare</i>	Horehound			Y	✓	✓
<i>Medicago polymorpha</i> var. <i>polymorpha</i>	Burr-medic			Y	✓	✓
<i>Medicago</i> sp.	Medic			Y	✓	✓
<i>Medicago truncatula</i>	Barrel Medic			Y	✓	
<i>Melaleuca lanceolata</i>	Dryland Tea-tree				✓	
<i>Mentha diemenica</i>	Slender Mint		R		✓	
<i>Moraea setifolia</i>	Thread Iris			Y	✓	✓
<i>Morus</i> sp.	Mulberry			Y	✓	
<i>Myoporum platycarpum</i> ssp.	False Sandalwood				✓	
<i>Nicotiana glauca</i>	Tree Tobacco			Y	✓	✓
<i>Nicotiana maritima</i>	Coast Tobacco				✓	
<i>Oenothera stricta</i> ssp. <i>stricta</i>	Common Evening Primrose			Y	✓	
<i>Olea europaea</i> ssp. <i>europaea</i>	Olive			Y	✓	✓
<i>Olearia axillaris</i>	Coast Daisy-bush					✓
<i>Onopordum acanthium</i>	Scotch Thistle			Y	✓	
<i>Onopordum acaulon</i>	Horse Thistle			Y	✓	
<i>Opuntia</i> sp.	Prickly Pear			Y	✓	
<i>Oxalis perennans</i>	Native Sorrel				✓	✓
<i>Oxalis pes-caprae</i>	Soursob			Y		✓
<i>Paronychia</i> sp.	Whitlow					✓
<i>Pauridia vaginata</i> var. <i>vaginata</i>	Yellow Star				✓	
<i>Pelargonium australe</i>	Austral Stork's-bill				✓	
<i>Pelargonium peltatum</i>	Ivy-leaf Pelargonium					✓
<i>Pennisetum setaceum</i>	Fountain Grass			Y	✓	
<i>Pentaschistis pallida</i>	Pussy Tail			Y	✓	

Palmer Wind Farm Variation Application - Flora and Fauna Impact Assessment

Scientific name	Common name	Conservation rating		Exotic	Year of survey	
		EPBC	NPW		2013	2022
<i>Petrorhagia dubia</i>	Velvet Pink			Y	✓	✓
<i>Phalaris</i> sp.	Canary Grass			Y	✓	
<i>Phoenix canariensis</i>	Canary Island Palm			Y	✓	
<i>Phragmites australis</i>	Common Reed				✓	✓
<i>Pimelea curviflora</i> var.	Curved Riceflower				✓	
<i>Pinus halepensis</i>	Aleppo Pine			Y	✓	
<i>Piptatherum miliaceum</i>	Rice Millet			Y	✓	✓
<i>Pittosporum angustifolium</i>	Native Apricot				✓	✓
<i>Poa</i> sp.	Meadow-grass/Tussock-grass					✓
<i>Podolepis rugata</i> var.	Pleated Copper-wire Daisy				✓	
<i>Podolepis tepperi</i>	Delicate Copper-wire Daisy				✓	
<i>Pogonolepis muelleriana</i>	Stiff Cup-flower				✓	
<i>Polycarpon tetraphyllum</i>	Four-leaf Allseed				✓	
<i>Polypogon monspeliensis</i>	Annual Beard-grass			Y	✓	
<i>Populus</i> sp.	Poplar			Y	✓	
<i>Portulaca</i> sp.	Purslane					✓
<i>Prostanthera behriana</i>	Downy Mintbush				✓	
<i>Prunus dulcis</i>	Almond			Y	✓	
<i>Pteridium esculentum</i>	Bracken Fern				✓	
<i>Ptilotus erubescens</i>	Hairy-tails		R		✓	
<i>Ptilotus spathulatus</i>	Pussy-tails				✓	✓
<i>Reichardia tingitana</i>	False Sowthistle			Y	✓	✓
<i>Retama raetam</i>				Y	✓	
<i>Rhagodia parabolica</i>	Mealy Saltbush				✓	
<i>Rhodanthe pygmaea</i>	Pigmy Daisy				✓	
<i>Rhodanthe</i> sp.	Everlasting				✓	
<i>Romulea rosea</i> var. <i>australis</i>	Common Onion-grass			Y	✓	✓
<i>Romulea</i> sp.	Onion-grass			Y	✓	
<i>Rosa canina</i>	Dog Rose			Y	✓	✓
<i>Rumex acetosella</i>	Sorrel					✓
<i>Rumex brownii</i>	Slender Dock				✓	
<i>Rumex crispus</i>	Curled Dock					✓
<i>Rumex</i> sp.	Dock					✓
<i>Rytidosperma caespitosum</i>	Common Wallaby-grass					✓
<i>Rytidosperma erianthum</i>	Hill Wallaby-grass				✓	
<i>Rytidosperma fulvum</i>	Leafy Wallaby-grass				✓	
<i>Rytidosperma</i> sp.	Wallaby-grass				✓	✓
<i>Salix</i> sp.	Willow			Y	✓	
<i>Salsola australis</i>	Buckbush				✓	✓
<i>Salvia verbenaca</i> var.	Wild Sage			Y	✓	✓
<i>Santalum acuminatum</i>	Quandong				✓	
<i>Scabiosa atropurpurea</i>				Y	✓	
<i>Scaevola albida</i>	Pale Fanflower				✓	✓
<i>Schinus molle</i>	Pepper-tree			Y	✓	✓
<i>Scleranthus pungens</i>	Prickly Knawel				✓	
<i>Sclerolaena diacantha</i>	Grey Bindyi				✓	

Palmer Wind Farm Variation Application - Flora and Fauna Impact Assessment

Scientific name	Common name	Conservation rating		Exotic	Year of survey	
		EPBC	NPW		2013	2022
<i>Senecio angulatus</i>				Y	✓	
<i>Senecio hypoleucus</i>	Pale Groundsel				✓	
<i>Senecio odoratus</i>	Scented Groundsel				✓	
<i>Senecio pterophorus</i>	African Daisy			Y	✓	
<i>Senecio quadridentatus</i>	Cotton Groundsel				✓	
<i>Senecio</i> sp.	Groundsel					✓
<i>Senna artemisioides</i> ssp.	Desert Senna				✓	
<i>Senna artemisioides</i> ssp. <i>coriacea</i>	Desert Senna				✓	
<i>Senna artemisioides</i> ssp. <i>petiolaris</i>					✓	
<i>Setaria constricta</i>	Knotty-butt Paspalidium				✓	
<i>Setaria jubiflora</i>	Warrego Summer-grass				✓	
<i>Sida petrophila</i>	Rock Sida				✓	
<i>Sisymbrium erysimoides</i>	Smooth Mustard			Y	✓	
<i>Solanum elaeagnifolium</i>	Silver-leaf Nightshade			Y	✓	
<i>Solanum nigrum</i>	Black Nightshade				✓	
<i>Sonchus asper</i> ssp.	Rough Sow-thistle			Y	✓	
<i>Sonchus oleraceus</i>	Common Sow-thistle			Y		✓
<i>Spyridium parvifolium</i>	Dusty Miller				✓	
<i>Tamarix aphylla</i>	Athel Pine			Y	✓	
<i>Taraxacum officinale</i>	Dandelion			Y	✓	
<i>Teucrium corymbosum</i>	Rock Germander				✓	
<i>Themeda triandra</i>	Kangaroo Grass				✓	✓
<i>Trifolium angustifolium</i>	Narrow-leaf Clover			Y	✓	✓
<i>Trifolium arvense</i> var. <i>arvense</i>	Hare's-foot Clover			Y	✓	✓
<i>Trifolium campestre</i>	Hop Clover			Y	✓	
<i>Trifolium repens</i>	White Clover			Y	✓	
<i>Triglochin procera</i>	Water-ribbons				✓	
<i>Triglochin striata</i>	Streaked Arrowgrass				✓	
<i>Triodia irritans</i>	Spinifex				✓	
<i>Trymalium wayi</i>	Grey Trymalium				✓	
<i>Typha</i> sp.	Bulrush				✓	
<i>Ulex europaeus</i>	Gorse			Y	✓	✓
<i>Urtica</i> sp.	Stinging Nettle			Y	✓	✓
<i>Velleia paradoxa</i>	Spur Velleia				✓	
<i>Verbascum virgatum</i>	Twiggy Mullein			Y	✓	
<i>Vittadinia blackii</i>	Narrow-leaf New Holland Daisy					✓
<i>Vittadinia cuneata</i> var.	Fuzzy New Holland Daisy				✓	✓
<i>Vittadinia gracilis</i>	Woolly New Holland Daisy				✓	✓
<i>Vittadinia</i> sp.	New Holland Daisy					✓
<i>Vulpia myuros</i> f.	Fescue			Y	✓	
<i>Wahlenbergia</i> sp.	Native Bluebell				✓	✓
<i>Wahlenbergia stricta</i> ssp. <i>stricta</i>	Tall Bluebell				✓	

Palmer Wind Farm Variation Application - Flora and Fauna Impact Assessment

Scientific name	Common name	Conservation rating		Exotic	Year of survey	
		EPBC	NPW		2013	2022
<i>Xanthorrhoea quadrangulata</i>	Rock Grass-tree				✓	✓
<i>Zygophyllum aurantiacum</i> ssp.	Twinleaf				✓	



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Native Vegetation Clearance

Palmer Wind Farm

Data Report

Clearance under the *Native Vegetation Regulations 2017*

27/02/2024

Prepared by H. Merigot – EBS Ecology (NVC Accredited Consultant)



Palmer Wind Farm Native Vegetation Clearance Data Report

27 February 2024

Version 3 - Final

Prepared by EBS Ecology for Tilt Renewables Australia Pty Ltd

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Glossary and abbreviations

BAM	Bushland Assessment Method
BDBSA	Biological Database of South Australia (maintained by DEW)
CEMP	<i>Construction Environmental Management Plan</i>
DCCEEW	Department of Climate Change, Energy, the Environment and Water (Commonwealth)
DEW	Department for Environment and Water (South Australia)
EBS	Environment and Biodiversity Services Pty Ltd (trading as EBS Ecology)
EPBC Act	<i>Environmental Protection and Biodiversity Conservation Act 1999</i>
ha	Hectare(s)
IBRA	Interim Biogeographical Regionalisation of Australia
km	Kilometre(s)
NatureMaps	Initiative of DEW that provides a common access point to maps and geographic information about South Australia's natural resources in an interactive online mapping format
NPW Act	<i>National Parks and Wildlife Act 1972</i>
NV Act	<i>Native Vegetation Act 1991</i>
NVC	Native Vegetation Council
PMST	Protected Matters Search Tool (under the EPBC Act; maintained by DCCEEW)
Project	Palmer Wind Farm
Varied Project Area	Farming and cropping land located 50 km northeast of Adelaide, South Australia
PWF	Palmer Wind Farm
SA	South Australia(n)
Search Area	5 km buffer of the Varied Project Area considered in the desktop assessment database searches
SEB	Significant Environmental Benefit
sp.	Species
spp.	Species (plural)
ssp.	Sub-species
TEC	Threatened Ecological Community
var.	Variety (a taxonomic rank below that of species and subspecies, but above that of form)
WTG	Wind Turbine Generator

TABLE OF CONTENTS

1. APPLICATION INFORMATION	1
2. PURPOSE OF THE CLEARANCE	4
2.1. Description.....	4
2.2. Background	5
2.3. General location map	8
2.4. Details of the proposal	9
2.5. Approvals required <i>or</i> obtained	12
2.6. Native Vegetation Regulation.....	12
2.7. Development Application information (if applicable).....	13
3. METHOD	14
3.1. Desktop assessment	14
3.1.1. Protected Matters Search Tool report	14
3.1.2. Biological Database of South Australia data extract.....	14
3.1.3. Likelihood of occurrence.....	14
3.2. Flora assessment	15
3.2.1. Bushland Assessment Method.....	15
3.3. Fauna assessment.....	16
3.3.1. Bird utilization surveys.....	16
3.3.2. Targeted Peregrine Falcon nest searches.....	19
3.3.3. Opportunistic fauna.....	19
3.4. Limitations	19
3.4.1. Spatial data limitations.....	20
4. ASSESSMENT OUTCOMES	21
4.1. Vegetation assessment.....	21
4.1.1. General description of the vegetation, the site and matters of significance.....	21
4.1.2. Details of the vegetation associates proposed to be impacted	23
4.1.3. Site map showing areas of proposed impact.....	33
4.2. Threatened Ecological Communities.....	35
4.3. Threatened species assessment	37
4.3.1. Threatened flora.....	37
4.3.2. Threatened fauna.....	41
4.4. Cumulative impacts.....	48

4.5.	Addressing the Mitigation Hierarchy	48
4.6.	Principles of Clearance (Schedule 1, <i>Native Vegetation Act 1991</i>)	51
4.7.	Risk assessment	56
5.	CLEARANCE SUMMARY	57
6.	SIGNIFICANT ENVIRONMENTAL BENEFIT	58
7.	REFERENCES	59
8.	APPENDICES	67
	Appendix 1 - Flora species recorded by the field survey (2013 and 2022).	68
	Appendix 2 - Fauna species recorded in the field survey.....	72
	Appendix 3 – Likelihood of Occurrence Assessment	75

List of Tables

Table 1.	Application details	1
Table 2.	Summary of the proposed clearance	1
Table 3.	Parcel and land information present in the Varied Project Area	4
Table 4.	Criteria for the likelihood of occurrence of threatened species within the Varied Project Area	14
Table 5.	The locations of bird survey sites.	17
Table 6.	Vegetation associations identified within the Varied Project Area	21
Table 7.	Summary of VA B2.....	23
Table 8.	Summary of VA B3.....	24
Table 9.	Summary of VA B4.....	25
Table 10.	Summary of VA C2	26
Table 11.	Summary of VA C3.....	27
Table 12.	Summary of VA C4.....	28
Table 13.	Summary of VA C5.....	30
Table 14.	Summary of VA C6.....	31
Table 15.	Summary of VA C8.....	32
Table 17.	Assessment for the presence of TECS in the Varied Project Area	35
Table 18.	Likelihood of occurrence of threatened species identified in the desktop assessment. The data source and threat levels are described in the table footer.....	38
Table 19.	Likelihood of occurrence of threatened fauna species identified in the desktop assessment. The data source and threat levels are described in the table footer.....	42
Table 20.	Assessment against the Principles of Clearance.....	51
Table 21.	Risk assessment for native vegetation clearance applications in the agricultural regions of South Australia.....	56
Table 22.	Summary of the level of risk associated with the application	56
Table 23.	Clearance summary and total Significant Environmental Benefit (SEB) obligations for vegetation associations impacted by the Project.....	57
Table 24.	Summary of the total SEB obligations of the clearance	57

Table 25. Likelihood of occurrence of threatened species identified in the desktop assessment. The data source and threat levels are described in the table footer..... 75

List of Figures

Figure 1. Location of the Varied Project Area.8

Figure 2. Location of the bird utilisation survey sites within the Varied Project Area. 18

Figure 3. Native Vegetation under application and the proposed impact of the Project, separated by Area B and Area C. Project designs provided by proponent on 24 January 2024. 34

Figure 4. Nationally and State threatened flora identified within the Search Area (DEW 2023a)..... 40

Figure 5. Nationally and State threatened fauna identified within 5 km of the Varied Project Area since 1995 (< 1 km reliability) (BDBSA Recordset number: DEWNRBDBSA230911-1) (DEW 2023a) (Map 1 of 3)..... 45

Figure 6. Nationally and State threatened fauna identified within 5 km of the Varied Project Area since 1995 (< 1 km reliability) (BDBSA Recordset number: DEWNRBDBSA230911-1) (DEW 2023a) (Map 2 of 3)..... 46

Figure 7. EBS records of threatened fauna species within the Varied Project Area and nesting habitat for Peregrine Falcons..... 47

Attachments

- Attachment 1 – Updated EPBC PMST report (pdf format)
- Attachment 2 - 11 – Bushland Assessment Method Scoresheets (B2, B3, B4, C2, C3, C4, C5, C6, C8, C9)
- Attachment 12 - Shapefile (20231201_EBS_Vegetation_DataPackage)

1. APPLICATION INFORMATION

Details of the native vegetation clearance applicant are summarised in Table 1 with a summary of the proposed clearance provided in Table 2.

Table 1. Application details.

Applicant:	Tilt Renewables Pty Ltd		
Key contact:	On behalf of Tilt Renewables Pty Ltd: Natalie Taggert E: Natalie.Taggert@tiltrenewables.com James Beckett E: James.beckett@tiltrenewables.com		
Landowner:	20 private landowners – written permission is available from the landowners consenting to the Project.		
Site Address:	On the west side of Palmer, across the suburbs of Palmer, Mount Pleasant and Tungkillo.		
Local Government Area:	Mid Murray Council	Hundred:	Tungkillo Jutland
Title ID:	Title ID's are provided in Table 3	Parcel ID	Parcel ID's are provided in Table 3

Table 2. Summary of the proposed clearance.

Purpose of clearance:	Clearance required for the construction of 40 wind turbine generators (WTGs) and associated infrastructure such as hard stands, access tracks, underground cables, two substations, 5 meteorological masts and transmission line.	
Native Vegetation Regulation:	Regulation 12, Schedule 1; clause 34, Infrastructure.	
Description of the vegetation under application:	Vegetation association	Clearance area (ha)
	<i>Austrostipa</i> sp. grassland with mixed exotic forbs and grasses	143.69
	<i>Eucalyptus camaldulensis</i> creek line with <i>Cyperus gymnocaulos</i>	0.957
	<i>Eucalyptus camaldulensis</i> and <i>Allocasuarina verticillata</i> open woodland over exotic grasses and forbs	18.04
	<i>Lomandra effusa</i> with <i>Austrostipa</i> sp. grassland and exotic mixed exotics	0
	<i>Austrostipa</i> sp. grassland with mixed exotic forbs and grasses	157.60
	<i>Eucalyptus camaldulensis</i> over <i>Cyperus gymnocaulos</i>	2.14
	<i>Eucalyptus camaldulensis</i> woodland over <i>Acacia pycnantha</i> shrubland and <i>Austrostipa</i> sp.	2.35

	<i>Eucalyptus fasciculosa</i> open woodland over <i>Austrostipa</i> sp.	15.36
	<i>Eucalyptus fasciculosa</i> open woodland with <i>Dodonaea viscosa</i> and <i>Acacia euthycarpa</i> shrubland over <i>Austrostipa</i> sp.	9.76
	<i>Xanthorrhoea quadrangulata</i> grassland with <i>Austrostipa</i> sp.	0
	<i>Ficinia nodosa</i> with <i>Juncus subsecundus</i> and <i>Cyperus gymnocaulos</i> sedgeland	1.03
	<i>Acacia euthycarpa</i> tall shrubland over <i>Austrostipa</i> sp.	0
	<i>Eucalyptus odorata</i> mallee woodland over <i>Austrostipa</i> sp.	0
Total proposed clearance – area (ha) and/or number of trees:	350.93 ha of native vegetation.	
Level of clearance:	Level 4	
Overlay (Planning and Design Code):	Native Vegetation Overlay	
Map of proposed clearance area:	Map of proposed clearance area is provided in Figure 3.	
Mitigation Hierarchy:	<p>Avoidance</p> <p>All stages of the project design have been undertaken considering vegetation mapping, threatened ecological community mapping and the known locations of threatened species populations. Whilst every effort has been made to avoid sensitive areas where possible, such as locating turbines outside of <i>Lomandra</i> spp. grasslands and Peppermint Box grassy woodlands, engineering and landscape constraints mean that clearing of native vegetation cannot be completely avoided.</p> <p>Minimization</p> <p>As far as is practicable, the development has been placed in areas with no native vegetation or avoided native vegetation in better condition or of higher conservation value. The majority of the clearance (301.28 ha) is located in the poorer quality grassland areas. The Varied Project Area has a long history of agriculture and the grassland and understorey is heavily degraded across the site. The best quality vegetation occurs in the gorges, which are being avoided. Good quality vegetation that has been avoided include the following:</p> <ul style="list-style-type: none"> • Threatened Ecological Community Iron-grass Natural Temperate Grassland of South Australia in good condition has been avoided. • The Threatened Ecological Community Peppermint Box (<i>Eucalyptus odorata</i>) Grassy Woodland of South Australia has been avoided. • Existing access tracks will be utilised wherever possible, noting the designs and geometry requirements for the transportation of WTG components. <p>Where native vegetation cannot be avoided, Tilt will minimise impact to flora and fauna, including threatened species, and avoid over clearing by implementing their <i>Construction Environmental Management Plan</i> (CEMP).</p>	

	<p>The Project will be referred under the <i>Environmental Protection and Biodiversity Conservation Act 1999</i> (EPBC Act) for the following Matters of National Environmental significance:</p> <ul style="list-style-type: none"> • Diamond Firetail (<i>Stagonopleura guttata</i>) (EPBC Act: Vulnerable; <i>National Parks and Wildlife Act 1972</i> (NPW Act): Vulnerable); • Southern Whiteface (<i>Aphelocephala leucopsis leucopsis</i>) (EPBC Act: Vulnerable); and • Hooded Robin (<i>Melanodryas cucullata cucullata</i>) (EPBC Act: Endangered; NPW: Rare). <p>The Commonwealth Department of Climate Change, Energy, the Environment and Water may require further impact minimisation measures beyond the measures listed above.</p> <p>Once known, this information can be provided if deemed required.</p> <p>Rehabilitation or restoration</p> <p>The Project includes areas of both temporary and permanent vegetation clearance. Temporary clearance areas including standalone underground cabling (not co-located with access tracks), laydown areas and temporary construction compounds will be rehabilitated according to the strategies discussed in a CEMP.</p>
SEB Offset proposal	Payment of \$1,687,351.90 which includes an admin fee of \$87,966.21 (including GST).

2. PURPOSE OF THE CLEARANCE

2.1. Description

EBS Ecology (EBS) were engaged by Tilt Renewables Pty Ltd (Tilt) (the Proponent) to prepare a Native Vegetation data report for the construction of Palmer Wind Farm (PWF) (the Project). The construction required for the Palmer Wind Farm is described in Section 2.4.

The Varied Varied Project Area is across 65 land parcels (Table 3) consisting of 20 landowners.

Table 3. Parcel and land information present in the Varied Project Area.

Parcel	Title Reference
D26866 A1	5144/864
D20944 A74	5153/319
F157755 A30	5297/468
F157755 A31	5297/468
F157755 A32	5297/468
F157755 A33	5297/468
H171000 S481	5385/990
H171000 S482	5385/990
F169891 A142	5404/721
F204303 A91	5405/94
F204303 A92	5405/94
F204303 A93	5405/94
F204303 A94	5405/94
F204303 Q95	5405/94
F204303 Q96	5405/94
D47145 A62	5408/141
H171000 S214	5409/144
F157574 A39	5421/814
F157582 A47	5421/813
F157583 A48	5421/812
H171000 B480	5421/815
H171000 S241	5433/293
H171000 S242	5433/294
H171000 S243	5433/702
H171000 S211	5473/924
H171000 S72	5479/260
H171000 S358	5578/297
F169873 A124	5732/435
F217815 A200	5756/275
F217815 A201	5756/276
F217815 A202	5756/277
F217815 A203	5756/278
F217815 A204	5756/279
F217815 A205	5756/280
H170500 S344	5761/336
H171000 S513	5762/33

Parcel	Title Reference
F218333 A17	5844/707
F218333 A18	5844/707
F218333 A19	5844/707
F218333 A20	5844/707
F218333 A21	5844/707
F218333 A22	5844/707
F169981 A232	5861/704
R4658 AA	5866/948
F43319 A23	5874/60
F169983 A234	5876/758
D1648 A9	5895/897
F169884 A135	5895/323
D20944 A75	5897/853
F169886 A137	5899/987
F43319 A20	5906/60
F43319 A21	5906/61
F43319 A22	5906/62
F43319 A26	5906/64
F43319 Q24	5906/63
F43319 Q25	5906/63
H171000 S483	6055/389
H171000 S485	6055/390
F157552 A17	6081/943
H171000 S488	6088/441
D17736 A102	6120/424
D113198 A10	6184/936
D119394 A20	6217/616
D119394 A21	6217/618
D120933 A201	6230/76

Objectives

This native vegetation assessment, in accordance with the *Native Vegetation Act 1991* (NV Act) and *Native Vegetation Regulations 2017* (the Regs), has the primary objectives to:

- Undertake a desktop assessment of the likelihood of occurrence and status of threatened flora and fauna protected under the Commonwealth EPBC Act and State NPW Act;
- Assess native vegetation within the Varied Project Area for clearance using the Native Vegetation Council (NVC) endorsed Bushland Assessment Method (BAM) in accordance with the NV Act; and
- Calculate the Significant Environmental Benefit (SEB) offset requirements for the Project based on the client supplied impact footprint.

2.2. Background

The proposed Palmer Wind Farm is located approximately 50 kilometres (km) east of Adelaide and is situated within the eastern hills of the Mount Lofty Ranges, in South Australia (SA) (Figure 1). The Varied

Project Area extends approximately 15 km in a north to south direction, centred on ridgelines, and is split into Area B (the northern area) and Area C (southern area).

The proposed total clearance area for the WTG and infrastructure is 350.93 hectares (ha).

Current and surrounding land use

Land use within the area is predominantly agricultural (e.g., grazing for sheep and cattle). Native vegetation in the area has been extensively cleared, with most of the Varied Project Area containing grasslands with large outcrops of rocks and boulders. Woodland vegetation is generally restricted within small patches and within creek lines in the north of the Varied Project Area and in there are more intact woodlands and shrublands as well as larger areas of scattered trees with minimal native understorey.

Administrative boundaries

The Varied Project Area occurs within the Mid-Murray Local Government Area and the Murraylands and Riverland Landscape Management Region, Sturt county, and the Tungkillo and Jutland hundreds (DEW 2023a).

Bioregions

The Interim Biogeographical Regionalisation of Australia (IBRA) identifies geographically distinct bioregions based on common climate, geology, landform, native vegetation, and species information. The bioregions are further refined into subregions and environmental associations. The Varied Project Area is located in the Kanmantoo IBRA bioregion, Fleurieu subregion, and Scotts Hill and Eden Valley environmental associations.

Approximately 12 percent (%) (45,372 ha) of the Fleurieu IBRA Subregion and approximately 6% (3,934 ha) and 10% (9,673 ha) of the Eden Valley and Scotts Hill IBRA Environmental Association respectively is mapped as remnant vegetation. Of this, 24% (10,865 ha), 3% (100 ha) and 5% (464 ha) is formerly conserved and protected, respectively.

2.3. General location map

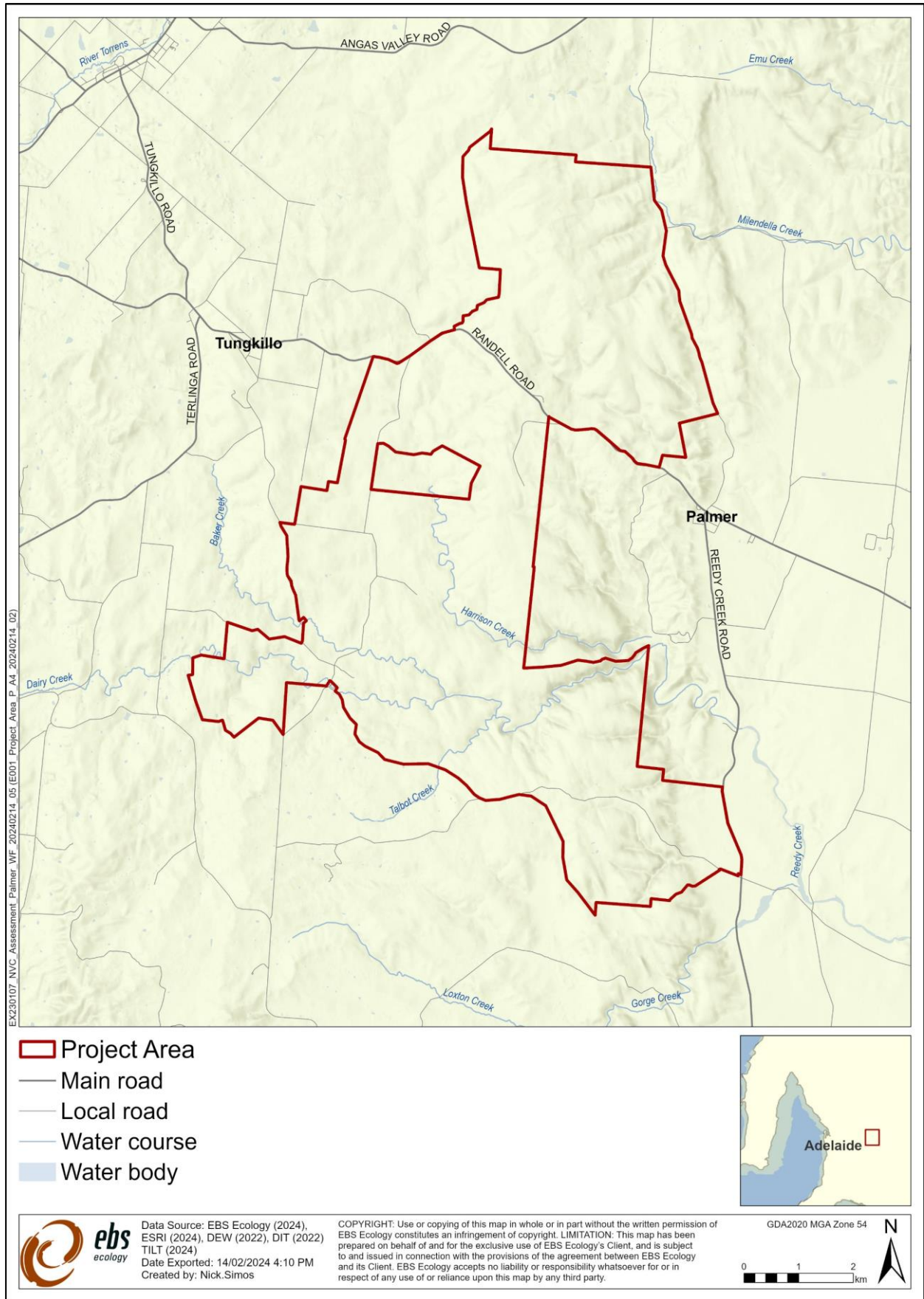


Figure 1. Location of the Varied Project Area.

2.4. Details of the proposal

The proposal involves the construction and operation of 40 WTGs and associated infrastructure for PWF.

Wind Turbine Generators

The 40 WTGs will have a maximum height of 220 m, a maximum blade length of 90 m, a maximum rotor diameter of 180 m and a maximum hub height of 130 m. Blades will have non-reflective coatings. Footings may be either a mass concrete footing (raft style), pile-type rock anchors, or a combination of both, the vast majority of which would be buried. Each WTG will also have a crane hardstand area.

Hardstands/Facility Benches:

- Approx. 20m from toe of batter
- 20m x 40m area for temporary backfill stockpile near hardstand.

Access tracks

Access tracks will be constructed throughout PWF. The access tracks will be up to 10 m wide during the construction phase to accommodate construction activities and cranes and designed to be of acceptable gradient for South Australian Country Fire Service (CFS) vehicles. Following construction, access tracks will be rehabilitated and reduced to the minimum widths requested by CFS. Where required, stormwater drainage, such as open swale drains of between 1-3 m in width, will be constructed adjacent to access tracks. In addition, in some sections of access track, batter slopes of between approximately 1-5 m may be required. A 10 m clearance buffer from the toe of the batter has been applied to the expected impact area to account for unforeseen changes to the designs (such as increased size of batter slopes).

The proposed total clearance area includes the following buffers within the design:

Wind Farm Access Tracks

- Approx. 10m from toe of batter.
- Waterway crossings = min.20m from toe of batter.

Transmission Line Access Tracks + Benches

- Approx. 10m from toe of batter.

Met Mast Access Tracks + Benches

- Approx. 10m from toe of batter.

Underground cables

Underground cabling will connect the WTGs to the Substations. Underground cabling for electrical transmission (33 Kilovolt) and communications (fibre) will generally be located immediately adjacent to access tracks. It will be installed via trenching, which will be approximately 500 millimetres (mm) wide per circuit and approximately 1.2m deep, with 900 mm coverage over the top of the cables. However, along access track alignments, the impact width during installation will be approximately 10 m for single cables, 15 m for two cables, plus 3 m for each additional cable, as required, with a maximum of 8 cable circuits in

Palmer Wind Farm Native Vegetation Clearance Data Report
some locations. For cables in open paddocks, the installation of one cable will be 15 m, 2 cables 18 m and 3 m for every additional cable above 2 cables. These estimates include a clearance buffer to account for unforeseen changes.

Cables (Following Access Track Alignments)

- Extra buffer on top of general disturbance:
- 1 cable = 10m corridor.
- 2 cables = 15m corridor.
- 3+ cables = additional 3m per cable above 2 cables.

Cables (Open Paddocks)

- 1 cable = 15m corridor.
- 2 cables = 18m corridor.
- 3+ cables = additional 3m per cable above 2 cables.

Junction Boxes

- Additional 15m corridor width at junction box locations, for 30m span.

Temporary construction compound and substations

Two substations will be established within the Varied Project Area and an overhead transmission line that runs the length of the Varied Project Area. A fenced construction compound area of approximately 300 m x 300 m will be required and will include a site office, staff facilities, a workshop, carpark and laydown/storage area. This will only be a temporary facility and will be rehabilitated post construction.

Meteorological Masts (met mast)

Five permanent met masts will be installed within the Varied Project Area during construction. Designs for the location of the met masts and tracks and the design of the met mast are still in development. The location of 10 met masts have been included in the disturbance footprint, however, only 5 will be installed. Currently a 10 m disturbance buffer has been applied to the access tracks and benches, but the required clearance for these is expected to be less.

2.5. **Approvals required or obtained**

Approvals or applications under the follow legislation are required:

- **Native Vegetation Act 1991 (NV Act)** – this data report is supplied to fulfil requirements under the NV Act.
- **Planning, Development and Infrastructure Act 2016 (PDI Act)** – Approval is required for this Project.
- **Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)** – A referral will be made to confirm whether assessment and approval under the Act is required.
- **National Parks and Wildlife Act 1972 (NPW Act)** – EBS has the required flora collection permit (K25613-22).
- **Landscape South Australia Act 2019 (LSA Act)** – A water affecting activity permit may be required for the proposed Project. Environmental management plans should consider the impact of erosion / runoff into the Baker River and Harrison Creek River. Several Declared Weeds were observed in the Varied Project Area. All land managers have a duty to manage environmental and Declared Weeds on their property. A permit to transport Declared Weeds on a public road may be required for the proposed Project (i.e., for contaminated topsoil which may be removed from site).
- **Aboriginal Heritage Act 1988** – Approval will be required if any sites, objects or remains are uncovered during the works.

2.6. **Native Vegetation Regulation**

Clearance is sought under **Regulation 12(34) – Infrastructure** to allow clearance of vegetation in connection with:

- (a) The infrastructure, equipment, structures, works and other facilities used in or in connection with the supply of water or electricity, gas or other forms of energy, the provision of telecommunications, or the drainage, removal or treatment of wastewater or sewage; or
- (b) Roads and their supporting structures or works; or
- (c) Ports, wharfs, jetties, railways, trams and busways.

The requirements of the Proponent to undertake clearance for the construction of infrastructure include:

- Clearance Application to the NVC.
- Provision of sufficient information for the NVC to assess the level of risk to biodiversity.
- Calculation of the SEB obligations required to offset the clearance.
- Development of a SEB Management Plan to be approved by the NVC if providing an on-ground SEB.
- Provision of an SEB in accordance with an on ground offset or payment into the Native Vegetation Fund.

2.7. Development Application information (if applicable)

This document is being submitted as part of the Development Application.

3. METHOD

3.1. Desktop assessment

A desktop assessment was undertaken to determine the potential for any threatened fauna species and Threatened Ecological Communities (TECs) (both Commonwealth and State listed) to occur within the Varied Project Area. This was achieved by undertaking database searches using a 5 km buffer of the Varied Project Area (Search Area).

3.1.1. Protected Matters Search Tool report

An updated PMST report was generated on 14 February 2023 (Attachment 1) to identify nationally threatened flora and fauna, migratory fauna and TECs under the EPBC Act relevant to the Varied Project Area (DCCEEW 2023). Only species and TECs identified in the PMST report that are likely or known to occur within the Search Area were assessed for their likelihood of occurrence within the Varied Project Area.

3.1.2. Biological Database of South Australia data extract

A data extract from the Biological Database of South Australia (BDBSA) was obtained from the Department for Environment and Water (DEW) to identify flora and fauna species that have been recorded within 5 km of the Varied Project Area (data extracted 13 June 2023; DEW 2023b Recordset number: DEWNRBDBSA230614-1).

The BDBSA is comprised of an integrated collection of species records from the South Australian Museum, conservation organisations, private consultancies, Birds SA, Birdlife Australia and the Australasian Wader Study Group, which meet the Department for Environment and Water's (DEW) standards for data quality, integrity and maintenance. Only species with records since 1995 and a spatial reliability of less than 1 km were assessed for their likelihood of occurrence.

3.1.3. Likelihood of occurrence

The criteria for the likelihood of occurrence of threatened species within the Varied Project Area are described in Table 4.

Table 4. Criteria for the likelihood of occurrence of threatened species within the Varied Project Area.

Likelihood	Criteria
Highly Likely/Known	Recorded in the last 10 years, the species does not have highly specific niche requirements, the habitat is present and falls within the known range of the species distribution or; The species was recorded as part of field surveys.
Likely	Recorded within the previous 20 years, the area falls within the known distribution of the species and the area provides habitat or feeding resources for the species.

Likelihood	Criteria
Possible	<p>Recorded within the previous 20 years, the area falls inside the known distribution of the species, but the area provides limited habitat or feeding resources for the species.</p> <p>Recorded within 20 - 40 years, survey effort is considered adequate, habitat and feeding resources present, and species of similar habitat needs have been recorded in the area.</p>
Unlikely	<p>Recorded within the previous 20 years, but the area provides no habitat or feeding resources for the species, including perching, roosting or nesting opportunities, corridor for movement or shelter.</p> <p>Recorded within 20 - 40 years; however, suitable habitat does not occur, and species of similar habitat requirements have not been recorded in the area.</p> <p>No records despite adequate survey effort.</p>

3.2. Flora assessment

The flora assessment was undertaken by NVC Accredited Consultant Accredited Consultant H. Merigot, with assistance of E. West, P. Drummond and G. Wilson on the 17th – 21st October 2022 in accordance with the BAM (NVC 2020a).

3.2.1. Bushland Assessment Method

The BAM is derived from the Nature Conservation Society of South Australia's Bushland Condition Monitoring methodology (Croft *et al.* 2007, 2008a, 2008b, 2009; Milne and Croft 2012; Milne and McCallum 2012). The BAM is used to assess areas of native vegetation requiring clearance and calculate the SEB requirements.

Details of site selection/stratification and assessment protocols, and the biodiversity value components assessed and the factors that influence these components are outlined in the *Bushland Assessment Manual* (NVC 2020a).

The Conservation Significance Scores were calculated from direct observations of flora and direct and historical observations of fauna species of conservation significance. All fauna identified as known or likely to occur in the PMST, and fauna with BDBSA records since 1995 and with a spatial reliability of less than 1 km, within 5 km of the Varied Project Area, were included in the BAM scoresheets. Species determined as unlikely to occur within the Varied Project Area will be removed by the Native Vegetation Branch if the finding is supported. Marine and/or wetland species were omitted from the scoresheets given the Varied Project Area is terrestrial.

3.3. Fauna assessment

Fauna surveys have been conducted at PWF in 2013 and in 2022-2023. In 2022 fauna surveys were conducted in conjunction with the BAM flora assessment and separately as Bird Utilisation surveys. All native and exotic fauna species opportunistically encountered (directly observed, or tracks, scats, burrows, nests, and other signs of presence) during the native vegetation clearance assessment were recorded. Potential fauna refuge sites, such as hollows, were noted as an indication of availability of suitable habitat. Particular attention was paid to identifying habitat for threatened species identified in the desktop assessment. For each opportunistic fauna observation, the species, number of individuals, GPS location, detection methodology (sight, sound, or sign) and habitat were recorded.

3.3.1. Bird utilization surveys

A total of 14 bird sites were surveyed at PWF in October 2022, January 2023, April 2023, July 2023, October 2023 and February 2024. Further seasonal bird surveys will be completed in Autumn and Winter 2024 to record 2 years of seasonal bird utilisation survey data for the Varied Project Area. The bird surveys were undertaken over five days in October 2022 and three days for each subsequent survey. The Bird Utilisation Surveys (BUS) were conducted utilising methods consistent with Birdlife Australia Systematic Bird surveys (2-ha, 20 minute search) (Birdlife, 2022) recommended survey method (as per the Guidelines for Detecting Birds Listed as Threatened under the *Environment Protection and Biodiversity Conservation Act 1999* (Magrath et al. 2010) and Department of Environment and Water (DEW) biological survey methods (Owens 2000).

The surveys were conducted twice at each site, once in the morning and once in the afternoon. The locations of the 14 bird sites are listed in Table 5 and Figure 2. Data collected for each observation were as follows:

- Species observed;
- Number of individuals;
- Height above ground (m) (minimum and maximum);
- Distance from observer (m);
- Behaviour:
 - o Flying in a single direction;
 - o Flying (hovering or circling) over or around a single point;
 - o Foraging (feeding) on ground;
 - o Perching/resting/walking on ground OR climbing on trees or shrubs; and
- Direction of flight where relevant.