SHIRE OF KOJONUP

Kojonup

One community, many choices

AGENDA

Special Council Meeting

13 September 2022

TO: THE SHIRE PRESIDENT AND COUNCILLORS

NOTICE is hereby given that a Special Meeting of the Council will be held in the Council Chambers, Administration Building, 93 Albany Highway, Kojonup on Tuesday, 13 September 2022 commencing at 3:00pm.

I certify that with respect to all advice, information or recommendation provided to the Council in or with this Agenda:

i. The advice, information or recommendation is given by a person who has the qualifications or experience necessary to give such advice, information or recommendation; and
ii. Where any advice is directly given by a person who does not have the required qualifications or experience, that person has obtained and taken into account in that person's general advice the advice from an appropriately qualified or experienced person.

GRANT THOMPSON
CHIEF EXECUTIVE OFFICER
9 September 2022

AGENDA FOR THE SPECIAL COUNCIL MEETING TO BE HELD ON 13 SEPTEMBER 2022

TABLE OF CONTENTS

1 DECLARATION OF OPENING AND ANNOUNCEMENT OF GUESTS 4

2 ANNOUNCEMENTS FROM THE PRESIDING MEMBER 5

3 ATTENDANCE 5

3.1 APOLOGIES 5
3.2 APPROVED LEAVE OF ABSENCE 5

4 DECLARATION OF INTEREST 5

5 PUBLIC QUESTION TIME 5

5.1 RESPONSE TO PREVIOUS PUBLIC QUESTIONS TAKEN ON NOTICE 5
5.2 PUBLIC QUESTION TIME 5

6 CONFIRMATION OF MINUTES 5

7 PRESENTATIONS 6

7.1 PETITIONS 6
7.2 PRESENTATIONS 6
7.3 DEPUTATIONS 6
7.4 DELEGATES' REPORTS 6

8 METHOD OF DEALING WITH AGENDA BUSINESS 6

9 REPORTS 6

9.1 KEY PILLAR 1 – 'PLACE' REPORTS 6

9.2 KEY PILLAR 2 – 'CONNECTED' REPORTS 6

9.3 KEY PILLAR 3 – 'PERFORMANCE' REPORTS 6

9.4 KEY PILLAR 5 – 'PROSPERITY' REPORTS 7

9.4.1 MOONIES HILL ENERGY PTY LTD – ASSESSMENT OF MANAGEMENT PLANS 7

9.5 KEY PILLAR 5 – 'DIGITAL' REPORTS 11

10 APPLICATIONS FOR LEAVE OF ABSENCE 12

11 MOTIONS OF WHICH PREVIOUS NOTICE HAS BEEN GIVEN 12

12 QUESTIONS FROM MEMBERS WITHOUT NOTICE 12

13 NEW BUSINESS OF AN URGENT NATURE INTRODUCED BY DECISION OF THE MEETING 12

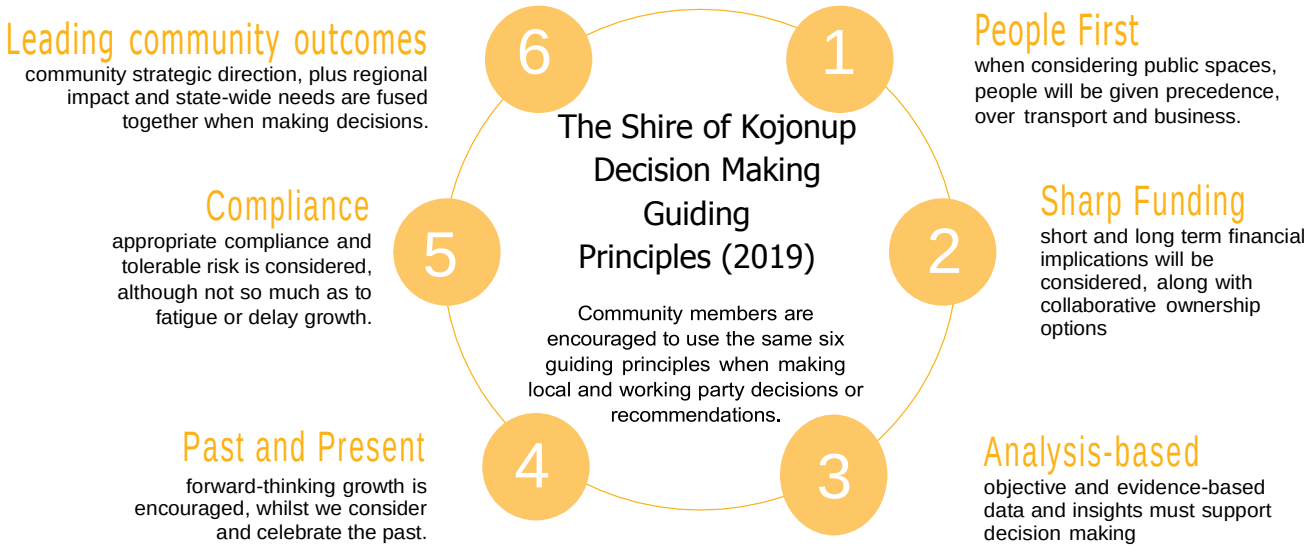
14 MEETING CLOSED TO THE PUBLIC 12

14.1 MATTERS FOR WHICH THE MEETING MAY BE CLOSED 12
14.1.1 BLACK COCKATOO CAFÉ – TRANSITION PLAN 12
14.2 PUBLIC READING OF RESOLUTIONS THAT MAY BE MADE PUBLIC 13
14.2.1 BLACK COCKATOO CAFÉ – TRANSITION PLAN 13

15 CLOSURE 13

16 ATTACHMENTS (SEPARATE) 14

The Shire of Kojonup has a set of six guiding principles it uses when making decisions. These principles are checked and enhanced every two years in line with the Strategic Community Plan review schedule.



AGENDA

1 DECLARATION OF OPENING AND ANNOUNCEMENT OF GUESTS

The Shire President shall declare the meeting open at____ and draw the meeting's attention to the disclaimer below:

Disclaimer
No person should rely on or act on the basis of any advice or information provided by a Member or Officer, or on the content of any discussion occurring, during the course of the meeting.

The Shire of Kojonup expressly disclaims liability for any loss or damage suffered by any person as a result of relying on or acting on the basis of any advice or information provided by a member or officer, or the content of any discussion occurring, during the course of the meeting.

Where an application for an approval, a license or the like is discussed or determined during the meeting, the Shire warns that neither the applicant, nor any other person or body, should rely upon that discussion or determination until written notice of either an approval and the conditions which relate to it, or the refusal of the application has been issued by the Shire.

Acknowledgement of Country

The Shire of Kojonup acknowledges the first nations people of Australia as the Traditional custodians of this land and in particular the Keneang people of the Noongar nation upon whose land we meet.

We pay our respect to their Elders past, present and emerging.

Prayer – Cr Gale

Gracious Father, we acknowledge you as our Maker and Judge. We ask for wisdom for our reigning monarch Queen Elizabeth. Grant to her good health and strength in the executing of her duties.

We pray for all Ministers and Cabinet members of the Australian Federal and State Government. Grant to them wisdom in the welfare of Australia, so that truth and justice is established for all Australians.

Lastly Gracious Father, we pray for ourselves. We ask that you might grant to us the ability to speak with integrity and to work with uncompromising diligence. Grant to us the wisdom to make good decisions, remembering that we are one community. Grant to us the good humour to keep things in perspective in a community that is a diverse population.

We ask that we might always be mindful of the safety and welfare of the people of Kojonup. Grant to all who serve on public committees the ability to listen and work together with mutual respect for one another. Bless us with the personal joy of knowing that we have done our best.

2 ANNOUNCEMENTS FROM THE PRESIDING MEMBER

3 ATTENDANCE

COUNCILLORS

Cr N Radford	Shire President
Cr P Webb	Deputy Shire President
Cr F Webb	
Cr Wieringa	
Cr Singh	
Cr R Bilney	
Cr A Egerton-Warburton	

STAFF

Grant Thompson	Chief Executive Officer
Robert Jehu	Manager Regulatory Services
Judy Stewart	Senior Administration Officer

CONSULTANT

Steve Thompson	Town Planner, Edge Planning and Property

3.1 APOLOGIES

Cr Gale

3.2 APPROVED LEAVE OF ABSENCE

4 DECLARATION OF INTEREST

5 PUBLIC QUESTION TIME

Questions may be submitted using the special email address for Council Meeting Public Question Time being cmpqt@kojonup.wa.gov.au

The Chief Executive Officer will table all correspondence received.

5.1 RESPONSE TO PREVIOUS PUBLIC QUESTIONS TAKEN ON NOTICE

Not applicable

5.2 PUBLIC QUESTION TIME

6 CONFIRMATION OF MINUTES

Nil

7 PRESENTATIONS

7.1 PETITIONS
7.2 PRESENTATIONS
7.3 DEPUTATIONS
7.4 DELEGATES' REPORTS

8 METHOD OF DEALING WITH AGENDA BUSINESS

9 REPORTS

9.1 KEY PILLAR 1 – 'PLACE' REPORTS

Nil

9.2 KEY PILLAR 2 – 'CONNECTED' REPORTS

Nil

9.3 KEY PILLAR 3 – 'PERFORMANCE' REPORTS

Nil

9.4 KEY PILLAR 4 – 'PROSPERITY' REPORTS

9.4.1 MOONIES HILL ENERGY PTY LTD – ASSESSMENT OF MANAGEMENT PLANS

AUTHOR	Steve Thompson - Consultant Planner, Edge Planning & Property	
DATE	Thursday, 8 September 2022	
FILE NO	BD.BDA.8	
ATTACHMENT(S)	9.4.1.1	Amended conditions of development approval - letter dated 5 October 2021
	9.4.1.2	Construction Management Plan
	9.4.1.3	Bushfire Management Plan (includes Emergency Management Plan)
	9.4.1.4	Traffic Management Plan including 9.4.5 and 9.4.6
	9.4.1.5	Pre-Construction Road Condition Report
	9.4.1.6	Route Study

STRATEGIC/CORPORATE IMPLICATIONS		
"Smart Possibilities – Kojonup 2027+"		"Smart Implementation – Kojonup 2018-2022"
Key Pillar	Community Outcomes	Corporate Actions
KP 4 - Prosperity	4.1 – Be providing business assistance for growth in small local industry	4.1.1 – Amend Town Planning Scheme to encourage economic development and private investment

DECLARATION OF INTEREST

Edge Planning & Property receive payment for planning advice to the Shire and declare a Financial Interest (section 5.70 of the *Local Government Act 1995*).

SUMMARY

The applicant has submitted various management plans to the Shire of Kojonup (Shire) seeking approval.

BACKGROUND

The Council has considered matters relating to the wind farm on various occasions. Most recently, the Council on 28 October 2021 resolved the following at item 116/21:

'That Council:

1) In accordance with Regulation 77 of the Planning and Development (Local Planning Schemes) Regulations 2015 approve the amendment of the development approval issued to Moonies Hill Energy Pty Ltd for the Flat Rocks Wind Farm and issue a revised development approval including the following changes to conditions 1, 5 and 10:

1) <u>Substantial commencement</u>
This wind farm shall substantially commence by 30 November 2023.

5) <u>Turbine specifications</u>
This approval is for Vestas V150 4.2MW wind turbine. Where the use of an alternative wind turbine is proposed, the Applicant must prepare and lodge with the local government a revised Noise Impact Assessment based upon the proposed

alternative turbine, which demonstrates that the alternative turbine can comply with condition 29 below.

10) Turbine specifications
The maximum height of each wind turbine shall be 200 metres, measured from the base of the tower to the rotor tip at its maximum elevation; and

2) Advise the Shire of Broomehill-Tambellup of the decision to approve the amendments to the Moonies Hill Energy Pty Ltd wind farm development.'

The Shire, on 5 October 2021, issued amended conditions of development approval (see Attachment 9.4.1.1).

The applicant has forwarded a number of management plans and documents to address the development conditions. In turn, the Shire has requested additional information on some matters including on noise impacts, the Development Layout Plan and 'micro' siting of wind turbines. Additionally, an independent/peer review is being undertaken by an acoustic consultant on the Noise Impact Mitigation Management Plan.

The development approvals propose 42 wind turbines (7 in the Shire of Kojonup and 35 in the Shire of Broomehill-Tambellup) plus supporting infrastructure and buildings.

The proponents have separately requested approval from the Shire of Broomehill-Tambellup to the management plans to reflect the development approval issued by the Great Southern Joint Development Assessment Panel.

COMMENT

The Construction Management Plan, Fire Management Plan and the Traffic Management Plan are outlined in Attachments 9.4.1.2 to 9.4.1.6. In summary:

Construction Management Plan (14 July 2022) – Condition 18

Generally no objections with the submitted document, with the exception of Appendix A (Development Layout Plan). Appendix A, within the Construction Management Plan, will be exempt from consideration for approval, as the Development Layout Plan is a separate plan requiring Council approval at a future scheduled Council Meeting. It is suggested that no additional information is required on the Construction Management Plan. There may separately be a need to obtain other approvals from other agencies including from Western Power.

Fire Management Plan (14 July 2022) – Condition 19

No objections with the submitted document and it suggested that no additional information is required. The Bushfire Management Plan, which also incorporates an Emergency Management Plan, will result in required on-the-ground mitigation measures including the proponent providing water tanks.

Traffic Management Plan (3 August 2022) – Condition 20

The Traffic Management Plan is supported by a Pre-Construction Road Condition Report (3 August 2022) and a Route Study report (19 July 2022). Modest modifications are suggested to the Traffic Management Plan to address Main Roads WA advice:

- 5.2 General Road Condition – Any reference to vegetation management (trimming and or removal of native vegetation) should reference the appropriate environmental approvals particularly within Main Roads road reserves. Note that separate approval(s) will be required to undertake any work within Main Roads road reserves.
- 5.3 Upgrades and modifications along Haulage Route currently looks at local access. It is strongly suggested that swept path analysis for all intersections be shown (including Albany Hwy/Warrenup Rd) be included.
- Table 6.1 refers to 53m road trains – RAV 7 are limited to 36.5m.
- RAV vehicle access will be limited to the current RAV network. Additional access permissions will be subject to HVS approval (i.e. most likely Permit).
- 6.4 Heavy Vehicle Management – it is suggested that travelling at night is not permitted.

There may be a need to separately obtain other approvals including from Main Roads WA and the Department of Water and Environmental Regulation.

The Route Study report mainly relates to Main Roads WA managed roads in transporting the wind turbines from Bunbury port to the wind farm site.

It is suggested that other management plans and other required information, to address the development conditions, can be brought to Council as a package.

Alternate options and their implications

The Council has a number of options available to it, which are discussed below:

1 *Not approve the management plans*
The Council can choose to not approve the management plans and advise the proponent giving reasons. If this option were chosen, the applicant would need to produce revisions of the management plan(s) which are not approved which better accord with the requirement of the technical subject matter that the management plan relates to, and Council's decision to not approve would need to be based on a lack of satisfaction that those technical requirements have been met.

2 *Approve the management plans*
The Council can choose to approve the management plans, in part or whole and/or with or without modifications. There are other management plans which are still in the process of being assessed by the Shire's engaged town planner, which need to also be approved by the Shire before the wind farm proposal can proceed; however, approval of the plans the subject of this report, would be a step forward towards the wind farm proceeding.

3 *Defer the proposal*
The Council can choose to defer the matter and seek additional information from the proponent or undertake consultation, if deemed necessary, before proceeding to make a decision.

There is not a right of merits review of Council's decision to approve or not to approve a Management Plan where it is lodged pursuant to a condition of development approval. However, the rationale for this is that the merits of the acceptability of the development have fundamentally been determined by the grant of the development approval, and what remains by way of Management Plans is an assessment of detail within the confines of specific narrow technical fields. Therefore, a Management Plan should not be refused approval if it appropriately addresses the technical subject matter that it is supposed to address.

CONSULTATION

The Shire has previously consulted on the Development Application. More recently, the Shire has advised interested stakeholders of the upcoming Council meeting.

STATUTORY REQUIREMENTS

Planning and Development Act 2005 and *Planning and Development (Local Planning Schemes) Regulations 2015.*

POLICY IMPLICATIONS

The proposal satisfies the WA Planning Commission Position Statement: Renewable Energy Facilities (March 2020) which replaced the former Planning Bulletin 67 Guidelines for Wind Farm Development (2004).

FINANCIAL IMPLICATIONS

The applicant has paid the Development Application fee.

RISK MANAGEMENT IMPLICATIONS

RISK MANAGEMENT FRAMEWORK			
Risk Profile	Risk Description/Cause	Key Control	Current Action
3 – Compliance	Impulsive decision making Ineffective monitoring of changes to legislation	Professional accreditation/ certification maintained	Nil
6 – Engagement	Inadequate documentation or procedures	Public notices/local papers/website communication	Nil
7 – Environment	Inadequate local laws/planning schemes	Environmental management compliance	Nil
8 – Errors, Omissions and Delays	Complex legislation Incorrect information	Development Approval performance report	Nil
Risk rating: Adequate			
IMPLICATIONS			

Applicants need to ensure that Development Applications accord with the intent of the Shire of Kojonup Town Planning Scheme. Council, in assessing applications, needs to adopt a similar approach that reflects present and future requirements without compromising amenity or establishing precedents.

ASSET MANAGEMENT IMPLICATIONS
Nil

SOUTHERN LINK VROC (VOLUNTARY REGIONAL ORGANISATION OF COUNCILS) IMPLICATIONS
Although the Moonies Hill wind turbine project is located in two Shires, this request for approving the management plans only relates to turbines located in the Shire of Kojonup. The Shire of Broomehill-Tambellup will separately consider the management plans.

VOTING REQUIREMENTS
Simple Majority

OFFICER RECOMMENDATION

That Council:

1) Approve the following management plans for Moonies Hill Energy Pty Ltd for the Flat Rocks Wind Farm as outlined in Attachments 9.4.1.2 to 9.4.1.6:

- Construction Management Plan (Condition 18) except for Appendix A (Development Layout Plan) within the Construction Management Plan. See point 2 below for the approval of Development Layout Plan;
- Fire Management Plan - Bushfire Management Plan incorporating the Emergency Management Plan (Condition 19); and
- Traffic Management Plan - incorporating the Pre-Construction Road Condition Report and the Route Study. This is subject to addressing Main Roads Western Australia advice and modifying the Traffic Management Plan to the satisfaction of the Shire's Chief Executive Officer (Condition 20).

2) While noting point 1, it is highlighted that approval of the management plans:
- Does not include the Development Layout Plan included with the documents; and
- Does not override the need to obtain any relevant approvals that may be separately required from other agencies.

Advice Notes:

A) Advise the Shire of Broomehill-Tambellup of the decision.

9.5 KEY PILLAR 5 – 'DIGITAL' REPORTS
Nil

10 APPLICATIONS FOR LEAVE OF ABSENCE

Nil

11 MOTIONS OF WHICH PREVIOUS NOTICE HAS BEEN GIVEN

Nil

12 QUESTIONS FROM MEMBERS WITHOUT NOTICE

Nil

13 NEW BUSINESS OF AN URGENT NATURE INTRODUCED BY DECISION OF THE MEETING

Nil

14 MEETING CLOSED TO THE PUBLIC

14.1 MATTERS FOR WHICH THE MEETING MAY BE CLOSED

14.1.1 BLACK COCKATOO CAFÉ – TRANSITION PLAN

AUTHOR	Grant Thompson – Chief Executive Officer
DATE	Friday, 9 September 2022
FILE NO	CP.LEA.1

STATUTORY REQUIREMENTS

Section 5.23(2) of the Local Government Act 1995 permits the Council to close a meeting, or part of a meeting, to members of the public if the meeting deals with any of the following:

(a) a matter affecting an employee or employees; and
(b) the personal affairs of any person; and
(c) a contract entered into, or which may be entered into, by the local government and which relates to a matter to be discussed at the meeting; and
(d) legal advice obtained, or which may be obtained, by the local government and which relates to a matter to be discussed at the meeting; and
(e) a matter that if disclosed, would reveal —
    (i) a trade secret; or
    (ii) information that has a commercial value to a person; or
    (iii) information about the business, professional, commercial or financial affairs of a person, where the trade secret or information is held by, or is about, a person other than the local government; and
(f) a matter that if disclosed, could be reasonably expected to —
    (i) impair the effectiveness of any lawful method or procedure for preventing, detecting, investigating or dealing with any contravention or possible contravention of the law; or
    (ii) endanger the security of the local government's property; or
    (iii) prejudice the maintenance or enforcement of a lawful measure for protecting public safety; and

(g) information which is the subject of a direction given under section 23(1a) of the *Parliamentary Commissioner Act 1971*.

Subsection (3) requires a decision to close a meeting, or part of a meeting and the reason for the decision to be recorded in the minutes.

PROCEDURAL MOTION

That the meeting proceed behind closed doors in accordance with Section 5.23(2) (c) of the *Local Government Act 1995* at _____ pm.

PROCEDURAL MOTION

That the meeting be reopened to the public at _____pm.

14.2 PUBLIC READING OF RESOLUTIONS THAT MAY BE MADE PUBLIC

14.2.1 BLACK COCKATOO CAFÉ – TRANSITION PLAN

15 CLOSURE

There being no further business to discuss, the President thanked the members for their attendance and declared the meeting closed at _____ pm.

16 ATTACHMENTS (SEPARATE)

9.4.1	9.4.1.1	Amended conditions of development approval - letter dated 5 October 2021
	9.4.1.2	Construction Management Plan
	9.4.1.3	Bushfire Management Plan
	9.4.1.4	Traffic Management Plan including 9.4.1.5 and 9.4.1.6
	9.4.1.5	Pre-Construction Road Condition Report
	9.4.1.6	Route Study

Kojonup

One community, many choices

Our Ref: DB.BDA.8

Dr Sarah Rankin – Managing Director
Moonies Hill Energy Pty Ltd
5 Barnfield Road
CLAREMONT WA 6010

Dear Sarah,

MOONIES HILL ENERGY PTY LTD REQUEST TO AMEND CONDITIONS OF DEVELOPMENT APPROVAL FOR THE FLAT ROCKS WIND FARM.

The Shire of Kojonup considered you r above request and resolved at its 28 September 2021 meeting to approve the request and amend the conditions.

Please find enclosed the Notice of determination on application for development approval form. The proposal may now proceed in accordance with the conditions set out in the attached approval form and plans.

This is a discretionary decision by the Shire, and you have a right to request a review of any decision and/or condition made by the Local Government to the State Administrative Tribunal if you are aggrieved by the decision and/or any condition. Appeals must be lodged within 28-days of receiving this advice.

If you have any questions or queries regarding this matter, please do not hesitate to contact Grant Thompson (Chief Executive Officer) or Phil Shephard (Town Planner) through the Shire Office on (08) 9831 2400.

Yours sincerely,

Phil Shephard
Town Planner

5/10/2021

Enc.

Shire of Kojonup
93-95 Albany Highway, Kojonup WA 6395
Postal address: PO Box 163, Kojonup WA 6395
Telephone: (08) 9831 2400 | Facsimile: (08) 9831 1566 | Email: council@kojonup.wa.gov.au

Kojonup

one community, many choices

Planning and Development Act 2005

Shire of Kojonup

Notice of determination on application for development approval

Location:	*Various including 4787, 1, 2, 1000, 1001, 4224, 3936, 96, 4747, 781, 1158, 1748, 1017, 1016, 4429, 6315, 7362, 5187, 1790, 1641, 1085, 6932, 1028, 1111, 7725, 6474, 1107, 4386, 725, 1110, 6085, 1697, 5979, 6855 & 6854*		
Lot:	*Various*	Plan/Diagram:	*Various*
Vol. No:	*Various*	Folio No:	*Various*
Application date:	*10 August 2021*	Received on:	*10 August 2021*

Description of proposed development:

Wind farm

The application for development approval is:

Substantial commencement

1) *This wind farm shall substantially commence by 30 November 2023.*

Wind turbine location and micro-siting

2) *This approval is for a maximum of 9 wind turbines.*
3) *The location of the wind turbines shall be generally in accordance with the attached plan, and the application as submitted which includes the 'Flat Rocks Wind Farm Environmental Report' and Appendices.*
4) *The wind turbines are to be micro-sited in accordance with the following restrictions –*
   (a) *All wind turbines shall be located a minimum distance of 1 kilometre from any residential dwelling / sensitive premises existing at the time of the issue of this planning approval, unless approval in writing is first granted from the owner of that residential dwelling / sensitive premises to a closer location;*
   (b) *The wind turbines shall be located in accordance with the 'Flat Rocks Wind Farm Landscape and Visual Assessment'. This report requires, in order to satisfy visual amenity considerations, either relocation of specified wind turbines or in the alternative, the implementation of vegetation screening.*

Turbine specifications

5) *This approval is for Vestas V150 4.2MW wind turbine. Where the use of an alternative wind turbine is proposed, the Applicant must prepare and lodge with the local government a revised Noise Impact Assessment based upon the proposed alternative turbine, which demonstrates that that the alternative turbine can comply with condition 29 below.*

6) *The transformer associated with each wind turbine shall be located beside each tower or enclosed within the tower.*
7) *The wind turbines and rotors are to be constructed utilising a light grey colour.*
8) *All wind turbine towers are to be fully enclosed (to prevent birds perching or nesting).*
9) *All wind turbine towers to be unlit, unless required to comply with CASA regulations or the recommendations of the Applicant's risk management strategy.*
10) *The maximum height of each wind turbine shall be 200 metres, measured from the base of the tower to the rotor tip at its maximum elevation.*

Temporary development

11) *The development approval also grants temporary development approval for the following –*
    (a) *temporary service roads and car parks;*
    (b) *crane hardstand areas;*
    (c) *concrete batching plants;*
    (d) *construction compounds;*
    (e) *water tanks; and*
    (f) *materials storage / laydown areas; and*
    (g) *any other construction related infrastructure,*

    shown on the Construction Management Plan required by condition 18.
12) *Any concrete batching plant shall be set back a minimum distance of 500 metres from any boundary shared with lots not the subject of this approval.*

Ancillary development

13) *The development approval also grants development approval for the following –*
    (a) *service roads;*
    (b) *cabling, whether above or below ground;*
    (c) *electricity reticulation / transmission powerlines, whether above or below ground;*
    (d) *fencing;*
    (e) *ancillary buildings;*
    (f) *an electricity substation;*

    shown on the Development Layout Plan required by condition 17.
14) *All service roads are to be located, designed, constructed and drained to minimise the impact on local drainage systems, landscape and farming activities.*
15) *Electricity reticulation / transmission powerlines –*
    (a) *Between groups of wind turbine towers (called 'gangs') shall be placed underground, unless it is demonstrated to the satisfaction of the local government that it is impracticable to do so;*
    (b) *Between the gangs, preferably underground, but over-head in circumstances where it is impracticable or uneconomical to install underground;*
    (c) *Shall not be placed on or over land outside the lots the subject of this approval without the written approval of those land owners.*
16) *The electricity substation to be shown on the Development Layout Plan required by condition 17, must comply with the following development standards –*
    (a) *Minimum setback of 100 metres from the perimeter of the substation to the boundary of the location within the nominated development area;*

(b) *Maximum height of the substation building and infrastructure within the substation area to be less than 60 metres, excluding masts, polies, or infrastructure required by a separate regulatory authority;*

(c) *The area of the substation does not exceed 2 hectares, with the area to include the substation, perimeter fencing, and excluding fire breaks or vegetation buffer planting;*

(d) *The substation will not exceed 150MW power transfer to the grid.*

Pre-construction conditions

17) *Prior to commencing any works, the Applicant is to lodge a Development Layout Plan for approval by the local government. The Development Layout Plan must include the following detail –*

(a) *The location of access / egress points and service roads;*

(b) *The location of any cabling between wind turbines;*

(c) *The location of any fencing;*

(d) *Permanent buildings;*

(e) *Permanent car parking areas;*

(f) *Locations of the wind turbines, having regard to the restrictions in conditions 3 and 4 above;*

(g) *The location of any landscaping if required by condition 4(b).*

18) *Prior to commencing any works, the Applicant is to lodge a Construction Management Plan for approval by the local government. The Construction Management Plan must include the following detail –*

(a) *The location of temporary access / egress points and temporary service roads;*

(b) *The location of crane hardstand areas;*

(c) *Temporary buildings;*

(d) *Temporary car parking areas;*

(e) *The location of the concrete batching plant, water tanks and any construction compounds and materials storage / laydown areas;*

(f) *The location and extent of excavation required for the purpose of laying cabling;*

(g) *A timetable for the removal of temporary development after completion of the construction phase;*

(h) *The management of dust and other construction impacts;*

(i) *The management of weed infestations.*

19) *Prior to commencing any works, the Applicant is to lodge a Fire Management Plan for approval by the local government. The Fire Management Plan shall be prepared by a suitably qualified consultant and in the context of the construction and operational phases of the development address the following matters –*

(a) *Identification and clear mapping of firebreaks, emergency ingress and egress points, water points, turnaround areas for fire trucks, water sources, on site fire-fighting equipment;*

(b) *Identification of on-site tracks for access by emergency fire vehicles, and the requirement for these tracks to be maintained to a trafficable standard at all times;*

(c) *Emergency procedures and personnel contacts;*

(d) *Consideration of activities on fire ban days;*

(e) *Notification for other agencies.*

20) *Prior to commencing any works, the Applicant is to lodge a Traffic Management Plan for approval by the local government. The Traffic Management Plan is to be prepared by a suitably qualified traffic consultant and in the context of the construction phase of the development is to include –*
   - *(a) Haulage routes;*
   - *(b) Heavy vehicle movements scheduling;*
   - *(c) Use of escort vehicles;*
   - *(d) Interaction with other road uses, for example, school bus routes;*
   - *(e) A Pre-Construction Road Condition Report along the proposed haulage routes, and the obligation to prepare a Post-Construction Road Condition Report once construction is complete.*

21) *Prior to commencing any works, the Applicant is to lodge a Noise Impact Mitigation Management Plan for approval by the local government. The Noise Impact Mitigation Management Plan is to outline the process by which the Applicant will –*
   - *(a) Undertake post-commissioning testing to ensure compliance with condition 29, including testing at existing noise sensitive premises;*
   - *(b) Make arrangements with adjoining landowners regarding the construction of noise sensitive premises on land;*
   - *(c) Modify micro-siting to ensure compliance with condition 29;*
   - *(d) Modify the operation of the wind turbines to ensure compliance with condition 29;*
   - *(e) Manage complaints regarding noise impact during the operational phase of the development.*

22) *Prior to commencing any works, the Applicant is to lodge a Landscaping Plan for approval by the local government, in relation to the permanent buildings and car parking areas, and where vegetation screening is required by condition 4(b). The Landscaping Plan is to be prepared by a suitably qualified landscape architect, and address the following matters –*
   - *(a) Identify, by numerical code, the species, quantity and anticipated mature dimensions of all plant types;*
   - *(b) Identify a schedule of maintenance required to ensure that the landscaping grows to its mature dimensions and can be maintained at that level.*

23) *Where the Applicant intends undertaking the development in stages, a Staging Plan must be lodged with the local government at the same time as the Management Plans referred to in conditions, 17, 18, 19, 20, 21, and 22. The purpose of the Staging Plan is to determine the scope of information required in order to satisfy the conditions of approval as it relates to that stage.*

24) *Prior to commencing any works, the Applicant is to advise the following entities regarding the construction of the wind turbines, including estimated dates of installation, details of exact locations and heights –*
   - *24.1 Civil Aviation Safety Authority (CASA);*
   - *24.2 Airservices Australia;*
   - *24.3 Royal Flying Doctor Service;*
   - *24.4 Royal Australian Air Force;*
   - *24.5 All known private airstrip owners within 20km of any wind turbine;*
   - *24.6 All known aerial agriculture operators, including the Aerial Agriculture Association of Australia.*

25) *Prior to commencing any works the Applicant is to acknowledge in writing to the satisfaction of the Shire that they are responsible for the remedying of any electromagnetic interference to pre-construction quality of signals directly attributable to the operation of the wind farm.*

Construction conditions

26) *The Applicant is to implement the following approved plans, as they relate to the construction phase of the development, during construction –*
    (a) *the Construction Management Plan, required by condition 18*
    (b) *the Fire Management Plan, required by condition 19; and*
    (c) *the Traffic Management Plan, required by condition 20;*
27) *All fill placed on the land must be free of disease and weeds.*
28) *Any damage caused to the roads attributable to the construction phase of the development is to be rectified by the Applicant to the standard identified in the Pre-Construction Road Condition Report.*

Operational conditions

29) *The Applicant shall ensure at all times that the operation of each wind turbine complies with the following noise levels at noise sensitive premises –*
    (a) *Will not exceed 35dB(A); or*
    (b) *Will not exceed the background noise (LA90, 10 minutes) by more than 5dB(A);*
    whichever is the greater.
30) *The Applicant is to implement the following approved plans, as they relate to the operational phase of the development, during the life of this development approval –*
    (a) *the Fire Management Plan, required by condition 19;*
    (b) *the Traffic Management Plan, required by condition 20;*
    (c) *the Noise Impact Mitigation Plan, required by condition 21; and*
    (d) *the Landscape Management Plan, required by condition 22.*

Decommissioning conditions

31) *The wind turbines are to be decommissioned when they are disconnected from the power grid or when they no longer generate energy into the power grid. This condition does not apply where the wind farm or individual wind turbines is disconnected temporarily from the power grid, or is not generating energy, for maintenance.*
32) *Prior to decommissioning the wind farm, or any wind turbines in the wind farm, the Applicant is to lodge a Decommissioning and Rehabilitation Management Plan for approval by the local government. The Decommissioning and Rehabilitation Management Plan is to include –*
    (a) *a detailed decommissioning schedule or works with timeframes for each stage;*
    (b) *a Traffic Management Plan;*
    (c) *a Fire Management Plan;*
    (d) *sufficient information that clearly outlines any below ground infrastructure to be retained on site and its treatment to allow for continued agricultural use;*
    (e) *implementation of suitable mechanisms to alert prospective purchasers of retention of any below ground infrastructure which may affect future building locations or development*

33) *The Applicant is to implement the Decommissioning and Rehabilitation Management Plan during the decommissioning and rehabilitation process.*

34) *All lots the subject of this development approval shall be returned to pre-development state following decommissioning, with the exception that underground infrastructure (such as footings and cables) may be retained below normal ploughing levels where retention allows for continued agricultural use.*

35) *If any below ground infrastructure is retained on site following decommissioning, notifications are to be placed on the affected Certificates of Title to alert prospective purchasers that there are underground cables and or infrastructure on the land which may impact on future development or building locations, within 3 months of the wind farm being decommissioned. The Notifications are to be prepared and lodged at the cost of the Applicant.*

Additional development

36) *The Applicant may construct a viewing area / platform and information / interpretative signage suitable for resident and visitor / tourist use at a wind turbine location to be agreed with the Shire of Kojonup.*

Date of determination: *28 September 2021*

Note 1: If the development the subject of this approval is not substantially commenced within a period of 2 years, or another period specified in the approval after the date of the determination, the approval will lapse and be of no further effect.

Note 2: Where an approval has so lapsed, no development must be carried out without the further approval of the local government having first been sought and obtained.

Note 3: If an applicant or owner is aggrieved by this determination there is a right of review by the State Administrative Tribunal in accordance with the *Planning and Development Act 2005* Part 14. An application must be made within 28 days of the determination.

Signed: Dated: 5/10/2021

for and on behalf of the Shire of Kojonup

Flat Rocks Wind Farm

Construction Management Plan

Enel Green Power Australia Pty Ltd

14 July 2022

The Power of Commitment

GHD Pty Ltd | ABN 39 008 488 373
999 Hay Street, Level 10
Perth, Western Australia 6000, Australia
T +61 8 6222 8222 | **F** +61 8 6222 8555 | **E** permail@ghd.com | **ghd.com**

Project name		Owner Engineering Flat Rocks					
Document title		Flat Rocks Wind Farm | Construction Management Plan					
Project number		12574907					
File name		12574907-00000-CM-PLN-001_C Flat Rocks Wind Farm - Construction Management Plan.docx					
Status Code	**Revision**	**Author**	**Reviewer**		**Approved for issue**		
			Name	**Signature**	**Name**	**Signature**	**Date**
S3	A	Adam Riley	Andrew Ferres		Rob Senior		05/07/22
S3	B	Adam Riley	Andrew Ferres		Rob Senior		08/07/22
S3	C	Adam Riley	Andrew Ferres		Rob Senior		14/07/22

© GHD 2022
This document is and shall remain the property of GHD. The document may only be used for the purpose for which it was commissioned and in accordance with the Terms of Engagement for the commission. Unauthorised use of this document in any form whatsoever is prohibited.

The Power of Commitment

Contents

1. Introduction 1
1.1 Project Overview 1
1.2 Purpose of this plan 2
1.3 Scope and limitations 3
1.4 Definitions and Abbreviations 3
2. Project Organisation 4
2.1 Key Personnel and Contact Details 4
2.2 Work Hours 4
3. Project Description 5
3.1 Site Access 5
3.1.1 Roads/Access Track Upgrades 5
3.2 Turbines 7
3.3 Hardstanding 8
3.4 Lifting Operations 8
3.5 Temporary Buildings & Worker Accommodation 9
3.6 Temporary Car Parking Areas 10
3.7 Site Facilities and Laydown 10
3.7.1 Concrete Batching Plant 10
3.7.2 Water Tanks 10
3.7.3 Material Storage and Laydown Areas 10
3.8 Substation/Switchyard 10
3.9 Transmission Lines and Underground Cabling 11
3.9.1 Overhead Lines 11
3.9.2 Underground Cabling 11
3.10 Met Masts 11
4. Construction Sequencing 13
5. Environmental Impacts and Mitigation 14
5.1 Dust and Other Construction Impacts 14
5.2 Management of Weed Infestations 14

Table index

Table 1 Details of Construction Management Plan requirements for Development Approval 2
Table 2 Definitions and Abbreviations 3
Table 3 Key Personnel and Contact Details 4
Table 4 Project wind turbine characteristics 7
Table 5 Construction Sequencing 13

Figure index

Figure 1	Location of Flat Rocks Wind Farm - Western Australia	1
Figure 2	Flat Rocks Project Area	2
Figure 3	Temporary roads and access tracks	6
Figure 4	Turbine Layout	7
Figure 5	Typical crane hardstand and laydown	8
Figure 6	Typical crane paving section	8
Figure 7	Location of Site Facilities and Batch Plant	9
Figure 8	Typical Met Mast isometric view	11
Figure 9	Typical Met Mast footing layout	12

Appendices

Appendix A	Development Layout Plan
Appendix B	Site Facilities Layout
Appendix C	Concrete Batching Plant Layout
Appendix D	Typical Trench Detail

1. Introduction

1.1 Project Overview

The Flat Rocks Wind Farm (FRWF) project is located approximately 260 km southeast of Perth, 30 km east of Kojonup. The proposed project consists of 18 x 4.2 MW turbines for a total installed capacity of 75.6 MW. Turbine components will be transported to site from Port of Bunbury, approximately 230 km by road.

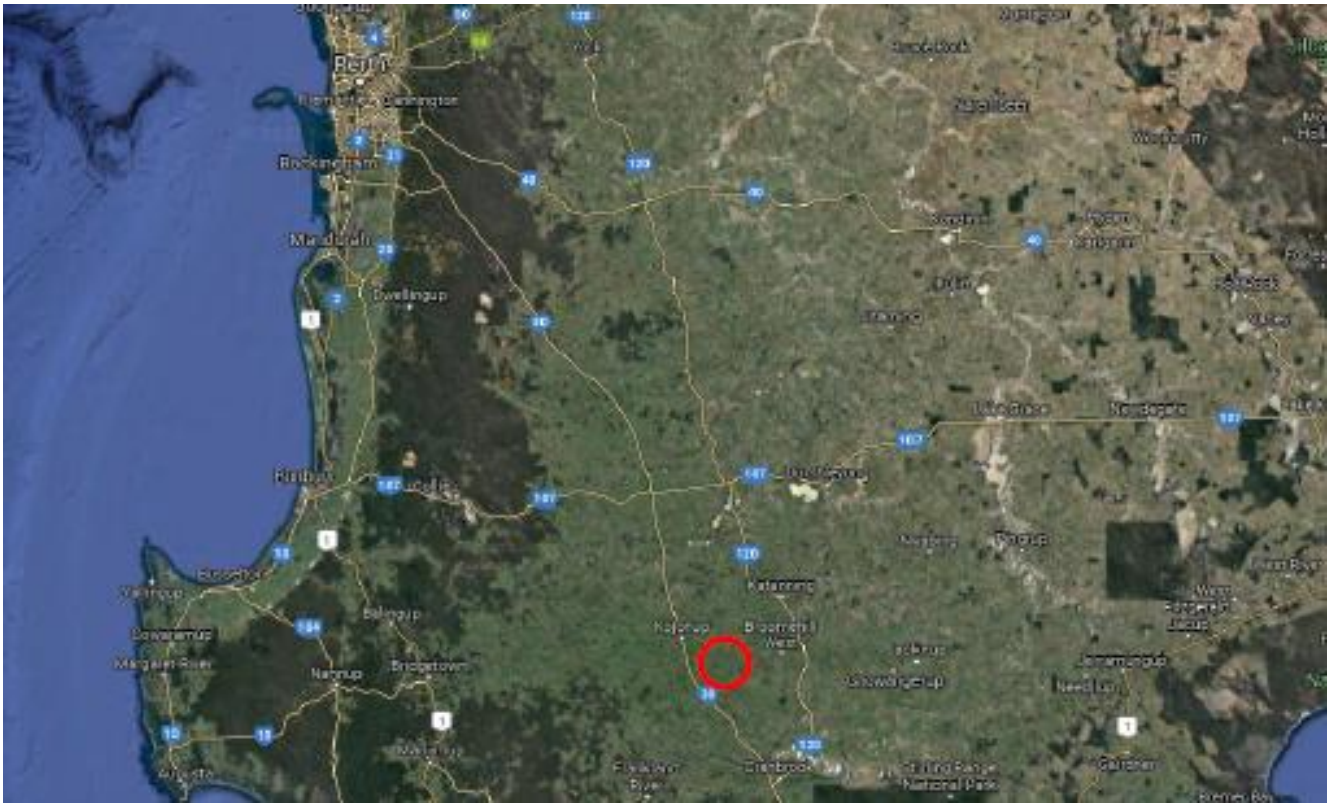


Figure 1 Location of Flat Rocks Wind Farm - Western Australia

ENEL Green Power (EGP) will be developing FRWF at the site mentioned above. FRWF will be connected to the Western Power network also known as the South West Interconnected Network (SWIN). There is an existing 132 kV Western Power Transmission line that is adjacent to the proposed wind farm substation location, seen in Figure 2. Western Power will provide a teed connection from this line into the Wind Farm substation.

EGP is intending to deliver this project through splitting up the work packages in 4 different contracts being:

1. IWC: Interconnection Works Contract with Western Power
2. OEM: Turbine Supply, Install and Commission contract with Vestas
3. EBoP: Electrical Balance of Plant contract with RJE Global
4. CBoP: Civil Balance of Plant contract with West Force

EGP will utilise an in-house project team with support from EGP's international resources and will utilise the owners engineer for support in the design review, support in compliance review, support in interface management, support in construction inspections and support in commissioning & handover activities.

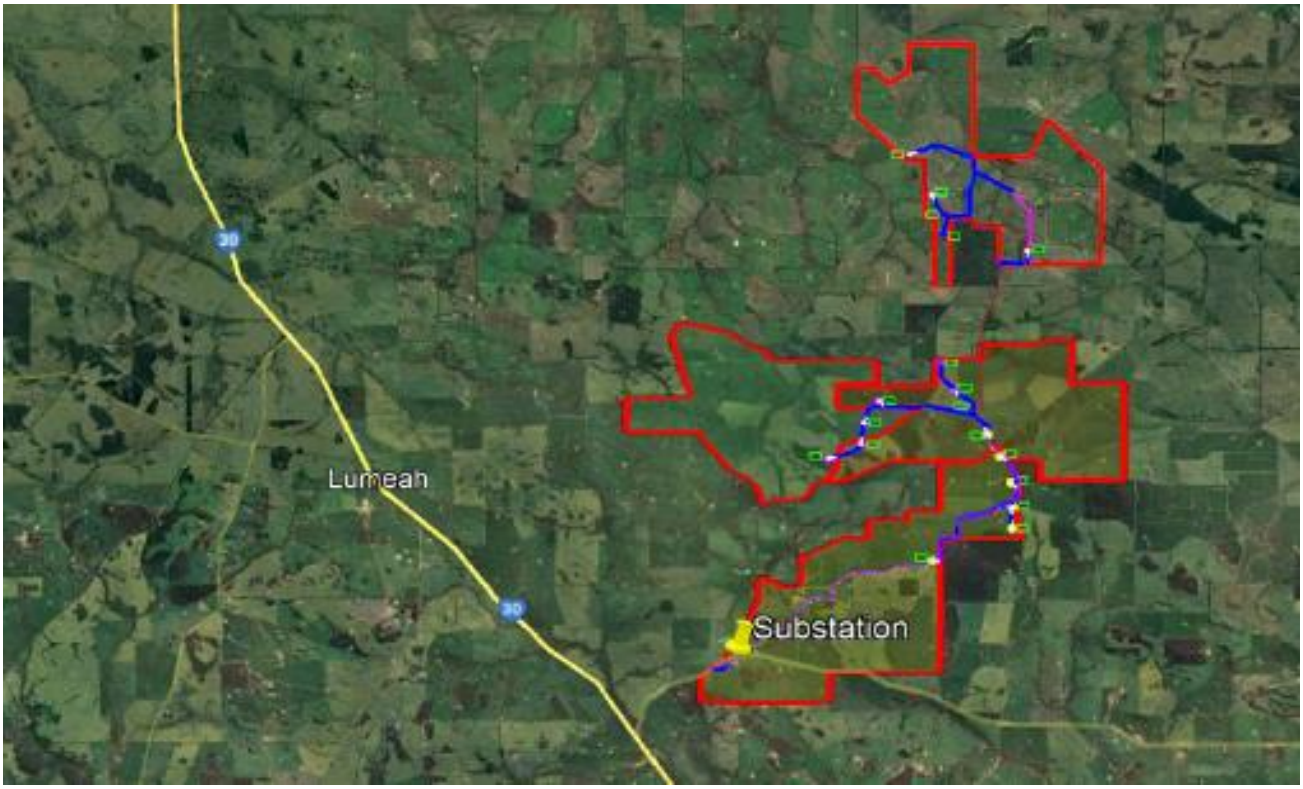


Figure 2 Flat Rocks Project Area

1.2 Purpose of this plan

This Construction Management Plan (CMP) covers the first phase of the FRWF project which is planned to include 18 wind turbines totalling 75.6 MW. The construction period is anticipated to last approximately 18 months.

The purpose of the CMP is to satisfy the Development Approval Condition 18 of the Shire of Kojonup (date of determination 28 September 2021) and Development Approval Condition 18 of the Shire of Broomhill-Tambellup (date of notice 22 May 2017).

The details of the CMP required for Development Approval are referenced in Table 1

Table 1 Details of Construction Management Plan requirements for Development Approval

Development Approval Requirement	Section Reference
The Construction Management Plan must include the following detail:	
a. The location of temporary access / egress points and temporary service roads;	Page 5, Section 3.1
b. The location of crane hardstand areas;	Page 8, Section 3.3
c. Temporary buildings;	Page 9, Section 3.5
d. Temporary car parking areas;	Page 10, Section 3.6
e. The location of the concrete batching plant, water tanks and any construction compounds and materials storage / laydown areas;	Page 10, Section 3.7
f. The location and extent of excavation required for the purpose of laying cabling;	Page 11, Section 3.9.2
g. A timetable for the removal of temporary development after completion of the construction phase;	Page 13, Section 4
h. The management of dust and other construction impacts;	Page 14, Section 5.1
i. The management of weed infestations.	Page 14, Section 5.2

1.3 Scope and limitations

This report: has been prepared by GHD for Enel Green Power Australia Pty Ltd and may only be used and relied on by Enel Green Power Australia Pty Ltd for the purpose agreed between GHD and Enel Green Power Australia Pty Ltd as set out in section 1.2 of this report.

GHD otherwise disclaims responsibility to any person other than Enel Green Power 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.

GHD has prepared this report on the basis of information provided by Enel Green Power 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.

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.

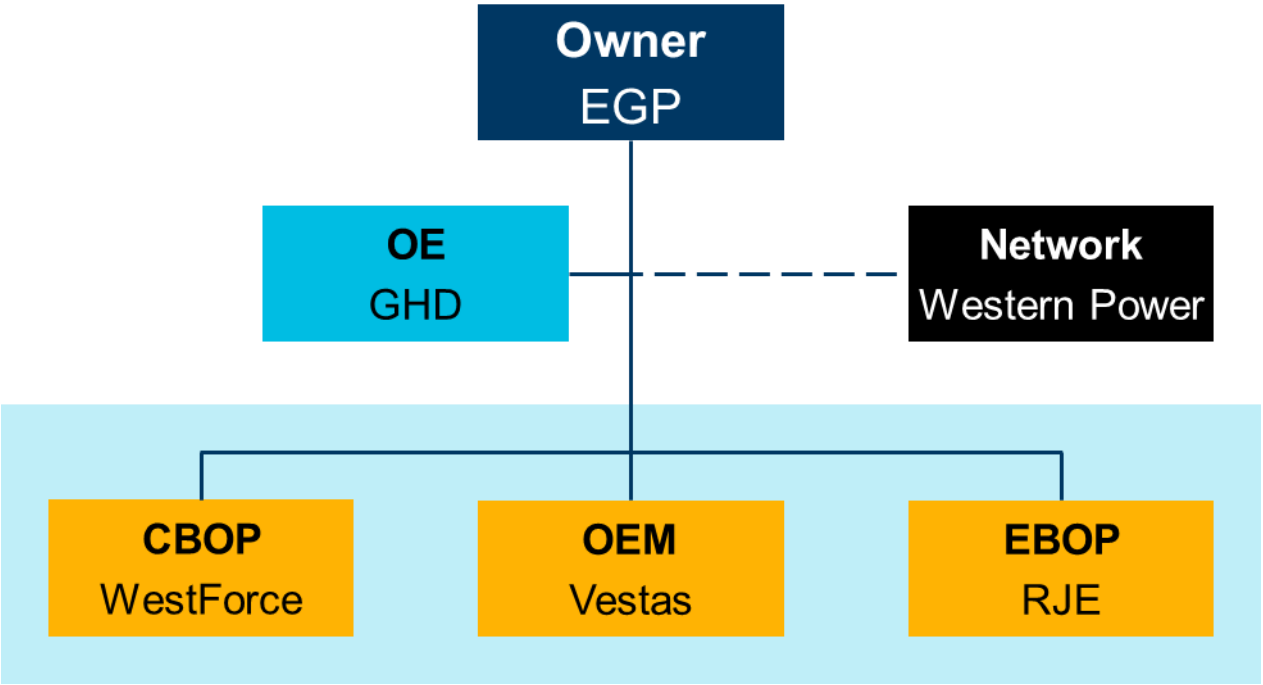
1.4 Definitions and Abbreviations

Table 2 Definitions and Abbreviations

Definition / Abbreviation	Description
BOP	Balance of Plant
CBOP	Civil Balance of Plant
CMP	Construction Management Plan
CEMP	Construction Environmental Management Plan
COD	Commercial Operation Date
DA	Development Approval
DTMR	Department Of Transport and Main Roads
EGP	Enel Green Power Australia Pty Ltd
EBOP	Electrical Balance of Plant
EPC	Engineering Procurement and Construction
FRWF	Flat Rocks Wind Farm
HV	High Voltage
IC	Independent Certifier
IWC	Interconnection Works Contract
MV	Medium Voltage
NSP	Network Service Provider
OE	Owner's Engineer
OEM	Original Equipment Manufacturer
WFC	WestForce Construction
WP	Western Power
WTG	Wind Turbine Generator

2. Project Organisation

The FRWF organisational structure is shown in the following chart:



2.1 Key Personnel and Contact Details

Table 3 Key Personnel and Contact Details

Name	Position	Contact	Email
Gabriele Mallarini	Project Execution Manager	+61 412 294 411	Gabriele.mallarini@enel.com
Tomas Gibbs	Project Manager	+61 455 210 249	tomas.gibbsrasquin@enel.com
Lionel Zhou	Project Engineer	+61 439 131 835	lionel.zhou@enel.com
John Price	EGP Site Manager	+61 427 940 771	TBC
Darryl Byatt	EGP HSEQ Site Rep	+61 401 724 458	TBC

2.2 Work Hours

Construction work will be carried out between 6 am and 6 pm Monday to Sunday with out-of-hours work to be conducted under an approved Noise Management Plan.

Night works will be required primarily for erection of turbines and wind turbine foundation pours or as required for critical construction work.

These hours are subject to change based on the time of year, progress and EGP requirements.

3. Project Description

3.1 Site Access

3.1.1 Roads/Access Track Upgrades

Temporary access roads will be constructed within the project development area. Access gates will be provided at all entry points from public roads to temporary access roads.

There are a total of five access gates to public roads:

- Tambellup West Road – To Substation and Permanent Operations and Maintenance Building
- Warrenup Road – Access to WTG08, 09, 10, 11, 16
- Warrenup Road, North of O'Neill Road – Access to Temporary Site Facilities and WTG01, 02, 03, 04, 05, 06, 07, 55
- Warranup Road, near Ngopitchup Road – Access to WTG18
- Nookanellup Road – Access to WTG13, 14, 15, 17

Temporary access roads are shown in Figure 3, with project access gates shown in Appendix A – Development Layout Plan, submitted to the council(s) under Condition 17.

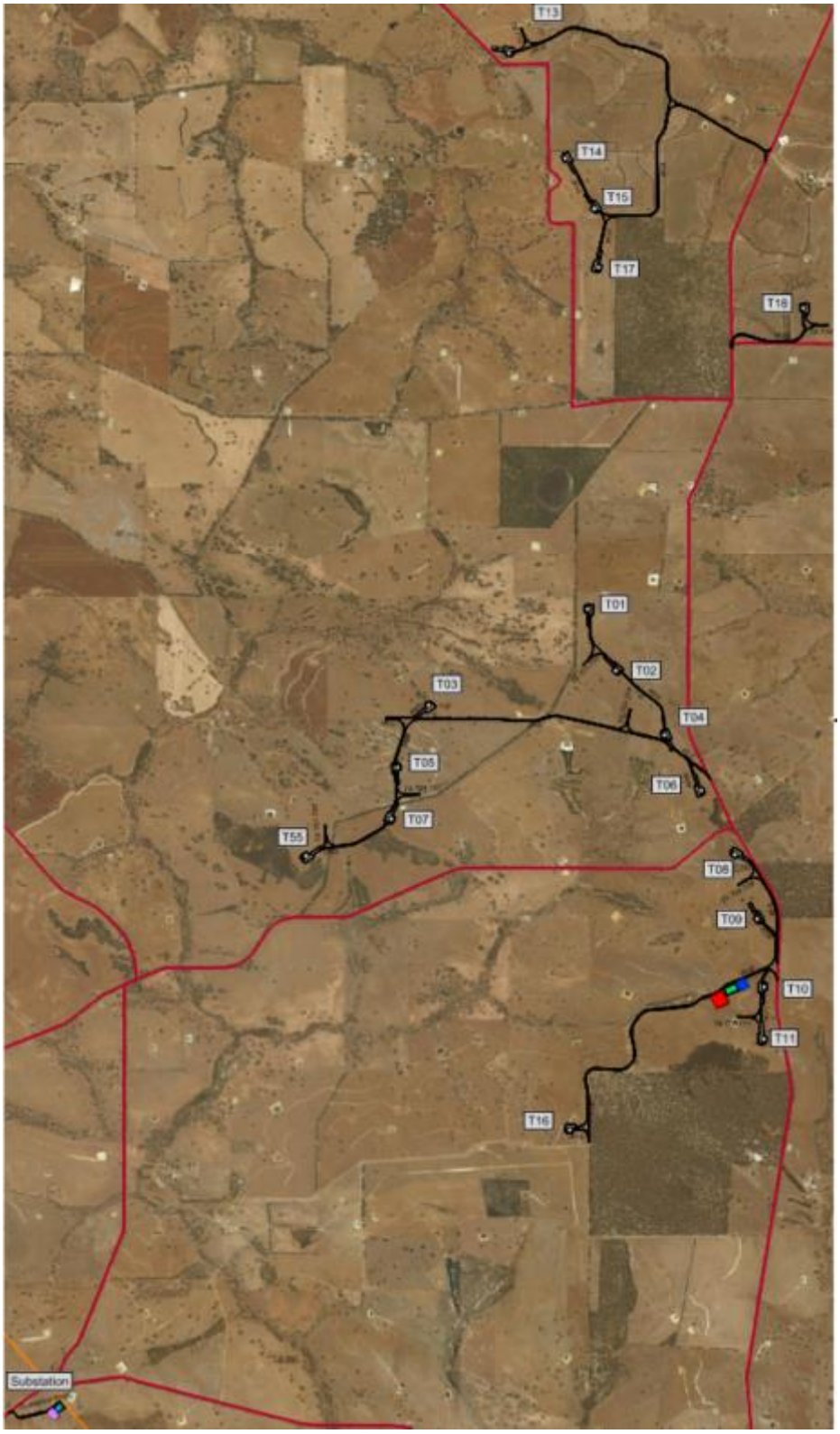


Figure 3 Temporary roads and access tracks

3.2 Turbines

Stage 1 of the Project involves the supply and installation of 18 units of Vestas V150 4.2 MW turbines. Turbine details are included below:

Table 4 Project wind turbine characteristics

	Details
Number of turbines - Stage 1	18
Number of turbines - Stage 2	24
Rated capacity	4.2 MW
Tip height	200 m
Hub heights	125 m
Rotor diameter	150 m
Blade length	73.7 m

The locations of the Stage 1 turbines are included in Figure 4 below. Refer to Development Plan submission as per DA Condition #17 for latest version.

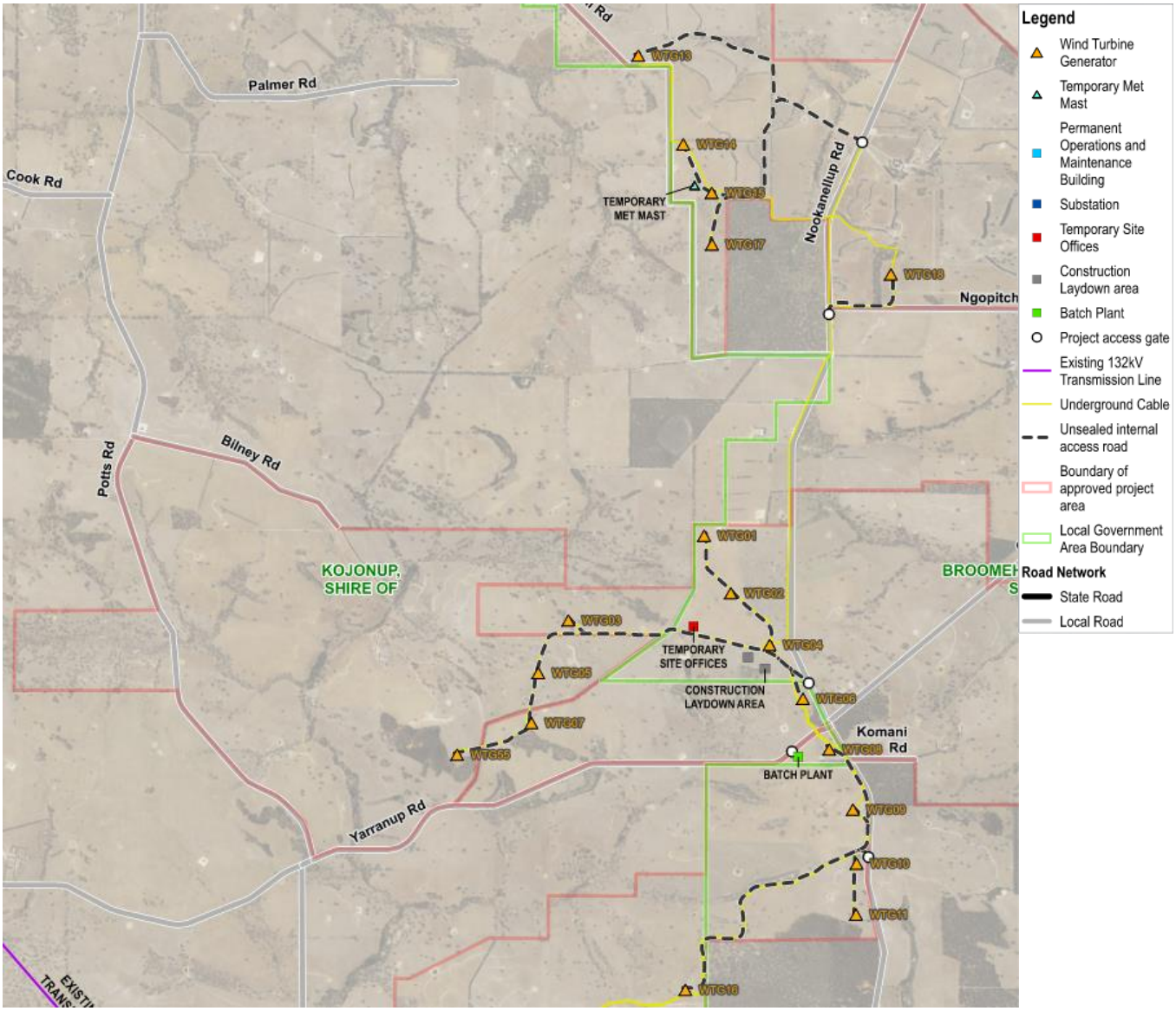


Figure 4 Turbine Layout

3.3 Hardstanding

There will be one crane hardstand adjacent to each WTG shown in Figure 4. Typical hardstand detail has been included in Figure 5 for information.

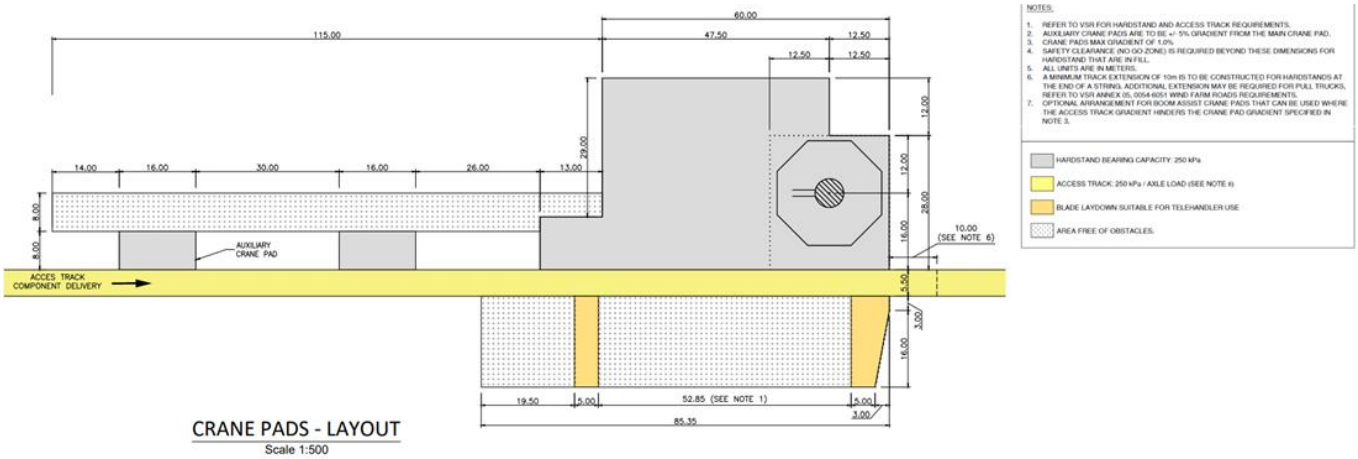


Figure 5 Typical crane hardstand and laydown

The access track will be built first, follow by the hardstand area. The turbine footing will be excavated, and once concrete has been poured, and backfilled the hardstand area will be finalised.

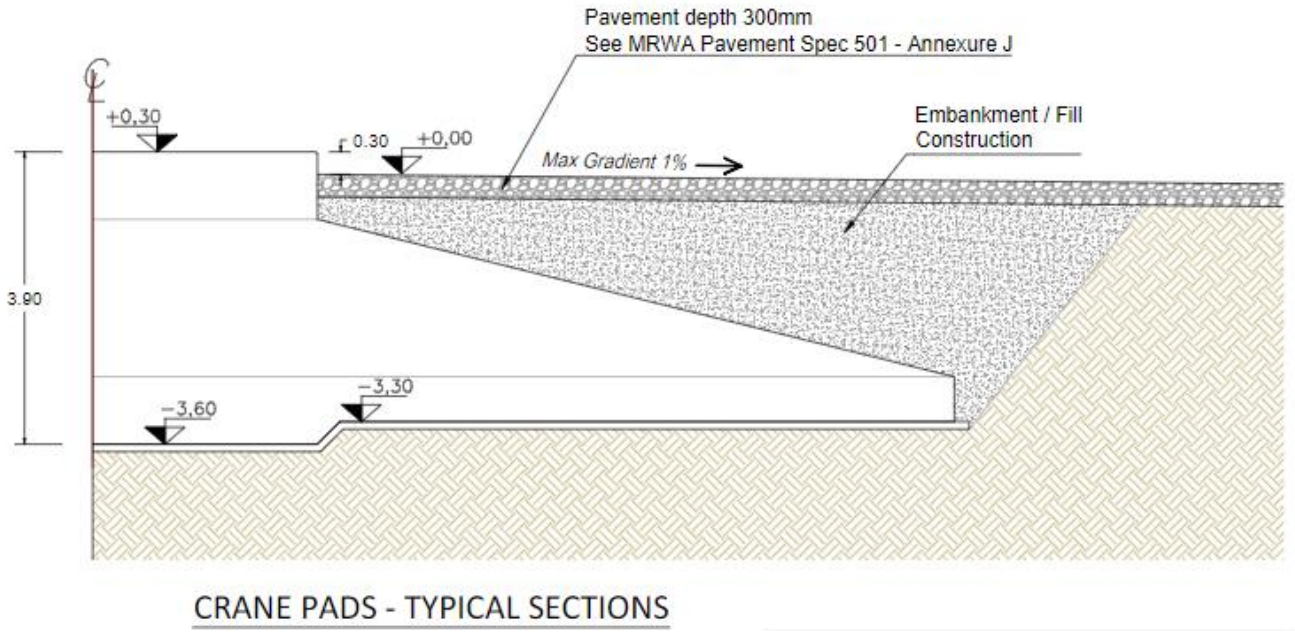


Figure 6 Typical crane paving section

3.4 Lifting Operations

All turbine component lifting operations will be subject to the preparation, review and approval of a lifting study. The details below are indicative only:

- Preassembly Crane: LTM1750- 3 Tower Sections (Base, Mid 1, Mid 2)
- Main Crane: LG1750SX- 2 Tower sections (Mid3, Top), Nacelle, Hub & Blades.
- Crane studies will include the planning information as below:
  - Route that transport will take to position the load for lifting;
  - Initial lifting position of the load, including radius. Lifting radius must be accurately determined.

- Final placement position of the load, including radius. Lifting radius must be accurately determined;
- Location of the crane(s) including tail swing limits;
- Route that crane(s) will take, if walking with the load, as well as associated matting requirements;
- Any utilities located within the work zone. Underground utilities – piping, ducts, etc., must be accurately located;
- Space necessary to assemble the crane; and
- Planning must include load transportation considerations, e.g., how to get the load close enough to the crane

3.5 Temporary Buildings & Worker Accommodation

Temporary buildings including site offices, crib room, toilets and skip bins will be established by Westforce (WFC). The temporary buildings will be located on site access road IR-C between WTG03 and WTG04 and will be accessed via Warrengup Road. Refer to Figure 7 – Laydown & Site Facilities.

No worker accommodation will be constructed within the project development area for FRWF Stage 1.

The construction contractors will mobilise site containers for tools and minor equipment storage and chemical cupboards and bunds for chemical management. Potable water and other pantry facilities will be made available at the crib room.

Site Facilities include:

- Office buildings for Contractors and Principal;
- Crib Rooms, first aid room, toilets; and
- Laydown Area which may include storage containers, workshop dome, fuel farm, and a geotech lab.

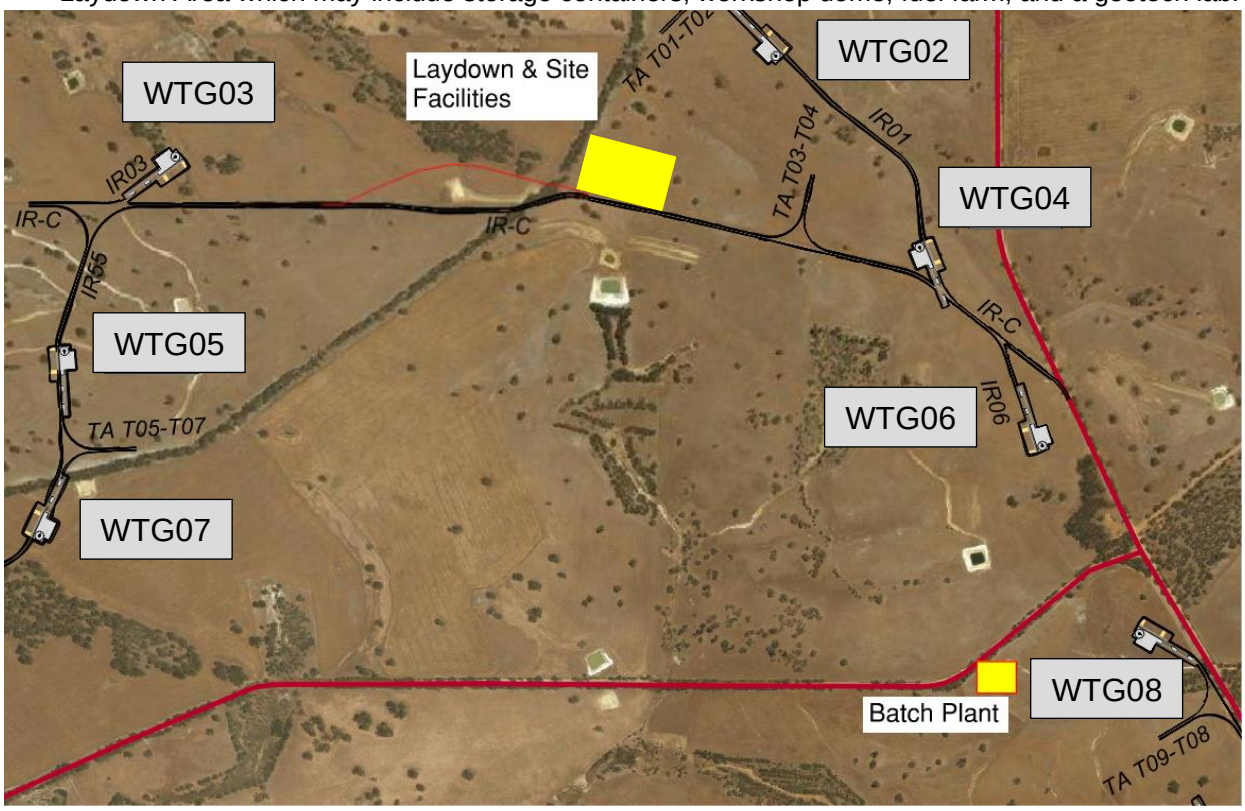


Figure 7 Location of Site Facilities and Batch Plant

Temporary buildings will also be provided at the substation / O&M including a site office with crib and toilets to facilitate the construction period.

3.6 Temporary Car Parking Areas

Temporary car parking areas will be provided for light and heavy vehicles in the following locations:

- Site Facilities
- Concrete Batching Plant
- O&M Building

Temporary parking for concrete trucks will be provided at the Concrete Batching Plant.

Proposed car parking bays are included in Appendix B – Site Facilities Layout and Appendix C – Concrete Batching Plant.

3.7 Site Facilities and Laydown

3.7.1 Concrete Batching Plant

A concrete batching plant will be located near WTG08 and will be accessed via Yarranup Road. The Batch Plant area layout can be found in Appendix C and will include:

- Access via Yarranup Rd, and WTG16 access road.
- Material storage areas,
- 2 x batch plants,
- Turkey nest water storage,
- Offices and crib rooms,
- Light vehicle and trucks parking
- Water tank and fuel tank.

The Concrete Batch Plant will be demobilised and removed upon completion of the Civil package (Estimated mid 2023)

3.7.2 Water Tanks

Water tanks will be located at the Concrete Batching Plant, indicated in Appendix C. The batch plant will use potable water which will be taken from Water Corporation Standpipes once quantities have been confirmed and agreed with Water Corporation. This water will then be stored in 3 tanks / bladders with each tank holding 200 kL of water.

For earthworks purposes, natural water will be used from landowners' dams following their approval.

3.7.3 Material Storage and Laydown Areas

Storage and laydown areas are utilised for receipt, temporary storage and assembly of construction supplies and equipment. Material storage and laydown areas are depicted in Appendix B at the Site Facilities. Additional storage and laydown areas will be provided on site access road IR-C between WTG03 and WTG04 (as per Figure 7) and Temporary laydown and car parking will also be included at the Substation.

The material storage and laydown areas will cater for all main construction contractors.

3.8 Substation/Switchyard

The Stage 1 substation is located to the South of the Project Development Area accessed from Tambellup West Road. Accompanying the Substation will be an Operation and Maintenance Building.

The substation is situated next to the existing 132 kV transmission line and is depicted in Appendix A – Development Layout Plan

3.9 Transmission Lines and Underground Cabling

3.9.1 Overhead Lines

There is an existing 132 kV Western Power Transmission line that is adjacent to the proposed wind farm substation location, seen in Figure 2. Western Power intends to provide a teed connection from this line into the Wind Farm substation.

No additional overhead lines will be constructed within the project development area for Stage 1.

3.9.2 Underground Cabling

Underground cabling traverses between WTGs and the substation. There are three collector systems with associated underground cabling which feed into the substation. Trenching will be required along the lengths of the cable routes indicated in Appendix A – Development Layout Plan.

Typical cable trench details are included in Appendix D.

3.10 Met Masts

There will be three temporary meteorological masts installed as part of the FRWF1 project. The masts will be 125 m tall and will include sensors such as wind speed, wind direction and ambient temperature.

Two temporary met masts will be constructed at the sites of WTG14 and WTG15 and will be removed during construction of the turbine foundations. The third met mast will be constructed between WTG14 and WTG15 and will be removed as part of the construction demobilisation process prior to COD.

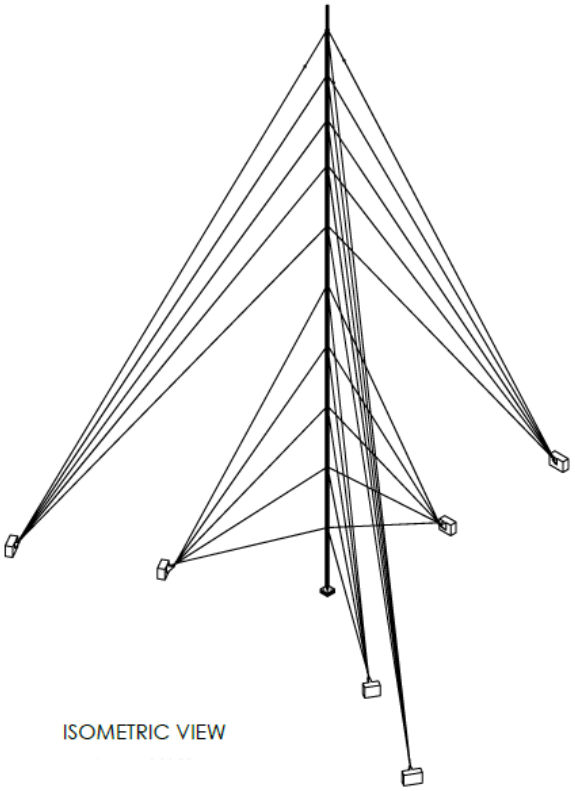


Figure 8 Typical Met Mast isometric view

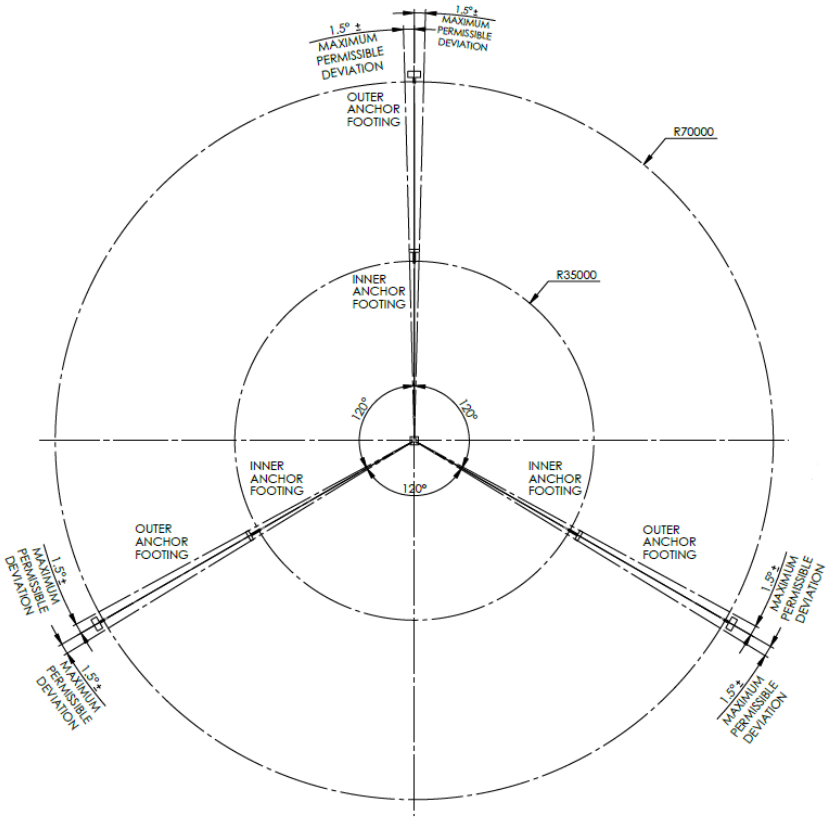


Figure 9 Typical Met Mast footing layout

4. Construction Sequencing

A construction timetable has been included in the following table for FRWF Stage 1

Table 5 Construction Sequencing

Construction Works Breakdown	Anticipated Commencement	Anticipated Completion
Site Establishment and Temporary Facilities	August 2022	September 2022
Internal roads and Hardstands	September 2022	March 2023
Turbine Foundations	December 2022	March 2023
Cable Reticulation	November 2022	June 2023
Substation and Switchyards	December 2022	July 2023
Removal of Batch Plant (after concrete works)		July 2023
Wind Turbine Erection	March 2023	August 2023
Wind Turbine Mechanical Completion	June 2023	October 2023
Removal of Temporary Buildings		February 2024

5. Environmental Impacts and Mitigation

5.1 Dust and Other Construction Impacts

Management of dust and other construction impacts will be managed by each construction contractor internally through their respective Environmental Management Plans and associated environmental processes.

The purpose of each construction contractors Environmental Management Plan is to ensure that all identified, as well as potential environmental impacts that could reasonably be expected to occur during the construction works, fall within acceptable and agreed limits.

Each construction contractor will manage dust through trailer mounted water carts that can be either placed in a stationary position or connected to heavy/light vehicles if required. The trailer mounted water cart will be used as regularly as required to suppress dust and improve air quality. Resources will be made available to ensure this function is carried out appropriately

5.2 Management of Weed Infestations

Management of weed infestations will be managed by each construction contractor internally through their respective Environmental Management Plans and associated environmental processes, with oversight from EGP.

Construction contractors will utilise Weed and Seed checklists, prior to entry and prior to leaving the site. Weed and seed checklists will also be completed prior to any ground engaging equipment (ie, grader, bulldozer, excavator) entering a new landowner boundary for any excavations / trenching works and prior to leaving.

The checklists will be used to track weed and seed compliance and managed internally by individual contractors to the satisfaction of EGP.

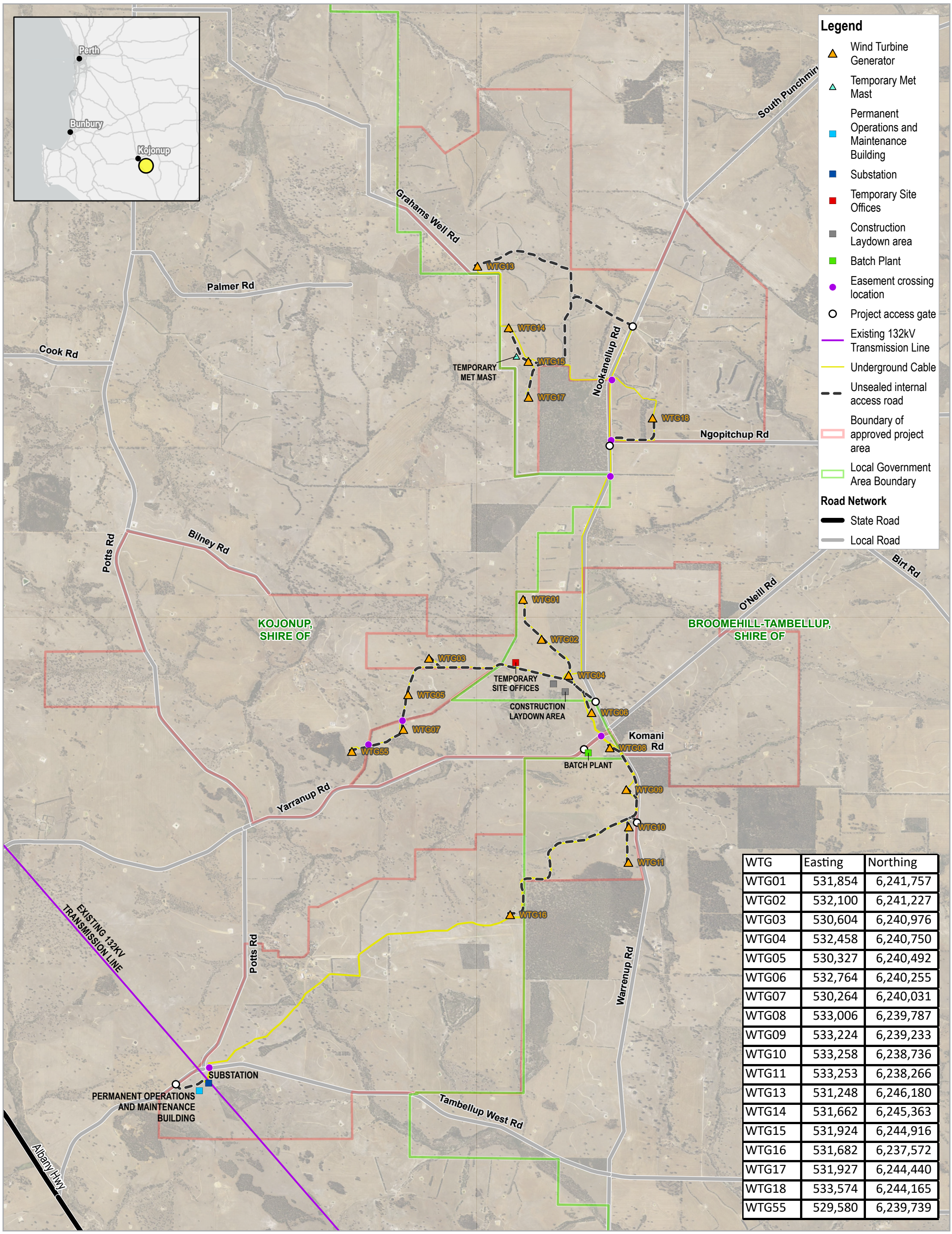
Whilst on the site construction contractors will ensure that no motor vehicles leave site laden with any material unless it is loaded in a manner that will prevent the discharge or dropping of any of the material.

Contractors will ensure that the wheels, tracks and body of all plant and equipment is clean prior to site entry so that they are weed and seed free, this shall be verified utilising weed and seed checklists. If non-compliances are detected, the plant and equipment shall also be washed prior to leaving the site.

Appendices

Appendix A

Development Layout Plan



WTG	Easting	Northing
WTG01	531,854	6,241,757
WTG02	532,100	6,241,227
WTG03	530,604	6,240,976
WTG04	532,458	6,240,750
WTG05	530,327	6,240,492
WTG06	532,764	6,240,255
WTG07	530,264	6,240,031
WTG08	533,006	6,239,787
WTG09	533,224	6,239,233
WTG10	533,258	6,238,736
WTG11	533,253	6,238,266
WTG13	531,248	6,246,180
WTG14	531,662	6,245,363
WTG15	531,924	6,244,916
WTG16	531,682	6,237,572
WTG17	531,927	6,244,440
WTG18	533,574	6,244,165
WTG55	529,580	6,239,739

REVISIONS REV	BY	DATE	DESCRIPTION	CKD	APP
0	AK	27.06.2022	ISSUED FOR USE	MM	RS
1	AK	07.07.2022	REISSUED FOR USE	MM	RS
2	AK	14.07.2022	REISSUED FOR USE	MM	RS

Paper Size ISO A3

0 0.5 1 1.5 2 Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

GHD

ENEL
Flat Rocks Wind Farm Stage One

12574907-00000-MD-LAD-001
Project Layout

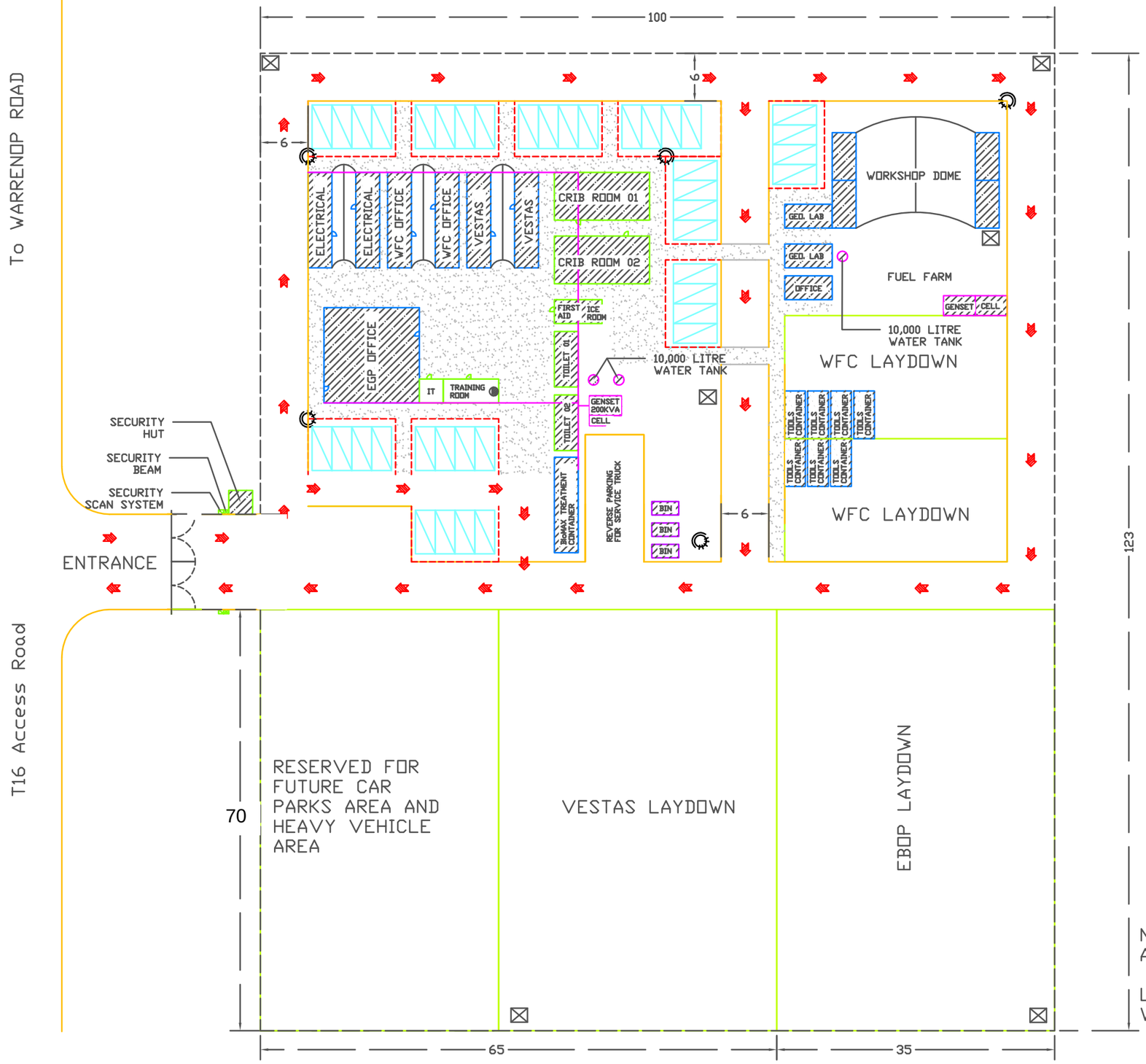
Project No. **12574907**
Revision No. **2**
Date **14/07/2022**

G:\61\12574907\GIS\Maps\Working\12574907\12574907.aprx\12574907-00000-MD-LAD-001_2
Print date: 14 Jul 2022 - 14:43

Data source: Light Gray Base: Esri, HERE, Garmin, FAO, NOAA, USGS. Created by: akang

Appendix B

Site Facilities Layout



LEGEND

- -LV BAY
- -WINDROW
- -TRAFFIC FLOW
- -HIGH BAY LIGHTING
- -PEDESTRIAN AREA
- -SECURITY FENCE LINE
- -SENTRY TOWER WITH CCTV
- -ACCESS CARD CHECK IN WINDOW LOCATED INSIDE TRAINING ROOM

NOTE:
ACCESS ROAD-150mm GRAVEL AND 15mm ROAD BASE
LAYDOWN -150mm GRAVEL
WALKWAY -100mm BLUE METAL

Rev.	DESCRIPTION	PREP.	DATE
A	ISSUED FOR TENDER INFORMATION.	MW	16/02/2022

WESTFORCE CONSTRUCTION

enel

WESTFORCE CONSTRUCTION & ENEL ENERGY

PROJECT: FLAT ROCK WIND FARM

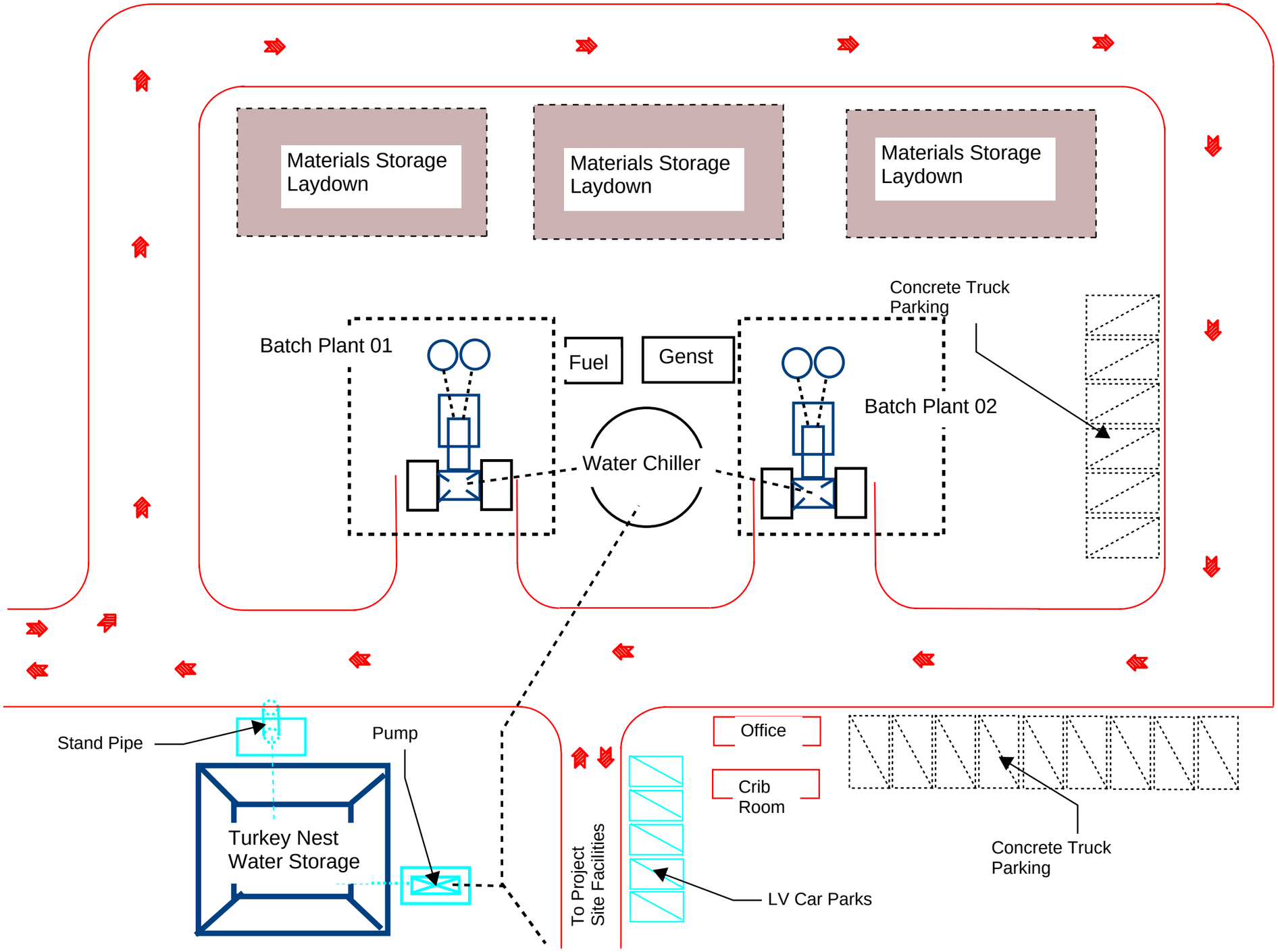
DRAWING No. WF2448A-GA-0001

DWG TITLE:
GENERAL ARRANGEMENT
SITE LAYOUT AND FACILITIES ARRANGEMENT

Rev. A

Appendix C

Concrete Batching Plant Layout



Rev.	DESCRIPTION	PREP.	DATE
A	ISSUED FOR TENDER INFORMATION.	MW	16/02/2022

WESTFORCE CONSTRUCTION

enel

WESTFORCE CONSTRUCTION & ENEL ENERGY

PROJECT: FLAT ROCK WIND FARM

DRAWING No. WF2448A-GA-0004

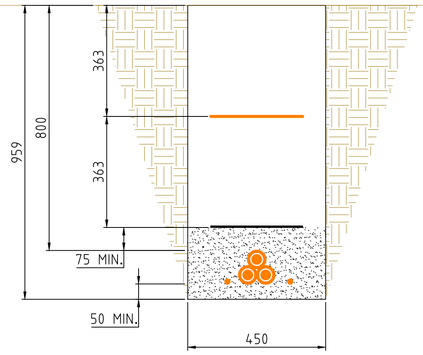
DWG TITLE:
GENERAL ARRANGEMENT
Batch Plant Arrangement

Rev. A

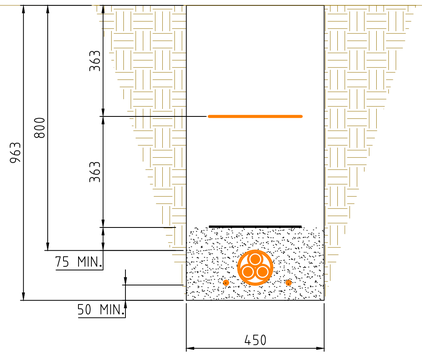
Appendix D

Typical Trench Detail

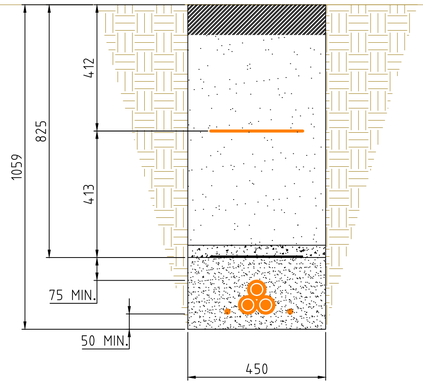
TRENCH DETAIL 3x1C CABLE



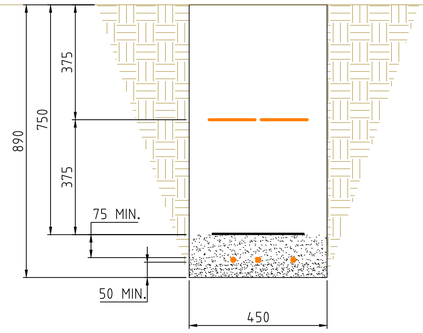
TRENCH DETAIL 1x3C CABLE



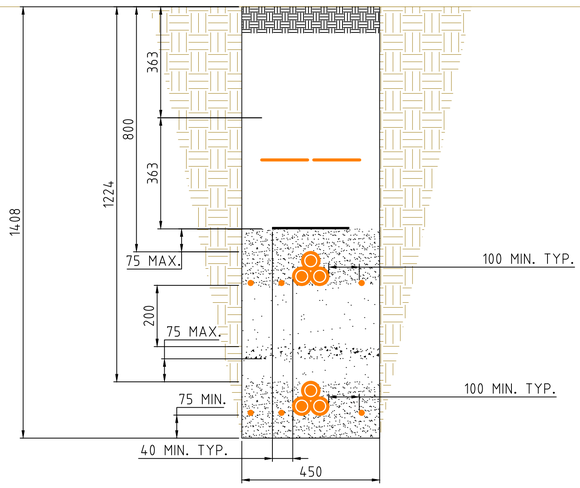
ROAD CROSSING DETAIL 3x1C CABLE



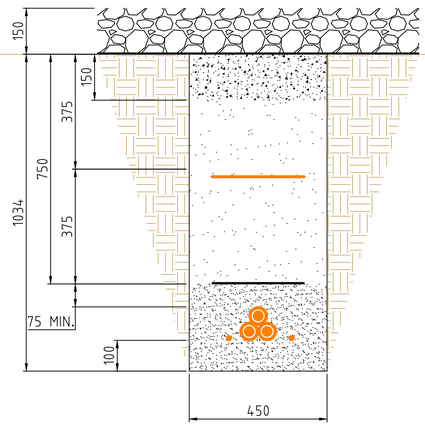
TRENCH DETAIL MET MAST



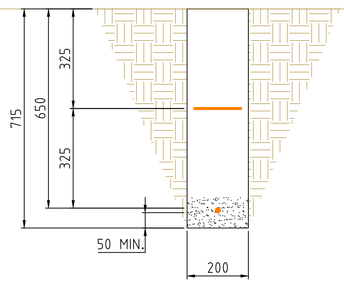
TRENCH DETAIL 3x1C CABLE CROSS OVER



CREEK CROSSING DETAIL



TRENCH DETAIL EARTH CABLE



© COPYRIGHT

THIS DRAWING REMAINS THE PROPERTY OF RJE GLOBAL PTY. LTD.
IT IS SUBJECT TO RETURN UPON DEMAND & MAY NOT BE PASSED ON TO ANY THIRD PARTY, OR USED DIRECTLY OR INDIRECTLY FOR ANY OTHER PURPOSE THAN THE MANUFACTURE OR CONSTRUCTION OF EQUIPMENT, OR IN THE DESIGN & INSTALLATION OF PLANT TO THE ORDER OF RJE GLOBAL PTY. LTD.

REFERENCE DRAWINGS

DRAWING NUMBER	DRAWING TITLE
1949-125-0001	33kV RETICULATION CABLE ALIGNMENT

REVISIONS & APPROVALS

REV	DATE	DESCRIPTION	DRN.	CHK'D.	C.E.	CLIENT
A	08.06.22	PRELIMINARY	MC	JM		

SCALE 1:10

APPROVALS		DATE
DRAWN	MC	08.06.22
CHECKED	JM	08.06.22
DESIGNED		
RJE C.E.		
CLIENT C.E.		
CLIENT P.E.		
CLIENT M.E.		

PRELIMINARY

RJE Global
Smarter Engineering
115 MORPHETT ROAD
MORPHETTVILLE, SA, 5043
TEL +61 8 8300 9500
FAX +61 8 8300 9501
EMAIL enquiries@rjeglobal.com

ACAD FILE:\1949-Flat Rock Wind Farm\5-Design\5-RJE CAD\1-DWG

.

FLAT ROCK WIND FARM
33kV RETICULATION
TRENCH CROSS SECTIONS
LAYOUT

SIZE A1

PROJECT No. 1949

DRAWING No. 1949-125-1101

REV. A

ghd.com

The Power of Commitment

Bushfire Management Plan

Flat Rock Wind Farm

July 2022

envision
bushfire protection

LIMITATIONS STATEMENT

This Bushfire Management Plan ('BMP') has been solely prepared for Enel Green Power Australia on behalf of Moonies Hill Energy Pty Ltd for the Stage 1 Flat Rock Wind Farm southeast of Kojonup across a 40 km^2 area within both the Shire of Kojonup and the Shire of Broomehill Tambellup.

Envision Bushfire Protection

ABN: 90958370365

P.O. Box 7209 SHENTON PARK WA 6008

P: 0428 066 147

Email: admin@envisionbp.com.au

Version Control

Stage 1 Flat Rocks Wind Farm			
Version	**Date**	**Author**	
V1	13 June 2022	Anthony Rowe	Draft
V2	2 July 2022	Anthony Rowe	Client revisions
V3	14 July 2022	Anthony Rowe	Submission

Copyright

Unless otherwise agreed in writing, this report is the intellectual property of Envision Bushfire Protection. The report is designed to be used exclusively by the person who commissioned it. Permission must be sought prior to the reproduction of any portion of this document, and every effort is made to ensure proper referencing of this document.

Disclaimer

In undertaking this work, the authors have made every effort to accurately apply the available information at the time of writing following the instructions of the regulatory authorities and applying best practice as described by the Fire Protection Association Australia. Any conclusions drawn or recommendations made in the report are made in good faith, and the consultants take no responsibility for how this information and the report are subsequently used.

Envision Bushfire Protection accepts no liability for a third party's use of, or reliance upon, this specific report.

Envision Bushfire Protection accepts no liability for the inaction of the owner to provide or maintain the bushfire protection measures identified in this report. Vegetation is dynamic, building materials may distort, and the accumulation and the location of flammable materials near the building may affect the potential for damage or loss of a building to occur.

Failure to maintain the property and/or building to these standards may compromise an insurance policy if currently covering any of your assets or those of any third party that may be consequentially affected due such failure. If not insured, and if you are seeking insurance, this report may not influence the decision of any insurer not to offer cover.

Importantly the measures contained in this report cannot guarantee human safety or an absence of harm or that the building will not be damaged or would survive a bushfire event on every occasion. This is due to the unpredictable nature of fire behaviour (knowledge in this field continues to develop) and the unpredictable nature of extreme weather conditions.

Client relationship

I was engaged to provide expert bushfire safety and planning advice. My relationship with the client is a standard commercial contract, and no private, personal, or other matter has influenced the content of the BMP or my findings.

STATEMENT OF CONFORMITY – PLANNING AND DEVELOPMENT ACT 2005

Anthony Rowe Level 3 - BPAD36690

Principal

EXECUTIVE SUMMARY

Preface

This Bushfire Management Plan ('BMP') has been solely prepared for Enel Green Power Australia for the Stage 1 Flat Rocks Wind Farm, to be located south east of Kojonup in an area within the Shire of Kojonup and the Shire of Broomehill Tambellup.

The wind farm at Stage 1 comprises 18 individually sited turbines within a 40 km^2 area.

The site is within a declared bushfire prone area. Accordingly, the proposal is to be assessed for compliance with State Planning Policy 3.7 *Planning in Bushfire Prone Areas* ('SPP 3.7') "*to preserve life and reduce the impact of bushfire on property and infrastructure*" in meeting the supporting elements described in the Guidelines for Planning in Bushfire Prone Areas V1.4 (the Guidelines).

The area in which the turbines are located is pasture, with isolated pockets of remnant forest vegetation. It is gently undulating with slopes of $2.0^0 – 3.0^0$. The windfarm will be hosted by individual landowners and the operation of the windfarm will be managed by Enel Green Power Australia. Agricultural operations will continue around the windfarm assets.

The development of the wind farm comprises a construction phase and an operational phase, the elements of which are described following:

Construction

- Construction compound
  - Construction site office and amenities
  - Concrete batching plant
  - Workshop and vehicle service
  - Fuel stores
- Access roads (making)
- Trenching and installing reticulated power; and
- Turbine assembly compounds at each site

Post construction

- 18 Turbine installations (site assembly compounds removed);
- Substation
- Operations compound (control building and workshop);
- Access roads

The windfarm has been conditionally approved by Shire of Kojonup and the Shire of Broomehill Tambellup. One of the conditions of approval (condition 19) requires the provision of a Bushfire Management Plan addressing the following:

"(a) Identification and clear mapping of firebreaks, emergency ingress and egress points, water points, turnaround areas for fire trucks, water sources, on site fire-fighting equipment;

(b) Identification of on-site tracks for access by emergency fire vehicles, and the requirement for these tracks to be maintained to a trafficable standard at all times;"

"(c) Emergency procedures and personnel contacts;

(d) Consideration of activities on fire ban days;

(e) Notification for other agencies."

Items (a) and (b) have been addressed in the risk register and illustrated spatially on Figures 1a-1g and Items (c), (d) and (e) have been addressed in the Emergency Management Plan contained in this Plan

Risk Assessment

Following the requirements of SPP3.7 a risk assessment has been undertaken as a basis for identifying the risk treatments to satisfy the intent of condition 19.

The intent of SPP3.7 is a risk based arrangement and has been affirmed by the West Australian State Administrative Tribunal.

> *SPP 3.7 is not a prohibition, that risk SPP 3.7 does not require that there be no increase at all in the threat of bushfire to people property or infrastructure. The intention of the policy is to 'implement effective, risk based land use planning and development to preserve life and reduce the impact of bushfire on property and infrastructure'[1].*

This BMP has applied the risk management methodology described in AS/ISO 31000:2018 and the National Emergency Risk Assessment Guidelines (NERAG 2020) to methodically identify the risks and provide corresponding practical risk treatments.

As Low as Reasonably Practical (ALARP) has been applied to determine the risk treatment measures, for both a fire arriving at the site and for a fire ignited and spreading from the site.

The objective, outcome sought, followed Objective 5.1 from SPP 3.7

> *To avoid any increase in the threat of bushfire to people, property and infrastructure. The preservation of life and the management of bushfire impact are paramount.*

This assessment of the Flat Rocks Wind farm has involved an extensive literature review on the subject of bushfires affecting wind farms and the ignition of bushfires from wind farms.

The Australian Fire and Emergency Service Authorities Council (AFAC) *wind farms and bushfire operations - Guideline 2018*, found wind farms are not expected to adversely affect bushfire behaviour, including as a hazard to low flying firefighting aircraft, but the turbines should be shut down to reduce turbulence.

International studies find a typical wind farm with 150 turbines may experience one or two fires during 20 years of operation.[2] The nacelle is provided with heat monitoring and fire suppression systems. If these are overwhelmed a nacelle fire is uncontrollable due to its height. The focus therefore is to ensure there is no fire spread or spotting ignitions allowed to develop downwind of the turbine.

A nacelle fire does introduce a different fire dynamic to that of traditional grassland fires. The height of the nacelle creates a potential for downwind spotting and can create dangerous conditions underneath necessitating an exclusion zone. For a grassfire the focus is mostly upon suppressing the fire line; in the event of a nacelle fire resources may need to be split to attend to the fire line as well as addressing any downwind spot fires.

A risk level is a combination of the likelihood and consequence.

The consequence was identified as moderate: if a fire occurs it has the potential to cause loss of a year's earnings due to the destruction of a crop. This is considered in the context of existing controls that should include following the directions of the annual fire break notice to reduce the vulnerability of buildings and assets to grassfire. Establishment of separation areas will reduce the consequence of damage to asset; the consequence is therefore the loss of a crop.

The residual risk after treatments as identified in the attached emergency management plan is 'medium' and comparable to the existing risk level characteristic of pastural activities.

It is acknowledged that the wind farm introduces a new dynamic to firefighting in the locality; a turbine fire has the potential for spotting downwind. Measures have been applied to minimise the occurrence and provision of flexible firefighting equipment will assist to chase down small fires before they can develop.

---

[1] HARMANIS HOLDINGS NO. 2 PTY LTD and WESTERN AUSTRALIAN PLANNING COMMISSION [2019] WASAT 43 (25 June 2019)

[2] Firetrace international 2020 citing studies into the frequency of turbine ignitions https://www.firetrace.com/hubfs/_img/reports/Firetrace-Report-In-The-Line-Of-Fire.pdf

Risk Treatment

This BMP has addressed a condition of a planning authorisation made under the Planning and Development Act 2005. As such it is also subject to the requirements of State planning Policy 3.7 which is a risk management arrangement. It requires the identification of risk and prescribes that the risk treatments should follow four elements identified in the bushfire protection criteria. The four criteria being location, siting and design, vehicle access and water.

Location

The location is predominantly grassland and classed as a moderate bushfire hazard level, a level that is suitable for development. Areas of extreme bushfire hazard (predominantly forest) are to be avoided

Siting and design.

Siting and design requires suitable setback from classified vegetation can be established in order to preserve life and reduce the impact upon property and infrastructure. The setback distances are identified as a risk treatment and are based upon a potential separation from grassland that is below a level of serious harm.

The following Asset Protection Zones apply

- Around the site camp (construction compound) a 30 m wide area of grass maintained at less than 100 mm and no grass within the compound.
- Around the turbine construction compound a 30 m wide area of grass maintained at less than 100 mm and no grass within the compound.
- Around the base of the turbine (operational) a 20 m diameter area of compacted limestone or equivalent, and a 40 m diameter area of grass maintained at less than 100 mm.
- Around the substation a 30 m wide area of grass maintained at less than 100 mm and no grass within the substation area
- Around the operations building and maintenance compound a 21 m wide area of grass maintained at less than 100 mm and no grass within the maintenance compound. The operational building is to be constructed and maintained to the BAL 29 standard.
- Access route easements are 20 m wide.

Access

The access roads will be constructed to 21 tonnes with a 20 m reserve to be maintained as low threat. The construction standard is determined by the heavy vehicles that will be used for construction and service of the turbines.

The turbines will provide an area at their base to facilitate the turnaround of service vehicles. The access routes are predominantly through grassland with gentle slopes affording extended view to the location of a fire and the opportunity to take avoidance action.

The windfarm will utilise public roads and access to the turbines will be gated (see figures 1a – 1g).

The gates will be light (with light locks to enable push through), they are not intended as barriers. Each access will have Emergency cannisters (see attached) installed with emergency information inside them, including emergency contact details and maps of the site.

The turbines will be hosted on agricultural production sites. The existing Shire firebreak requirements will apply.

Water supply

The site does not have access to a reticulated water supply. Within the area of the windfarm there are a number of dams, but these may not be a reliable source of water in a period of extended drought. A distribution of water tanks is proposed within the windfarm as a convenient point to replenish firefighting appliances.

Three 50 000 L standalone water tanks ae proposed to be located at the:

- Inside of the access gate to WTGs 13,14,15,17
- Inside of the access gate to WTGs 1,2,3,4,5,6,7,55
- Inside of the access gate to WTGs 8,9,10,11,16

A 50 000 L standalone water tank will be provided at the construction compound and maintained at the operations building maintenance compound during the operation of the windfarm.

A 1 000 litre fire appliance (slip on unit) will accompany each working area during the construction phase and a 1 000 litre fire appliance (slip on unit) will be retained at the operations building and maintenance compound to attend maintenance site works during operation.

All vehicles entering the windfarm area will be required to be equipped with a fire extinguisher, to provide an early response to any grassland ignition.

Additional treatments are identified as management measures in the Emergency Management Plan continued in Appendix 2. It follows an Emergency Management System approach: *Prevention* (*Planning), Preparation, Response and Recovery*. It identifies the emergency procedures and personnel contacts, responsibilities and notification in a bushfire event and operational practices of total fire ban and harvest and vehicle movement restrictions.

In summary the Emergency Management Plan responds to two event types. The event of a turbine nacelle fire, and the event of a grassfire approaching the site.

Nacelle Fire

Report fire

- Shut down turbines, Y position and head to wind if possible
- Alert adjoining residents (SMS contact/WhatsApp)
- Alert the Shire/ Brigade for attendance

Landowner response

- Set up an exclusion zone no closer than 75 m from the base
- Provide the immediate suppression to the fire line outside the exclusion area
- Monitor the area downwind from the turbine for spot fires.
- Monitor the area until the nacelle fire is exhausted and an all clear has been given.

Brigade response

- Attend to the fire line outside the exclusion area.
- Alert areas down wind of the turbine, up to 5 km.
- Monitor for, and attend to, spot fires downwind from the turbine.

A fire approaching the site

- Shut down turbines, lock in Y position and head to wind if possible.
- Determine the severity of the fire. If there is potential endangerment to the site:
    - Workers at a turbine (if not safe to evacuate) should park vehicles at the base of the turbine at the lee side of the approaching fire
    - Guide personnel at risk to safety (evacuate or take shelter)
    - All personnel not directly involved in the fire response are to evacuate the site to a safe location as directed by the management team in coordination with public emergency services.
    - The Chief Warden (operations manager), and designated personnel, will ensure the evacuation of personnel has been successfully completed and that all personnel are accounted for.

The risk treatments identified in this BMP have followed the emergency management system approach Prevention (Planning) Preparation, Response and Recovery.

The risk assessment has identified treatments (physical works) as part of Prevention (planning) and Preparation, (described in the Risk Register) and the Response and Recovery described in the Emergency Management Plan (in Appendix 1). Combined these represent an As Low as Reasonably Practical outcome.

Table of Contents

1. PROPOSAL DETAILS 1

1.1 Introduction 1

1.2 Development Proposal 2

Construction compound 2
Substation 3
Turbines 3
Access roads/Power reticulation 4

1.3 Regulatory Compliance Requirements 12

1.4 Environment Considerations 13

2. BUSHFIRE RISK ASSESSMENT 15

2.1 Context Objective And Scope 15

2.2 Risk Identification 15

Bushfire Attack Level Inputs 20
Bushfire History 22
Residential proximity 24
Risk identification 25

2.3 Risk Analysis 27

Existing controls 27
Consequence Criteria 30
External Consequence Assessment 31
Likelihood Level 34
Risk Level 34

2.4 Risk Evaluation 35

2.5 Risk Treatment 35

Risk Register and Residual Risk 36

APPENDIX 1 - EMERGENCY MANAGEMENT PLAN
APPENDIX 2 - VEGETATION CLASSIFICATION
APPENDIX 3 – SCENARIO RESPONSE PLAN
APPENDIX 4 – NACELLE SUPPRESSION SYSTEMS
APPENDIX 5 – REFERENCES

1. PROPOSAL DETAILS

1.1 Introduction

This Bushfire Management Plan ('BMP') has been prepared for Enel Green Power Australia on behalf of Moonies Hill Energy Pty Ltd for the Flat Rocks Stage 1 wind farm to be located within the Shire of Kojonup and the Shire of Broomehill Tambellup.

The site is located in a 40 km^2 area south of the township of Kojonup **(Plate 2)** and is classed as overall being located within a bushfire prone area (OBRM 2021) as shown on **Plate 3.** Some development elements are outside the area shaded as bushfire prone, but the development is comprised of dependent elements within the area shaded as bushfire prone, the development as a whole is treated as within bushfire prone land.

Development, which includes buildings and land use, where located within a bushfire prone area, is required to demonstrate compliance with the requirements of State Planning Policy 3.7.

The policy intent is ***to preserve life and reduce the impact of bushfire on property and infrastructure.*** Compliance is achieved where a proposal incorporates the Acceptable Solutions as described under each Element in the Bushfire Protection Criteria or can satisfy the intent of each Element by performance principle and the Precautionary Principle.

SPP 3.7 is not a prohibition; SPP 3.7 does not require that there be no increase at all in the threat of bushfire to people property or infrastructure. Rather, as is seen in cl 2 of SPP 3.7, the intention of the policy is to 'implement effective, risk based land use planning and development to preserve life and reduce the impact of bushfire on property and infrastructure'.

Background

The proposed development represents Stage 1 of a wind farm concept for 18 turbines, the site area straddling the Shire of Kojonup and the Shire of Broomehill Tambellup.

The Shire of Kojonup at its meeting 28 September 2021 resolved to conditionally approve Stage 1. Condition 19 of the approval as provided:

> *"Prior to commencing any works, the Applicant is to lodge a Fire Management Plan for approval by the local government. The Fire Management Plan shall be prepared by a suitably qualified consultant and in the context of the construction and operational phases of the development address the following matters -*
>
> *(a) Identification and clear mapping of firebreaks, emergency ingress and egress points, water points, turnaround areas for fire trucks, water sources, on site fire-fighting equipment;*
>
> *(b) Identification of on-site tracks for access by emergency fire vehicles, and the requirement for these tracks to be maintained to a trafficable standard at all times;*
>
> *(c) Emergency procedures and personnel contacts;*
>
> *(d) Consideration of activities on fire ban days;*
>
> *(e) Notification for other agencies."*

This Shire decision follows the conditional approval of the Great Southern Joint Development Assessment Panel made on 27 July 2013 – condition 10.

This (Bushfire Management Plan (contemporary terminology for a Fire Management Plan) has been prepared following condition 19 in the Shire approval.

The Bushfire Management Plan has followed the contemporary procedures for the identification of risk determination and risk management measures as required for a power generating land use.

1.2 Development Proposal

The foundation investigations supporting the approved windfarm were summarised in the Environmental Impact Report 2010, which included:

- Flora, Vegetation and Fauna Assessment: prepared by: Mattiske Consulting Pty Ltd 2010
- Ethnographical Survey Report: prepared by R and E O'Connor Pty Ltd Sept 2010
- Archaeological Survey Report: prepared by John B. Cecchi Sept 2010
- Background Monitoring Report: prepared by Herring Storer Acoustics May 2011
- Noise Impact Assessment: prepared by Herring Storer Acoustics June 2011
- Landscape and Visual Impact Assessment: prepared by William James Landscape Architects July 2011
- Zones of Visual Influence: prepared by GL Garrad Hassan May 2011
- Shadow Flicker Report: prepared by GL Garrad Hassan May 2011

Key components of the wind farm Stage 1 comprise:

- Construction compound (temporary)
- Construction site office building and amenities
- Concrete batching plant
- Workshop and vehicle service
- Fuel stores
- Substation and operations building;
- 18 Turbine installations;
- Access roads and reticulated power; and
- Fire management.

Construction compound

A single construction compound will be established to service the installation of the turbines. It will occupy 4 ha and include site offices, machinery parking, concrete batching plant and laydown/staging areas. The construction compound will also include fuel and oil stores required for the vehicles servicing the construction. On site storage will be in accordance with:

- *Dangerous Goods Safety Act 2004* and Dangerous Goods Safety (Storage and Handling of Non-Explosives) Regulations 2007 (managed by Department of Mines, Industry Regulation and Safety).
- *Occupational Safety and Health Act 1984*
- *Environmental Protection (Controlled Waste) Regulations 2004* (managed by Department of Water and Environmental Regulation)
- Department of Water and Environment Regulation policy Water Quality Protection Note 58 Tanks for Temporary Elevated Fuels and Chemical Storage 2018.

The site works at the construction compound are expected to provide a base for 100 – 120 persons during the construction phase.

Upon completion of the wind farm the construction compound will be reduced in size and function. An Operations Building / control centre and maintenance centre will be retained to provide supervision of the operating wind farm. The building will include all amenities and a workshop for the storage of tools and spare parts and provide a base for attending technicians and the undertaking of routine maintenance.

Substation

The electrical substation will be constructed to house transformers required to feed the wind farms output into the grid as well as metering, control and circuit protection. The transformers and oil supplies will be bunded to contain any oil spill.

Turbines

The Stage 1 proposal is 18 wind turbine compounds. Each turbine compound will comprise a single turbine (rotor, nacelle, tower, and crane hardstand). The hub height is 125 m with the rotor comprising three blades 73 m each. The tip height from ground is 200 m and a radius of 150 m. (see plate 5)

Plate 1: Typical turbine (photo courtesy of Western Power), a clear base within open land (pasture), retained crane pad and access track.

At construction, each turbine site will have an extended low threat space to be occupied by the laydown for large components, tower sections, nacelle and rotor blades and temporary office, lunchroom, and ablutions buildings to support the assembling workforce. Firefighting facilities will be provided at each construction site to suppress any ignitions that may inadvertently occur at the site. This includes a 50 000 L water tank to support suppression operations from the site.

Each turbine site will consist of a pile anchored foundation for the wind turbine (17 m foundation diameter) and a hardstand pad 20 m x 35 m to support a crane for installation and maintenance.

The turbines incorporate fire risk management systems, which are sealed systems for electrical fires.

The system includes arc detector technology, the lightning protection system, and the smoke/heat detection sensors package that can trigger the fire suppression system.

All high voltage electrical works are contained to, and within, the pylon. The fire hazard zones are as follows:

- Nacelle controller cabinet
- Converter cabinet
- Transformer room

The Fire Suppression System uses a non-conductive 3M Novec 1230 fire protection fluid. The fluid extinguishes principally by the removal of heat from the fire (to break the combustion cycle). Novec 1230 is environmentally safe and has the highest heat capacity of any available Halon alternative; requiring lower extinguishing concentrations for a given fuel.

Novec 1230 also leaves no residue for clean-up in the event of a false suppression event; minimising any wind turbine downtime, and the service cost of an alarm.

Agricultural production can occur up to the Asset Protection Zone (APZ) that is established around the base of the turbine.

At the end of the turbine life, if not replaced, the land will be restored to as close as practical pre-construction condition that will permit a return to broad acre farming. Access tracks will be removed if not retained as a benefit for farming.

Access roads/Power reticulation

The existing road network will be used to access the wind farm site. Within the wind farm area a dedicated network of gravel (all weather roads) will be established to provide access for the construction of the wind farm and year round access to the turbines for servicing and maintenance.

The access ways have been designed to minimise the clearing of any regulated vegetation and minimise disruption to farming operations by siting in cleared paddocks.

The substation will be connected to the turbines by an underground reticulation network (condition of planning approval) that will follow the access roads. The reticulation network will be buried at a depth to permit the continued economic use of the land above.

Fire Management

Each turbine is provided with a fire suppression system in the nacelle for electrical fires, and each turbine is monitored. The base of each turbine, pylon, is non combustible

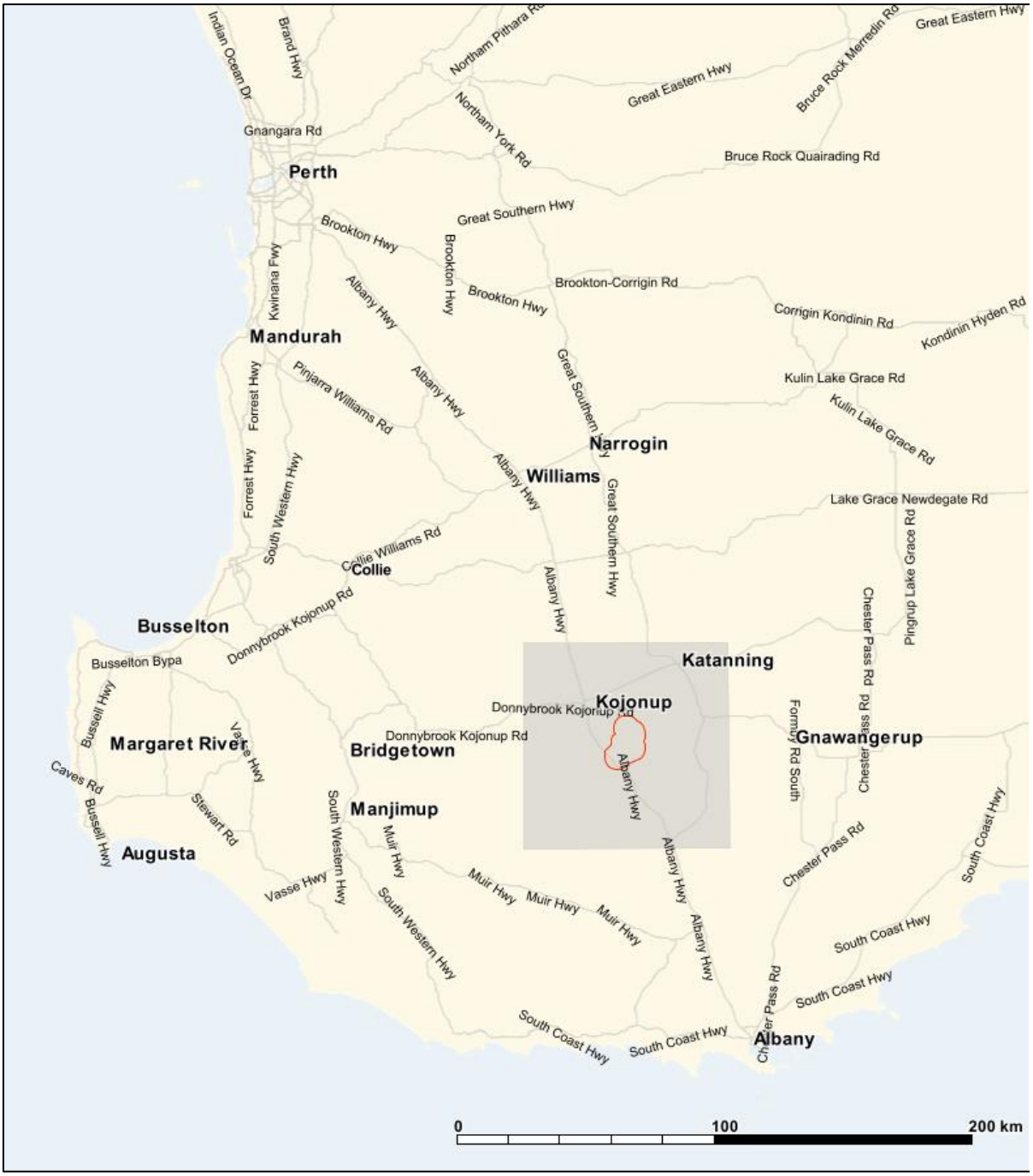


Plate 2: Site Locality, and state road network

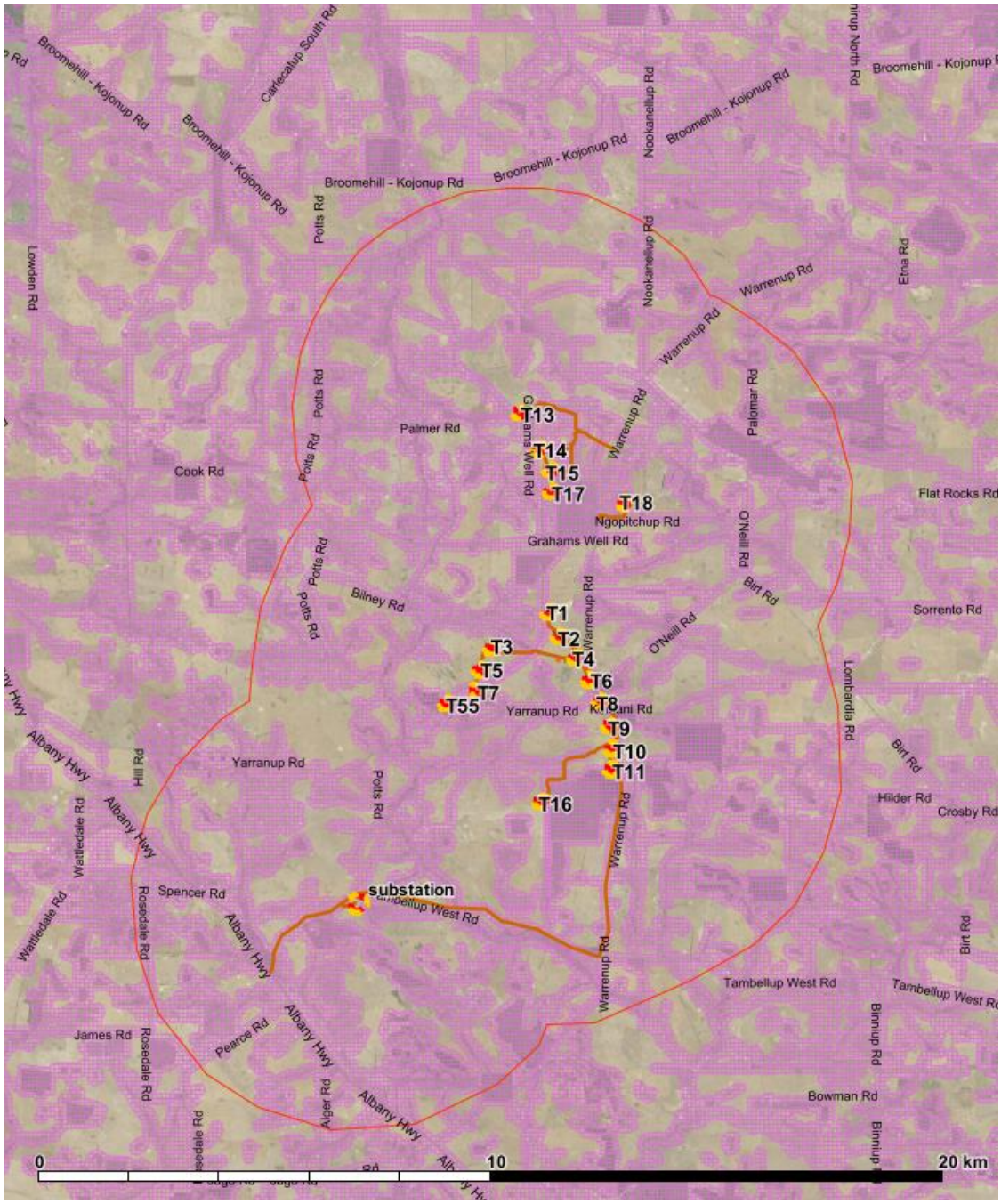
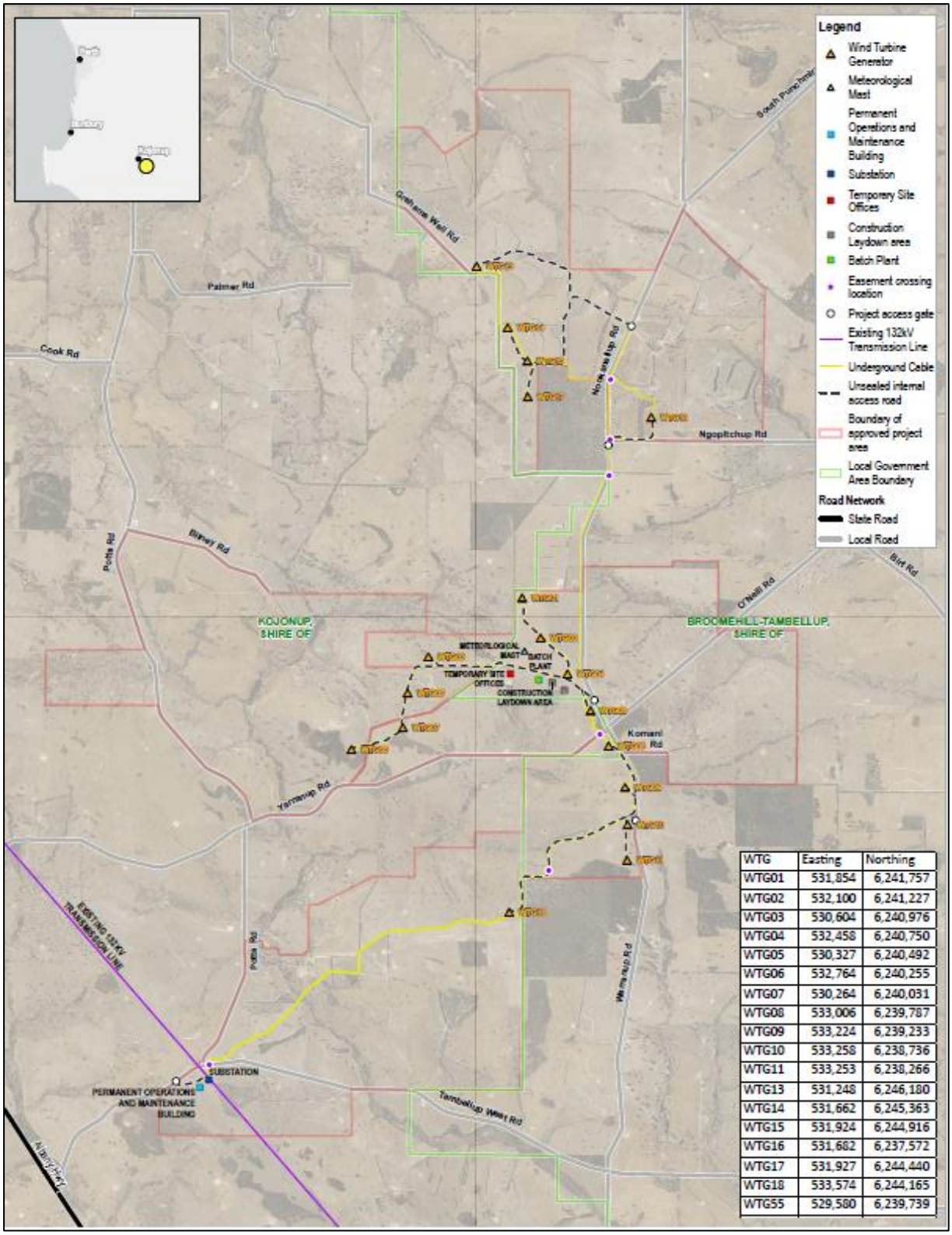


Plate 3: OBRM Bushfire Prone Area (pink*)*. The red boundary represents a 5 km separation from each asset.



WTG	Easting	Northing
WTG01	531,854	6,241,757
WTG02	532,100	6,241,227
WTG03	530,604	6,240,976
WTG04	532,458	6,240,750
WTG05	530,327	6,240,492
WTG06	532,764	6,240,255
WTG07	530,264	6,240,031
WTG08	533,006	6,239,787
WTG09	533,224	6,239,233
WTG10	533,258	6,238,736
WTG11	533,253	6,238,266
WTG13	531,248	6,246,180
WTG14	531,662	6,245,363
WTG15	531,924	6,244,916
WTG16	531,682	6,237,572
WTG17	531,927	6,244,440
WTG18	533,574	6,244,165
WTG55	529,580	6,239,739

Plate 4: Site Plan

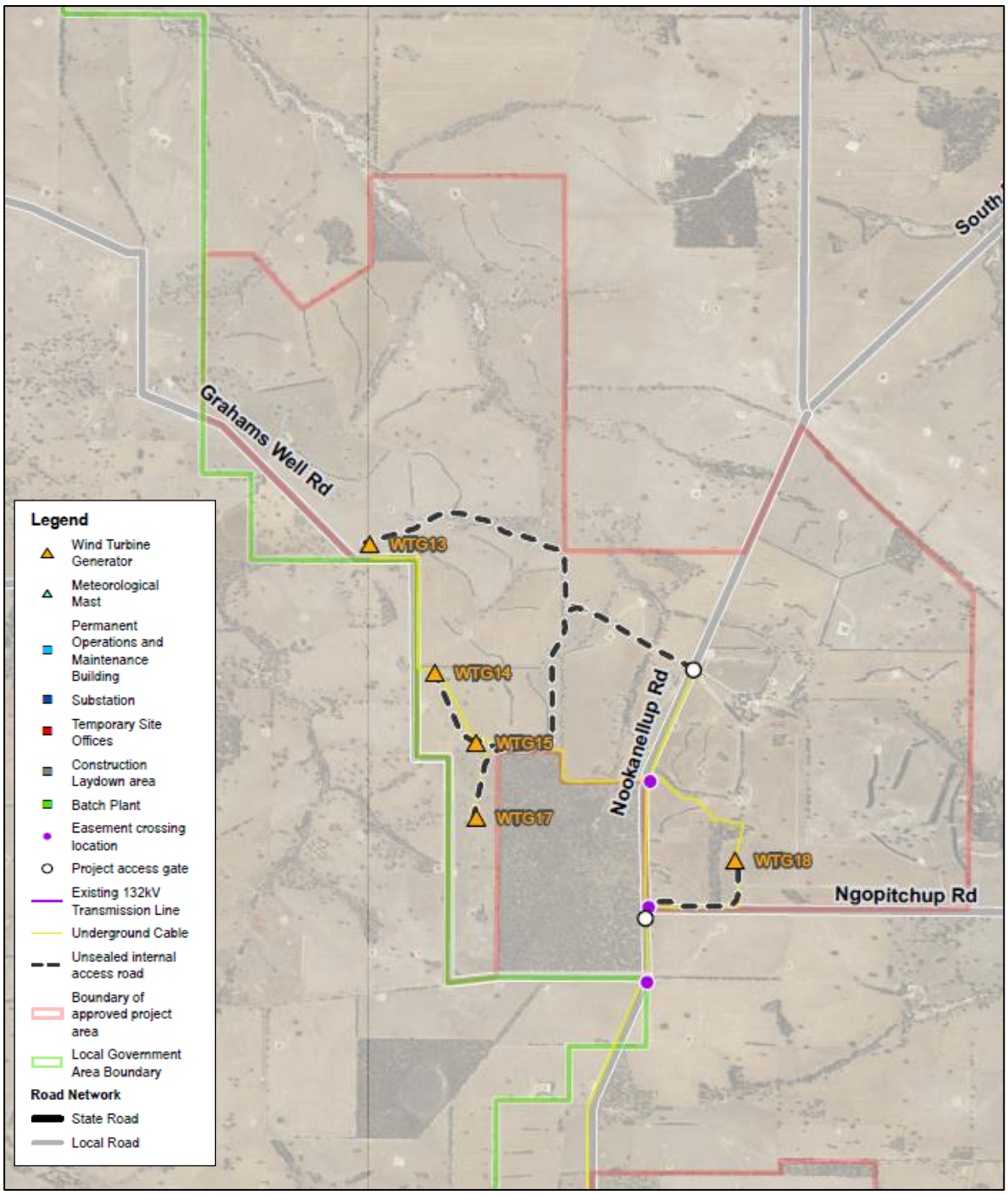


Plate 4a: Site Plan (enlarged north)

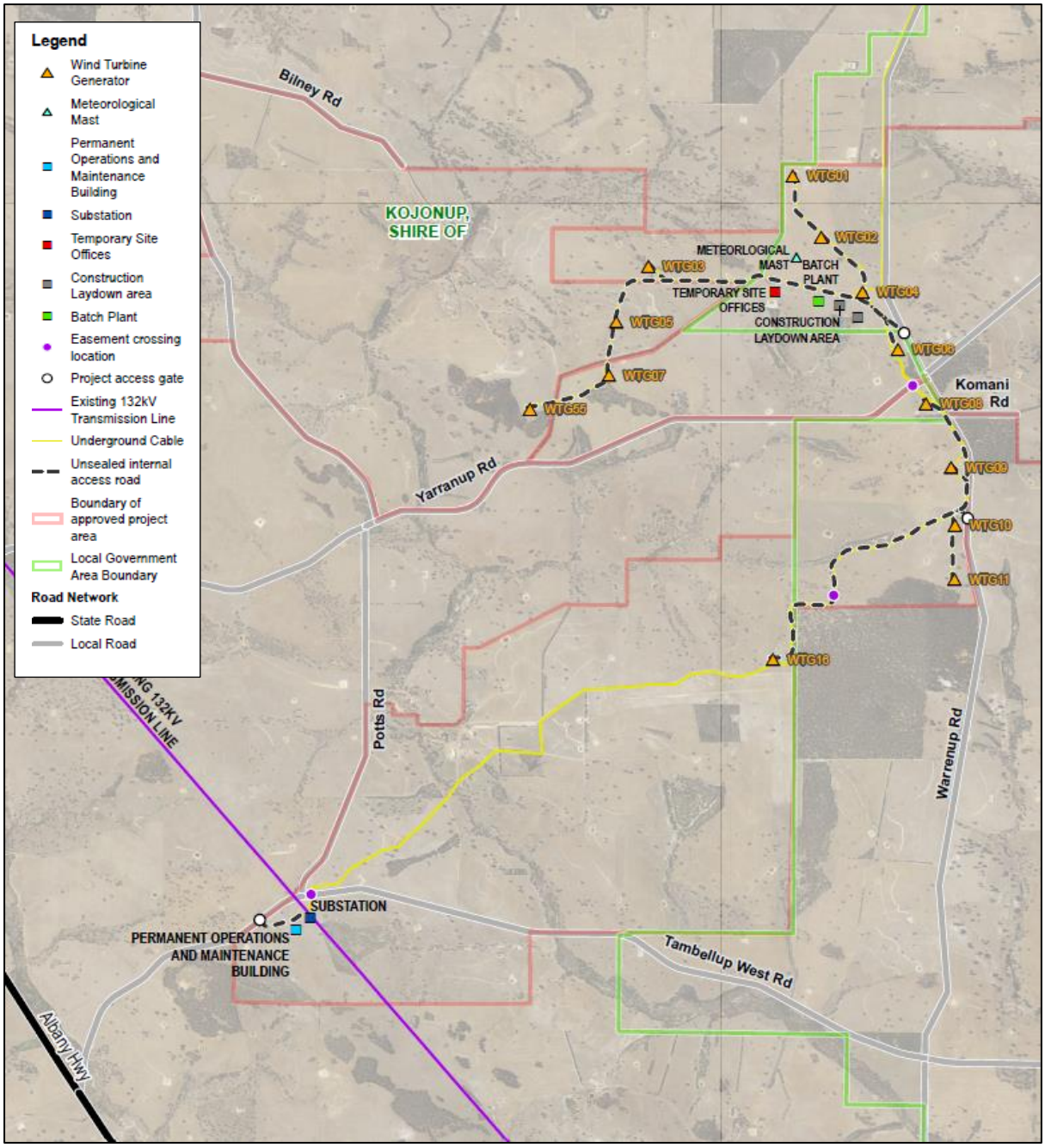


Plate 4b: Site Plan (enlarged south))

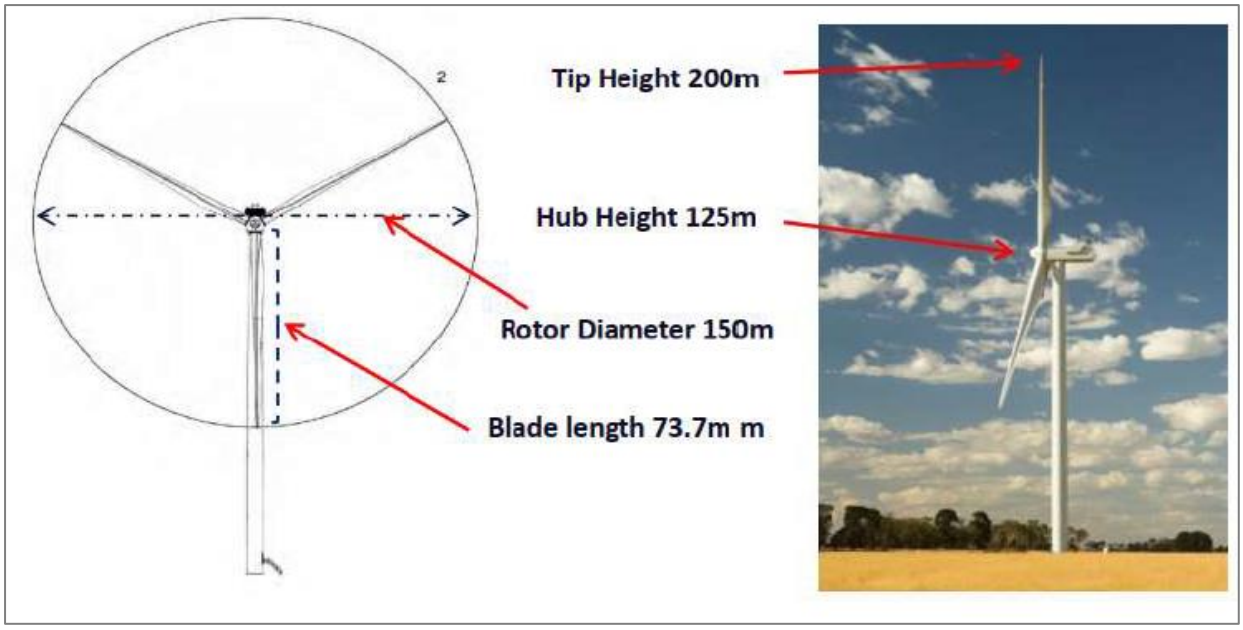


Plate 5: Turbine

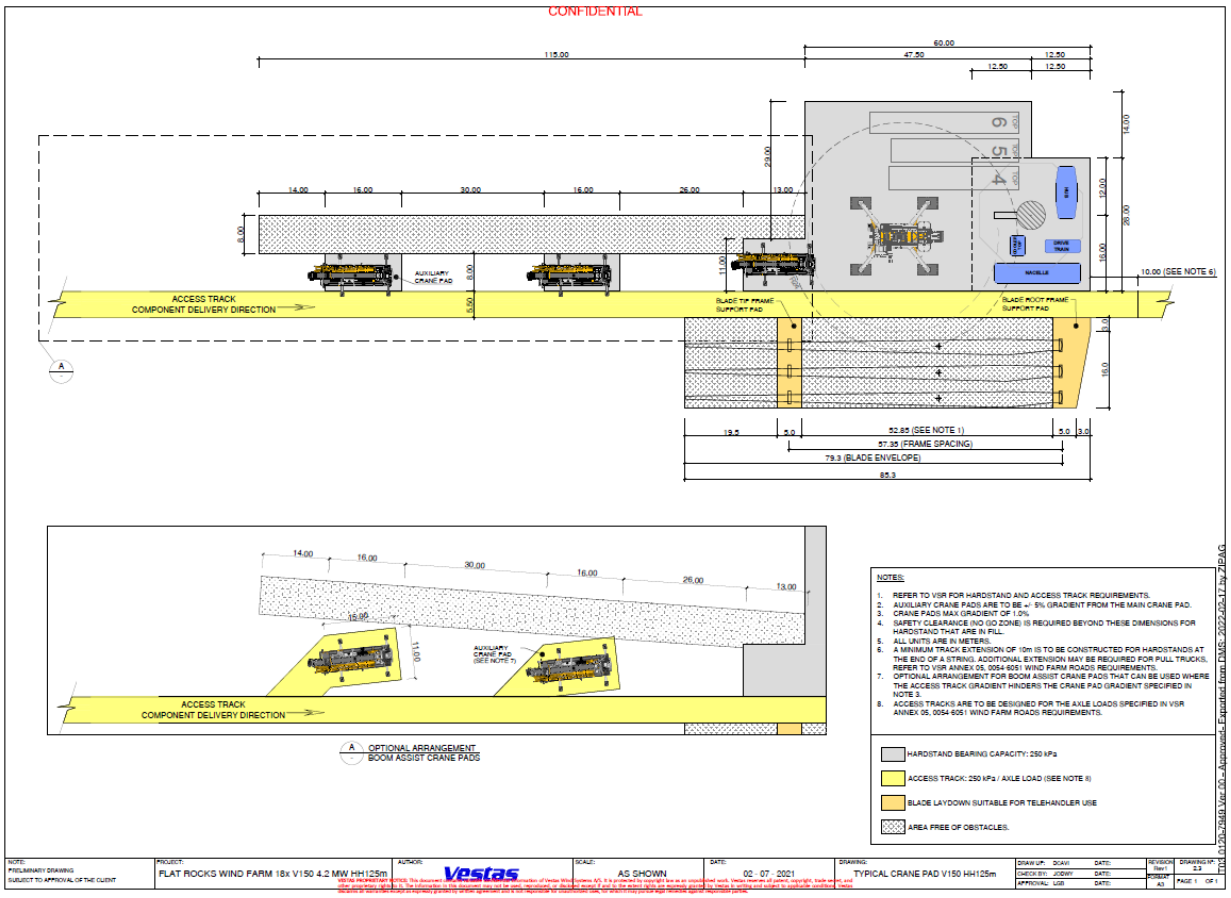


Plate 6: Turbine construction compound

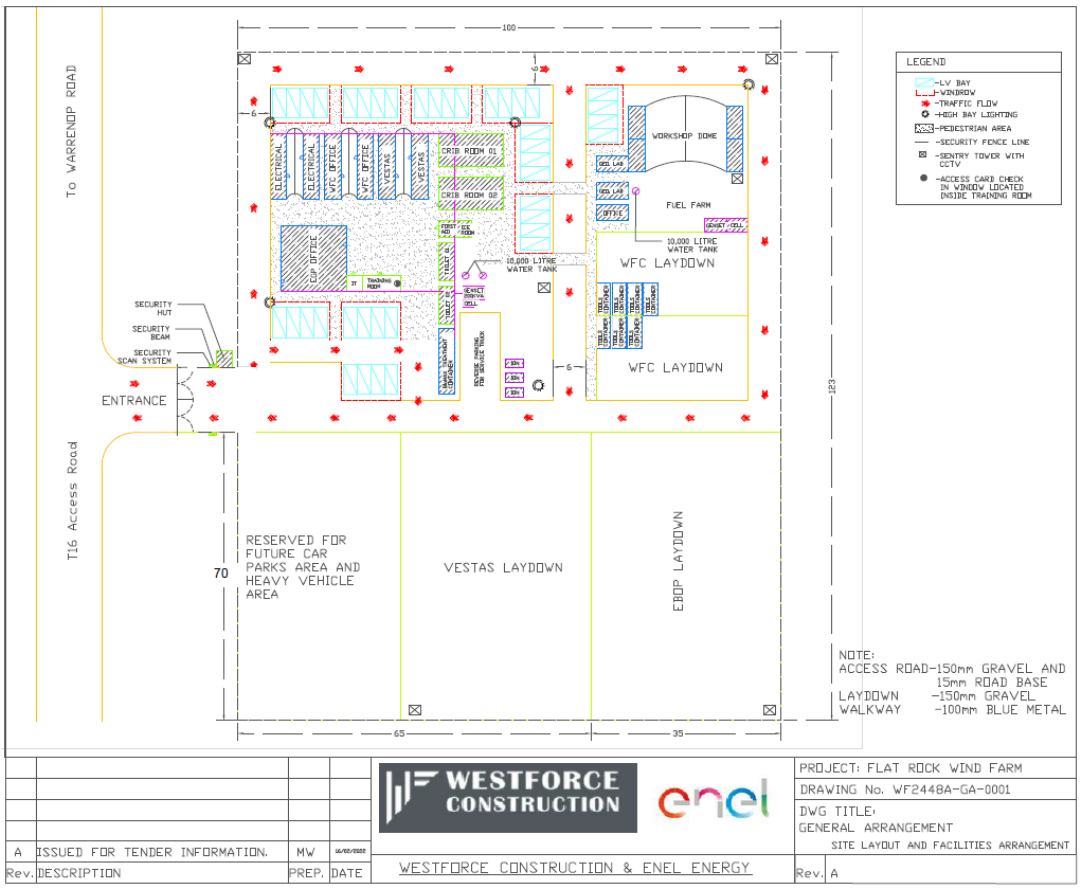


Plate 7: Indicative construction camp

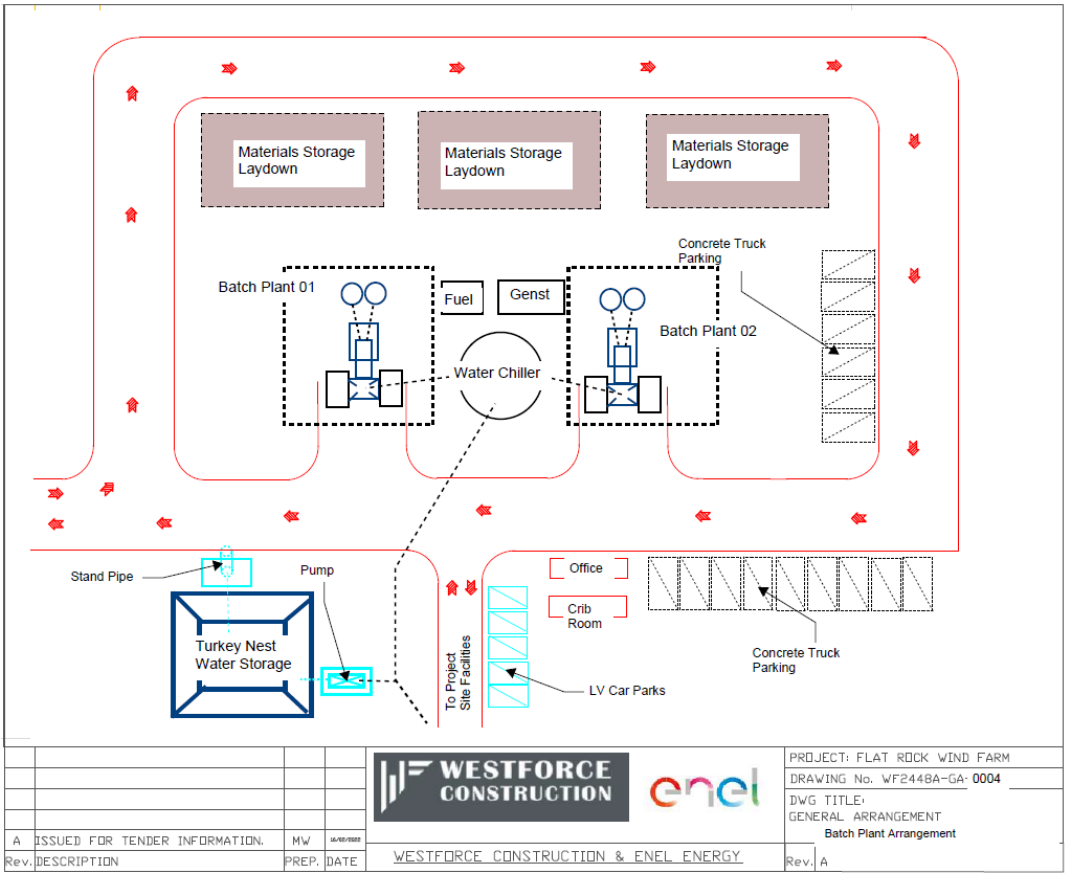


Plate 8: indicative Batching Plant

1.3 Regulatory Compliance Requirements

The following regulations have been applied to this assessment.

Planning and Development Act 2005 - SPP 3.7

On 7 December 2015, the State Government introduced a state map of Bushfire Prone Areas by order under the *Fire and Emergency Services Act 1998* and introduced development controls in Bushfire Prone Areas through the *Planning and Development Act 2005*. These controls were authorised by State Planning Policy 3.7 (Planning in Bushfire Prone Areas) regulations introduced under Part 10A Schedule 2 of the *Planning and Development (Local Planning Scheme) Regulations 2015* and guided by the *Guidelines for Planning in Bushfire Prone Areas*.

The State Planning Policy, Regulations, and Guidelines now form the foundation for fire risk management planning in WA at a community and land development level. The Policy Intent of SPP 3.7 is a risk-based land-use planning and development ***to preserve life and reduce the impact of bushfire on property and infrastructure***.

SPP 3.7 . Policy Objectives

> *5.1 Avoid any increase in the threat of bushfire to people, property and infrastructure. The preservation of life and the management of bushfire impact are paramount.*
>
> *Examples of increasing a threat of bushfire may include a high-frequency ignition (increased likelihood) or converting a low bushfire hazard to an extreme bushfire hazard (converting pasture to forest).*
>
> *5.2 Reduce vulnerability to bushfire through the identification and consideration of bushfire risks in decision-making at all stages of the planning and development process.*

Reducing vulnerability may include facilitating safe evacuation and ensure the building performance (by setback or construction standards) can exceed the bushfire impact.

***Clause 6.6 Vulnerable or High-Risk land uses* (Guidelines for Planning in Bushfire Prone Areas cl.5.5.1**

The proposal is a power generating landuse which is development type listed as high risk in the Guidelines.

> SPP 3.7 recognises that vegetation is not necessarily the only fuel in a bushfire event and that certain land uses may potentially ignite a bushfire, prolong its duration, or increase its intensity. Such uses may also expose the community, firefighters, and the environment to dangerous, uncontrolled substances during a bushfire event. High risk landuse may include, but are not limited to: service stations, landfill sites, bulk storage of hazardous materials, fuel depots and certain heavy industries as well as military bases, power generating land uses, saw-mills, highways and railways, among other uses meeting the definition.”.[3]

Proposals for high-risk land uses in bushfire-prone areas are to be supported by a risk management plan that addresses bushfire risk management measures for any flammable on-site hazards such as the storage and location of flammable material to reduce the threat, among other considerations

There are a range of specific regulations that apply to the storage and handling of hazardous products, including petroleum products, that also include a design and licensing requirement. These are principally based upon a fire in a building (structural) fire.

It is not the role of SPP 3.7 to direct specific regulation in this regard. The role of SPP 3.7 is to consider the consequence of bushfire, either by the proposal igniting a bushfire or a bushfire arriving at the site.

Associated legislation acknowledged but not addressed in this BMP includes:

- Dangerous Goods Safety Act 2007
- Dangerous Goods Safety (Storage and Handling of Non-explosives) Regulations 2007 (bulk >500 L)
- Dangerous Goods Safety (Storage and Handling of Non-explosives) Regulations 2007
- Dangerous Goods Safety (Storage and Handling of Non-explosives) Regulations 2007

[3] Guidelines for Planning In Bushfire Prone Areas V1.3 page 34 under cl.5.6

DMIRS Accredited Compliance Consultant WA Dangerous Goods Storage and Handling Licensing assessment are responsible for the facility design and submission of applications for licencing.

This will apply to the bulk storage of fuels used for electricity generation, and the service of vehicles. It will also include the management of oils and flammable substances to be used at the substation.

Bush Fires Act 1954

Section 33 of the *Bush Fires Act 1954* recognises the responsibility of all land holders to prevent the spread of bushfire. Local government, at any time, may give notice in writing to an owner or occupier of land within the district of the local government. The Notice may specify works to be undertaken, including the management of grasses on the property usually to be maintained at less than 10cm during the fire season. It also provides that the identified works can be undertaken as a separate operation or in coordination with the neighbouring land.

The *Bush Fires Act 1954* also provides the basis for the declaration and enforcement of total fire ban days.

1.4 Environment Considerations

Environment Protection Act 1986 and Environmental Protection (clearing native vegetation) Regulation 2004

It is an offence to clear native vegetation without the authority of a permit or an exemption. The act of clearing native vegetation, requires a permit from either the Department of Water and Environmental Regulation (DWER) or the Department of Mines, Industry Regulation and Safety (DMIRS), unless an exemption applies.

Exemptions include:

Environment Protection Act 1986

- Clearing of regulated vegetation required by local Government Section 33 *Bushfire Act 1954.*
- Clearing of regulated vegetation in accordance with the terms of a subdivision approval.
- Clearing of regulated vegetation in accordance with a permit (for prescribed burning) under the *Bushfires Act 1954*.

Environmental Protection (clearing native vegetation) Regulation 2004 (exemptions do not apply in Environmentally Sensitive Areas, and clearing > than 5ha)

https://www.der.wa.gov.au/your-environment/environmentally-sensitive-areas

- Clearing of regulated vegetation to the extent necessary to construct an approved building.
- Clearing of regulated vegetation that is for fire hazard reduction burning.
- Clearing of regulated vegetation to maintain an area cleared in the last ten years.

(WA) Biodiversity Conservation Act 2016 and Bio-diversity Conservation Regulations 2018

The *Biodiversity Conservation Act, 2016*, replaces the *Wildlife Conservation Act, 1950*, and the *Sandalwood Act, 1929*, it became operational with the *Bio-diversity Conservation Regulations 2018*, on 1 January 2019.

The Act provides for listing species, threatened ecological communities (TECs), key threatening processes and critical habitats. It introduces criteria for listing species' endangered', 'critically endangered' or 'vulnerable', to align with the Environment Conservation and Biodiversity Conservation Act 1999 (Cth).

The subject land is not presently affected by a TEC.

Commonwealth Environment Protection Biodiversity Conservation Act 1999

The Commonwealth Environment Protection Biodiversity Conservation Act 1999 provides for the protection of matters of national environmental significance. National environment law does not generally regulate fire prevention measures taken by state and territory governments, but no specific exemptions are provided.

Bushfire Treatment and Environment Conservation

A fundamental consideration in determining the treatments for a given risk is to avoid conflict with biodiversity management measures, which may limit the treatment options.

In accordance with the Department of Planning Lands and Heritage template (BMP template to support a BAL Contour Assessment) a review of the listed databases has been undertaken as part of this assessment to identify whether restrictions or other specific considerations may apply that would affect the implementation of any bushfire protection initiatives that may otherwise be identified.

Table 2: Ecology datasets

Is the land affected by:	**Affected by the proposal**	**If yes - describe**
Conservation Wetland or buffer (DBCA-019 DBCA-017)	No	
RAMSAR Wetland (DBCA-010)	No	
Threatened and Priority Flora (DBCA-036)	No	
Threatened and Priority Fauna (DBCA-037)	No	
Threatened Ecological Communities (DBCA-038)	No	
Bush Forever (COP-071)	No	
Environmentally Sensitive Area (DWER-046)	No	
Regionally Significant Natural Areas (DWER-070)	No	
Conservation Covenant (DPIRD-023)	No	
South West Ecological Linkages	No	
Does the proposal require the removal of restricted vegetation?		**No**

The proposed development does not require the displacement of vegetation other than pasture grasses.

During construction each turbine site will require an expanded area for the storage and assembly of the turbines. Following completion of construction the expanded construction area will be removed, and pasture returned up to the extent determined for the APZ.

2. BUSHFIRE RISK ASSESSMENT

2.1 Context Objective And Scope

Context

The land is gently undulating with slopes of 2.0^0 - 3.0^0. The land is suitable for broadacre farming and historically cleared of native vegetation to provide for pasture production. Consequently, only a few isolated pockets of remnant native vegetation remain.

The locality is sparsely populated comprising primarily single dwellings on rural production holdings. The approximate ratio is 1 dwelling per 100 km^2.

Various outbuildings are located within the area associated with agricultural production.

Public roads are separated by large distances. The site is located between Albany Highway, and the Great Southern Highway. The turbines are arranged along Warrenup Road which connects north to Broomehill Kojonup Road and south to Tambellup West Road. Both Broomehill Kojonup Road and Tambellup West Road are sealed roads that connect with Albany Highway, and the Great Southern Highway.

Objective

The relevant objective from SPP3.7 is:

To avoid any increase in the threat of bushfire to people, property and infrastructure. The preservation of life and the management of bushfire impact are paramount.

The attainment is the application of As Low as Reasonably Practical (ALARP) risk treatment measures.

This is to be recognised in context with the present risk that applies to the locality.

Scope

The scope defines the evidence and data that will be followed in determining the treatments that satisfy the objective.

- Determined risk to be assessed by AS 3959:2018 (site topography, fuels and fire danger index)
- Bureau of Meteorology climate data to verify the applicable FDI and prevailing wind directions
- DBCA bushfire History
- Literature review, wind farm fire incidents and bushfire impacts.
- A review of existing risk controls and strengths
- The identification of risk treatment following emergency management principles.

2.2 Risk Identification

Bushfire behaviour is the primary determinant of the bushfire risk and the design fire as a basis for identifying appropriate treatments. Bushfire behaviour is affected by three factors;

- Topography (slope of the ground, aspect, and wind influences) – fire travels faster uphill, the flame length is increased uphill (x 2 for every 10^0), landforms can channel and increase local windspeed and create turbulence. They are measured as 0.0^0 or in 5^0 increments downslope in AS 3959 (Method 1).
- Climate (drought and season) & weather (temperature, humidity, wind, atmospheric instability) – determines the intensity of a fire, the speed and direction, and potential for advanced spotting. It is measured as an FDI (FFDI or GFDI) in AS 3959.
- Vegetation (horizontal and vertical structure, flammability, mass, and availability). It is measured as a vegetation classification, or an exclusion, in AS 3959 (Method 1).

It is assumed that a bushfire will achieve a steady-state and be fully developed to maximum intensity over a 100 m (minimum fire run).

Grassfires travel faster (GFDI) than a forest canopy fire, but a forest canopy fire can eject a higher level of embers and also eject them over a greater distance.

The arrangement of fuel has a greater effect upon the intensity of the fire than just its mass; its exposure to oxygen is referred to as its availability in a bushfire.

Climate

The climate, using data from Kojonup Weather Station, can be described as Mediterranean with wet winters and warm summers from December through to March.

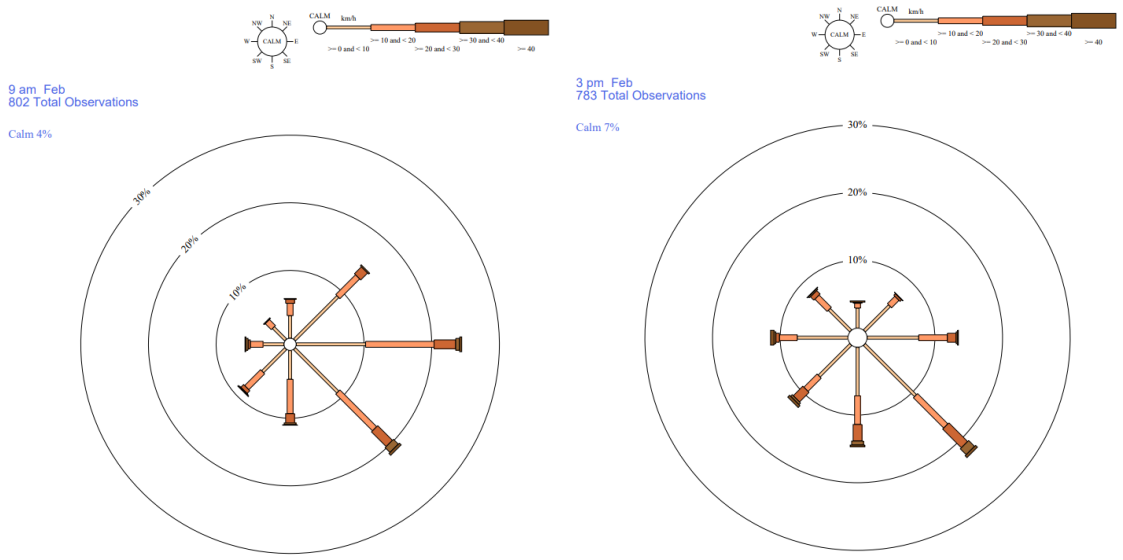


Plate 9: Wind roses (February 9 am and 3 pm), Bureau of Meteorology, Kojonup.

Bushfires generally travel in the direction of the prevailing wind. Prevailing wind conditions are most likely to be extreme in the afternoon in December to March (February is representative and selected below). The direction of the prevailing wind conditions, strength, and direction, can help anticipate the direction, the fuels present, the effect of topography from that direction and the fire intensity. Whilst a fire can come from any direction an uncontrolled fire at some time is likely to be influenced by the common prevailing winds.

The prevailing winds shows a bias to the eastern hemisphere, in the morning but it is noted that afternoon winds are distributed through the southern hemisphere.

Fire Danger Weather

The FFDI is calculated from temperature, wind speed, relative humidity, drought factor (time since last rain) and Keetch-Byram Drought Index (soil moisture) index which is a measure of soil moisture

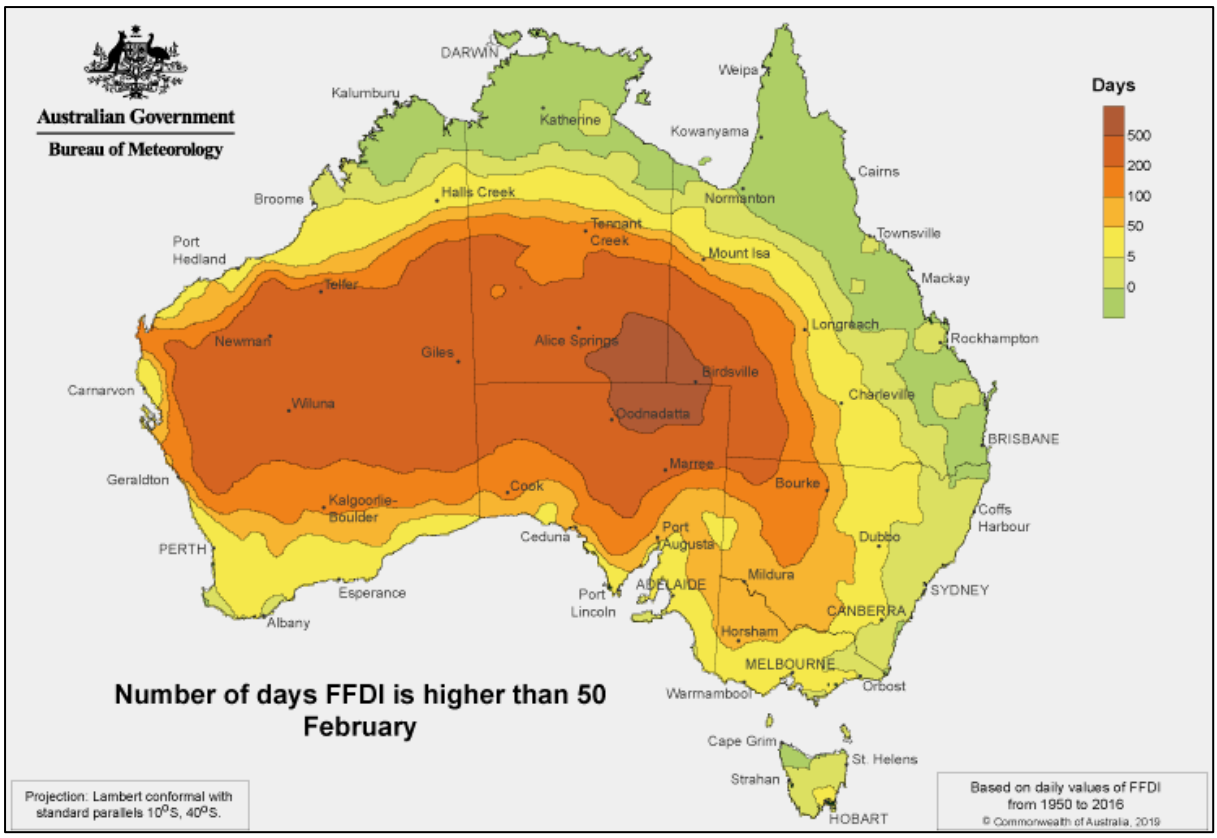


Plate 10: BoM national FFDI map, February illustrates the site is within the same band as Metropolitan Perth.

An assessment of the BoM national FFDI maps suggests a FFDI 50+ can occur in November through to March, at Kojonup (Plate 10), with February the highest frequency.

Days with an FFDI of 50 or over represent conditions where a fire may not be controlled, although grassfires over flat land whilst fast moving are more responsive to suppression efforts compared to a forest fire which has a higher intensity and has the complexity of distant spotting.

The map suggests Kojonup has a similar number of days above FDI 50 as the FDI for the Perth CBD. The Perth CBD corresponds to the nominal FFDI of 80 which is used across Western Australia for Bushfire Attack Level assessment purposes. Whilst it is possible to apply a higher or lesser FFDI than 80 if justified by climate data, in regard to the development site an FFDI of 80 is appropriate.

Topography

The topography can influence the direction and speed of a bushfire and the predictability of its behaviour. It can also determine the accessibility for firefighting purposes.

The topography and open pasture land presents few limitations for access through the pasture fields in order to undertake fire suppression.

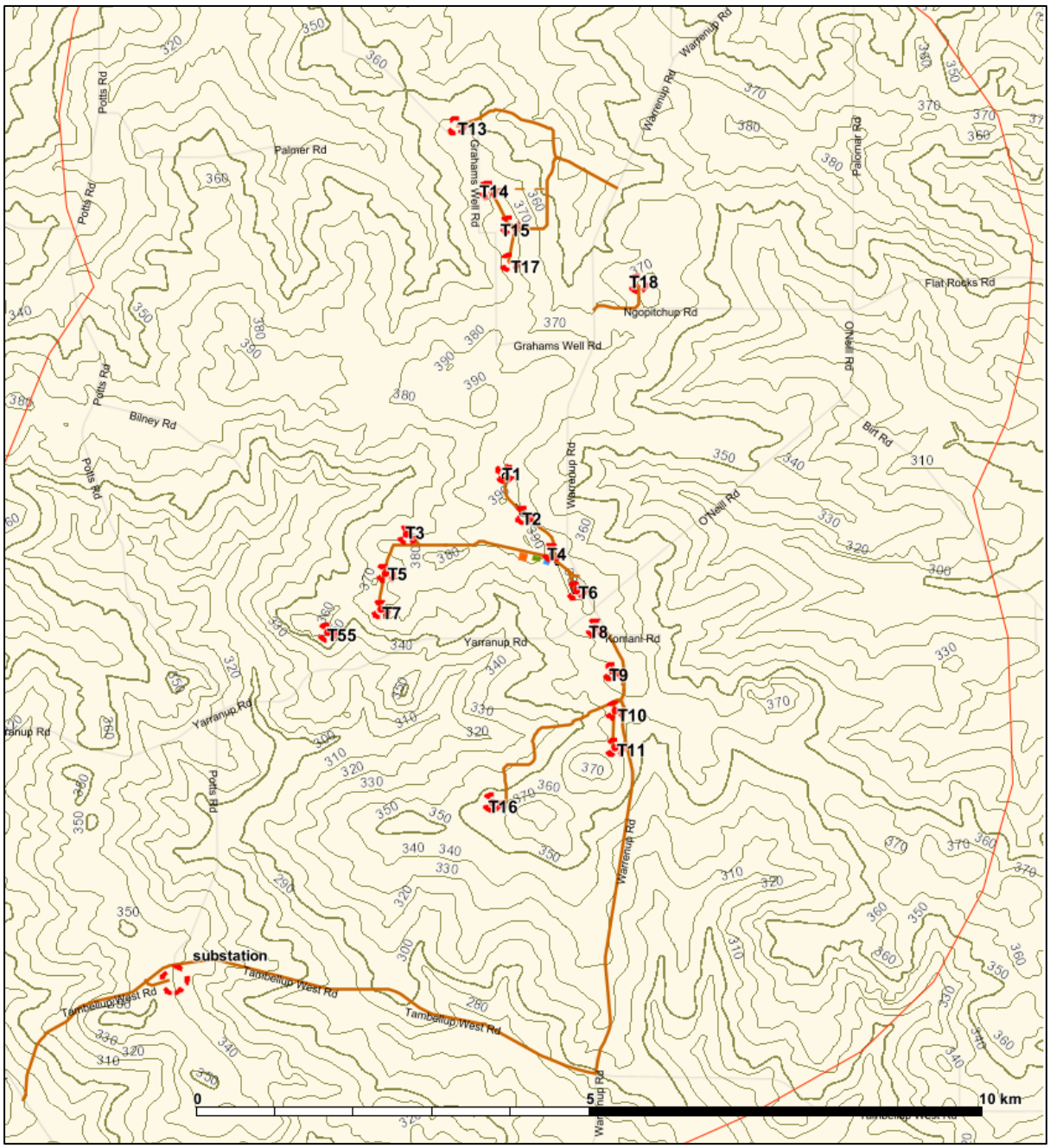


Plate 11: Topography illustrates the slope ranges of 0.0^0 – 3.0^0 is uniform across the site and characterised as gently undulating.

The turbines have been located upon the highest elevation, consequently the vegetation on the approaching slope toward the turbine is classed as downslope from the turbine. A bushfire approaching the turbine will be running up hill and a fire escaping a turbine site would be running downhill. For Bushfire Attack Level assessment purposes a slope of $0\text{-}5.0^0$ has been applied as a conservative measure.

Vegetation

The following vegetation descriptions from the Environmental Impact Statement (2010) have been applied to the following vegetation groupings in AS 3959:2018.

Grassland: Agriculture production pasture grasses

Woodland: Open Woodland of Eucalyptus rudis subsp. rudis Melaleuca rhaphiophylla over Acacia saligna, Acacia acuminata, Jacksonia sternbergiana over Ficinia nodosa and introduced grasses on sandy-loams and clay-loams on fringes of creeklines.

Forest: Woodland of Eucalyptus astringens subsp. astringens Eucalyptus wandoo on sandy-loam and some Eucalyptus marginata subsp. marginata over subshrubs and introduced grasses on sandy-loams on slopes.

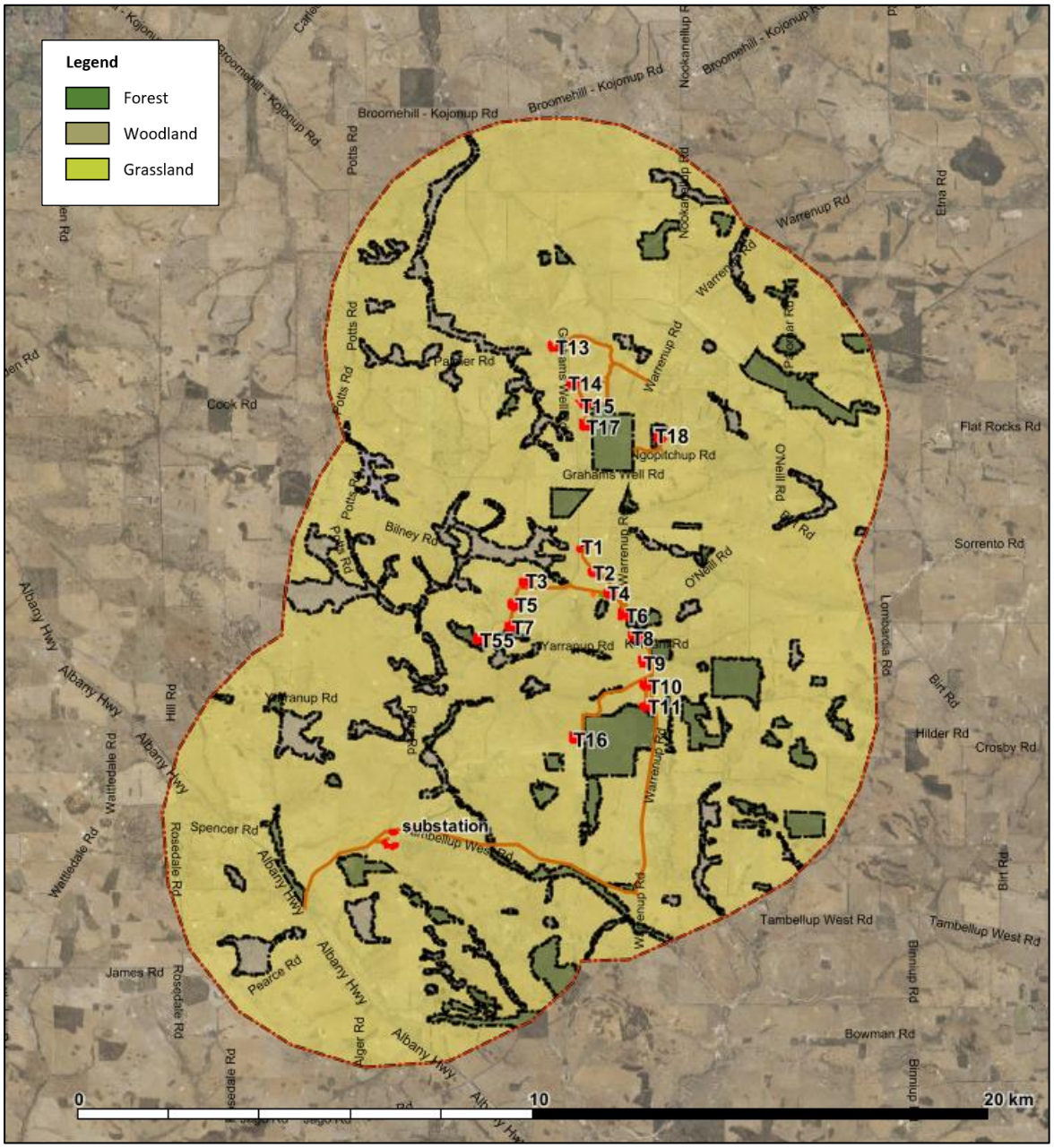


Plate 12: Landscape context 5 Km from assets.

Plate 12 illustrates the arrangement of classified vegetation within 5 km of the Stage 1 Flat Rocks Wind Farm assets.

All turbines are located no closer than 100 m to any other vegetation classification. Grassland has the most influential radiant heat impact at each site. Risk treatment to address the BAL at the site can be made in consideration of grassland.

An enlargement of the vegetation classifications at each Turbine location is shown in APPENDIX 2 (figures 1a - 1g) to provide the detail and photographic verification of the vegetation within 150 m of each Turbine location.

Bushfire Attack Level Inputs

The Bushfire Attack Level Assessment has been undertaken in accordance with the methodologies described in AS 3959:2018 and in accordance with the Guidelines, and the Fire Protection Association accredited practitioner methodology.

The BAL has followed:

All vegetation within 150 m **(context)** of an asset has been classified (AS 3959:2018 Clause 2.2.3) to determine the Bushfire Hazard Level at the locality;

The BAL rating has been determined through site inspection and assessment of the following parameters:

- Fire Danger Index (FDI) rating; assumed to be FDI - 80 for Western Australia; *Note for the purpose of planning for a shelter an FFDI with 1:200 APE is used. This equates to an FFDI of 100.*
- A separation distance between the building and the classified vegetation source(s) within 100 m (for BAL impact) the separation distance is measured from the wall face (receiver) to the unmanaged understory rather than the canopy edge (dripline) *see plate 6*; and
- Slope of the land under the classified vegetation.

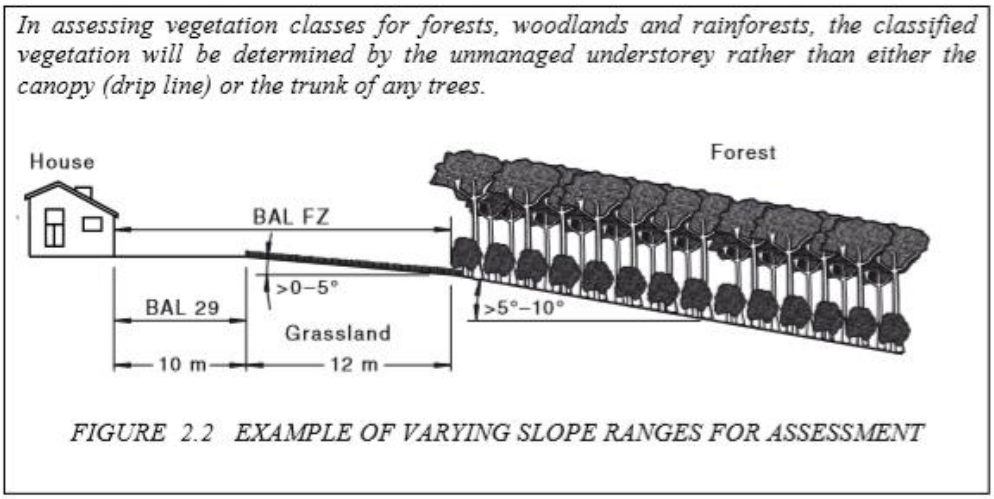


Plate 13: Arrangement of inputs for the determination of a BAL.

Determine bushfire Attack Level at each turbine location

There is no restriction upon clearing grassland to achieve the desired Bushfire Attack Level.

The bushfire attack level available at the Turbines, the construction compound and the substation and operations building will be determined by the clearing of grass.

The BAL level at the nominated receiver is dependent upon the separation (APZ) indicated as follows based upon a downslope of 5.0^0

Vegetation classification	Effective slope (degrees)	Separation Distance (AS 3959:2018 Table 2.5)	BAL
Grassland	0-5	< 7 m	BAL-FZ
		7 - < 9 m	BAL-40
		9 - < 14 m	BAL-29
		14- < 20 m	BAL-19
		20- < 50 m	BAL-12.5
		> 50 m	BAL-LOW

As an explanation, if pasture grasses were restricted to 9 m from the base of the pylon the BAL rating at the pylon would be BAL-29; if pasture grasses were restricted to 20 m from the base of the pylon the BAL rating at the pylon would be BAL-19.

Asset	APZ	BAL	Purpose
Construction compound	**30 m**	**<BAL - 12.5**	This equates to 7 kWm^2 which is a maximum operating level for a fire fighter to short term exposure corresponding to a grassfire. It would permit the perimeter to be defended and the defence of open stored assets.
Turbine Base	**30 m**	**<BAL - 12.5**	This equates to 7 kWm^2. It will enable shelter at the lee side of a turbine base, and a parking of a vehicle at the base would be less than 10 kWm^2 to provide tenability
Substation	**50 m**	**BAL - Low**	To provide a standoff position to supress a bushfire from penetrating or escaping.
Operations building	**20 m**	**BAL - 12.5**	Provides resilience to the passage of the fire front
Operations compound	**20 m**	**BAL - 12.5**	Provides resilience to the passage of the fire front and the suppression of external fires (external stores) after the passing of the fire front

Bushfire History

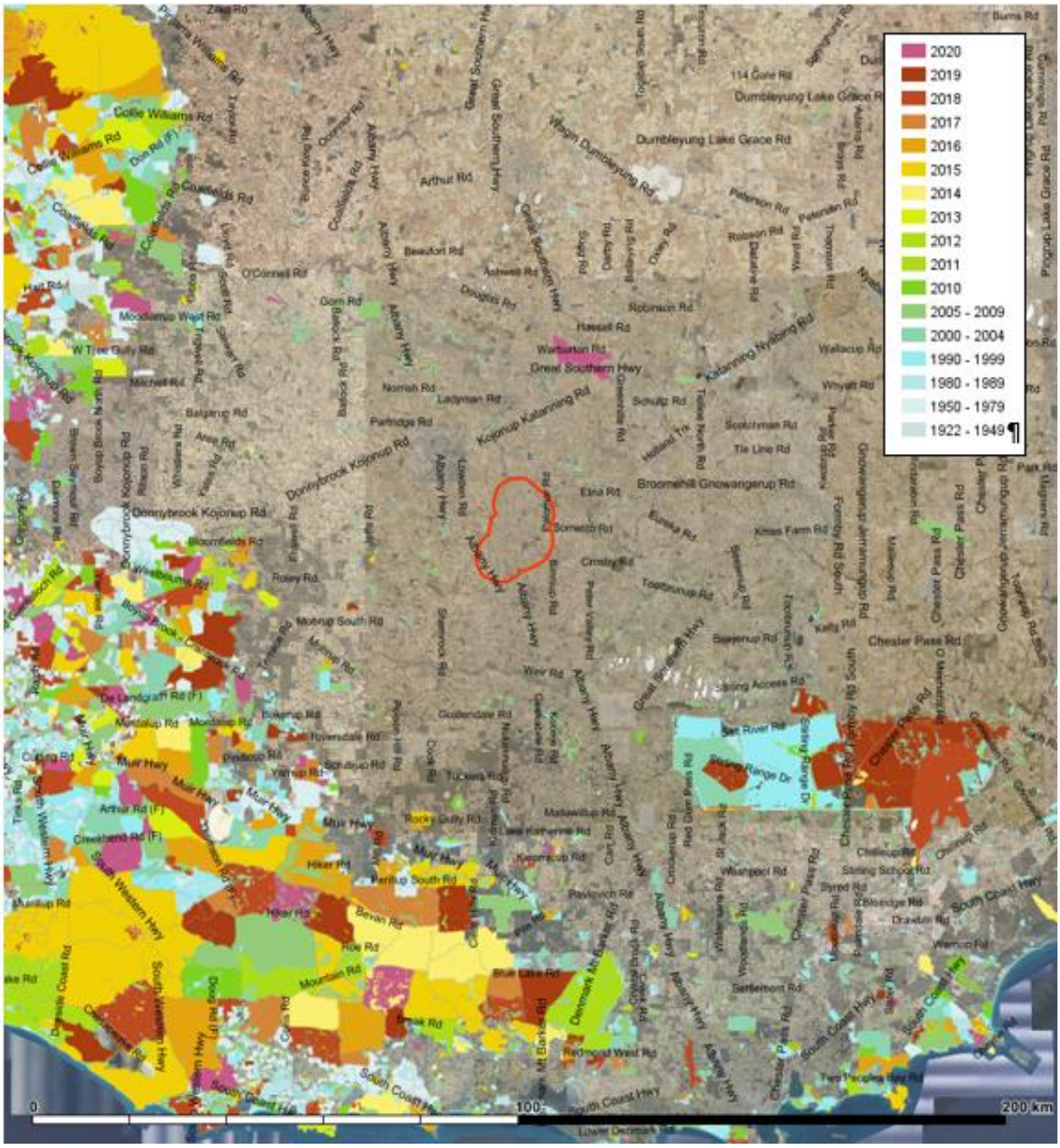


Plate 14: Recorded fire history within 100 Km of the site

Fire history within site area

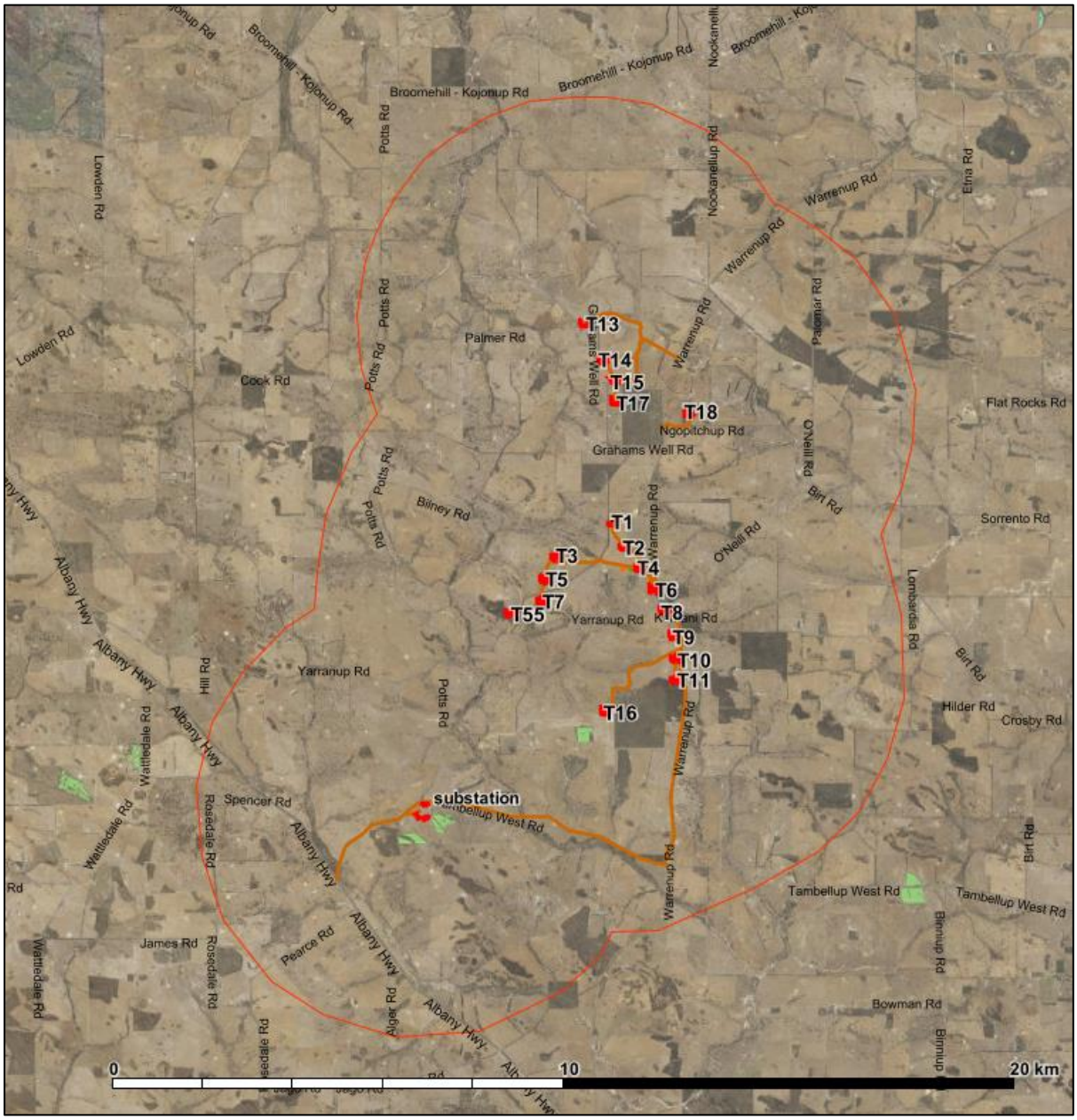


Plate 15: Fire history within 5 km of the site assets

The Department of Biodiversity Conservation and Attraction (DBCA) bushfire data identifies no landscape fires (> 20 ha) within the area of the site since 1922.

BoM data identifies that Kojonup has a similar frequency of lightning strike as the City of Perth. In wheatbelt areas lightning is a major source of natural ignitions which account for 6-10% of bushfire ignitions, suspicious and deliberate ignitions account for up to 50%, and the remainder are accidental. The vast majority of ignitions are attributed to human activities which include machinery failure, electric fences and powerlines, and outdoor works[4].

A landscape-scale bushfire based upon similarities with other wheatbelt areas occurs at a rate of 1-10 in every ten years; it is a measure of potential notwithstanding one has not occurred within the area of the site. This may be attributed to the effectiveness of local suppression or due to a lack of reporting because the ignitions have been suppressed early.

[4] ABC Science Wednesday 20 November 2019

Residential proximity

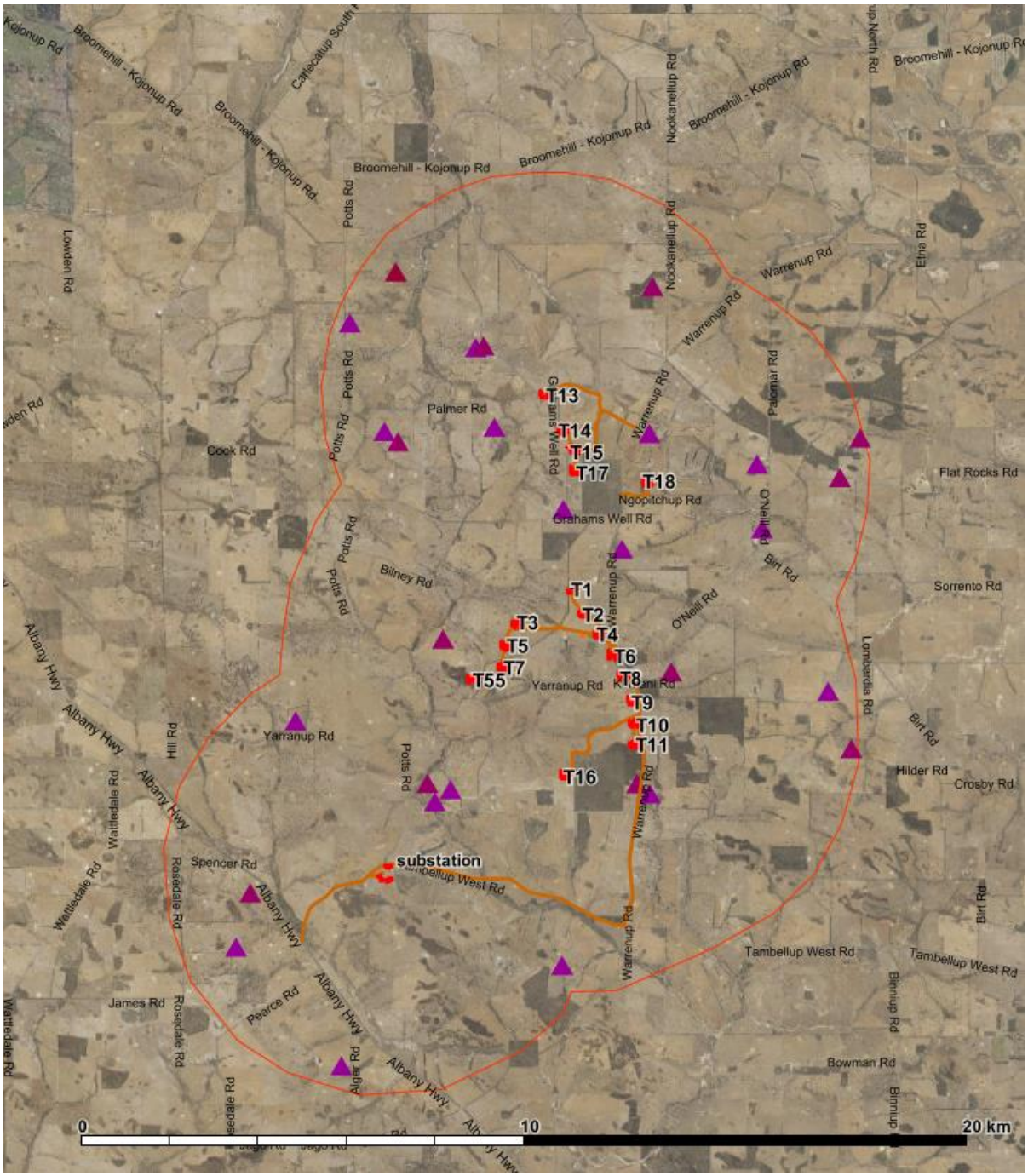


Plate 16: Residential dwelling locations (purple triangles) within 5 km of the site assets

Plate 16 illustrates the location of the dwellings within 5 km of site assets. The turbines have been sited to ensure no dwelling is located within 1 km of a turbine. Three dwellings located at 1 km from a turbine (T8, T11 and T17), are the closest turbines to a dwelling. Ten dwellings are distributed around the turbines and located within 2 km from the nearest turbine. Within the area 5 km from the site assets the ratio of dwellings equates to a density of 1 dwelling for every 90 km^2; a low density.

Risk identification

Bushfires have the potential to cause fatalities and serious injury, damage to property, extended community disruption and environmental degradation.

The objective of State Planning Policy 3.7 in examining development within bushfire prone areas is to reduce the vulnerability of development to the effects of a bushfire and to avoid increasing the threat of a bushfire external to the development.

The Risk assessment is therefore to analyse the potential (scenarios) for a bushfire to affect the site, to minimise the consequence, and the potential for a bushfire to escape the site and identify treatments to reduce the likelihood and consequence.

Expected site context Fire behaviour

The Flat Rocks Wind Farm is within an extended area of pasture grasses and comparatively level land with slopes under vegetation of up to 3.0^0 (5.0^0 has been used to assess the risk)

Grassfires travel faster (GFDI) than a forest canopy fire, but a forest canopy fire can eject a higher level of embers and also eject them over a greater distance; up to 5 km.

A grassfire influenced only by wind, over flat land with consistent fuel, will take an elliptical shape in the direction of the wind. The width of the elliptical will be narrower as the windspeed increases.

Scenarios

Given the land is flat and predominantly pasture, within and extending beyond the wind farm, the usual analysis of scenarios, a fire arriving from a different direction through different vegetation of different slopes is not necessary in this instance. Notwithstanding the prevailing wind directions identified by the nearest weather station, a fire can come from any direction and in this instance the surrounding conditions at each asset is the same and each asset has a surrounding area of grassland/pasture and slopes less than 5.0^0 at no less than 100 m.

Appendix 2 illustrates the vegetation at each site with a photograph, and Appendix 3 provides an assessment of each turbine and the substation and operations compound describing the vegetation (fire behaviour), resident location and nearest public road in each direction up to 5 km from each asset. It can be used to inform the arrival of a fire, to provide assistance and to alert those down wind of an asset should an uncontrolled ignition occur in an asset.

Two scenarios have been considered for risk identification.

A fire arriving at the site and a fire escaping from an asset within the wind farm.

Fire arriving at the site

A grassfire arriving at an asset within the wind farm (each turbine, the substation and operations compound, and the construction compound).

The windspeed has been increased for the calculation 45 kmph to 65 kmph to identify a worst-case rate of spread and an elliptical fire spread 25% of its length. The residence time for a grassfire (most intense flaming is 15 seconds[5], the temperature quickly rises reduces after its passing, and can travel over ground at up to 25 kmph[6], although may appear to travel faster.

Grassfires produce smoke and are easily observed in an open landscape.

The head width of the fire will be proportionate to the distance that the ignition occurred from the site. A fire arriving at the site may affect more than one turbine, either by its width or if multiple turbines are in line with the fire.

A fire during construction will affect more people distributed at the construction sites, up to 150 people, whereas during operation, outside of the operations compound two technicians may be in the field. Farming practices will also continue within the area of the wind farm and up to each turbine.

---

[5] P.Cheney Grassfire, weather and fire behaviour CSIRO 2008

[6] P.Cheney Grassfire, weather and fire behaviour CSIRO 2008

Fire escaping from an asset within the wind farm.

An ignition from within the wind farm may occur from the ongoing agriculture production, i.e. maintenance, harvesting vehicle movement, which will continue up to the base of the wind farm assets.

An ignition may also occur from activities directly associated with a wind farm, including the construction works, but through the ongoing operation may include hot works (although fabrication will mostly occur within the workshop requiring only installation at isolated sites) and vehicle movements. Separation areas, APZs, will be established around each asset to avoid a continuity of bushfire fuel and fire spread.

The most problematic fire ignition is a turbine nacelle fire due to accessibility constraints caused by the height.

Turbine nacelle fires

Plate 17: Illustration of the wind farm wake effect.

A Spanish study[7] into turbine fires (primarily to assess ASET time) identified they are related to diverse ignition sources including lighting strike, electrical equipment malfunction (electrical cabinet in the nacelle - common), hot surface ignition. The nacelle contains oils (up to 900 L) plastics i.e. wire coatings, and the nacelle cover and insulation. Rotor hub and blades can also become involved in a fire.

The study identified the nacelle is fitted with natural ventilation to prevent overheating, but this also provides an oxygen source to a large amount of highly flammable materials.

The study also identified that if suppression systems are overwhelmed, a total loss is expected as firefighters have difficulty dealing with the nacelle's height. A nacelle fire will therefore only extinguish when the available fuels have been consumed. The study also identified that falling materials may lead to wildfires (European).

The Australian Fire and Emergency Service Authorities Council (AFAC) in its 2018 Guidelines identified there is little evidence to suggest a grassland fire is a threat to a turbine. It identified the case example of a bushfire started on a paddock affecting the Waterloo Wind Farm in South Australia in January 2017.

> "The wind farm operator confirmed that there was no damage to any wind farm infrastructure and no danger at any time to human life as a result of the fire."

AFAC also identified that if the turbines are shut down there will be no consequence of a wake effect upon fire behaviour and the operations of low flying firefighting aircraft.

Whilst the AFAC position is acknowledged, it assumes a control of the turbine has not been affected by the failure. The process to shut down as identified should be to position the rotor head into the wind and lock the rotor in a Y position. Facing the rotor into the wind will reduce the likelihood of damage and ignition of the blades.

[7] Rengel, B Computational analysis of fire dynamics inside a wind turbine (2017)

2.3 Risk Analysis

Existing controls

There is an inherent risk of bushfire in the Australian landscape. Various activities undertaken and infrastructure is provided which work to reduce the risk we have today; the residual risk.

Identified Stakeholders

There are a range of stakeholders whose actions affect the bushfire risk, either by undertaking works that reduce the risk (preparation) or who are engaged in a response. They provide and maintain existing risk controls and an important part of understanding and adapting if necessary to the proposed development and risk treatments.

- The community
- Shire services
- Bushfire Brigade Captains and volunteers
- Landowners
- Water Corporation
- Western Power
- Telstra/ telecommunications sector
- Bureau of Meteorology
- Department of Fire and Emergency Services
- Office of Bushfire Risk Management
- Department of Biodiversity Conservation and Attractions
- Parks and Wildlife Service
- Main Roads Western Australia and
- WAPOL

State Emergency Management

The Bureau of Meteorology plays an important role in monitoring local weather conditions from local weather stations, providing analysis and climate information, forecasts of climate and weather conditions and Fire Danger Ratings as a basis for assisting preventative actions such as declaring total fire ban days.

The Department of Emergency Services provides a range of important communication services including public announcement of the fire danger ratings, bushfire incidents and warnings (Australian Warning System standard).

It is also responsible for coordinating local brigade responses (Comcen) and taking incident control for Level 2 (Complex) - 3 incidents (Protracted).

State Emergency Management Framework

The *Emergency Management Act 2005* has been established to detail roles and responsibilities at a State, district, and local level in the implementation of the emergency management principles of Prevention (Planning), Preparation, Response, and Recovery (PPRR).

The *State Emergency Management Policy* (State EM Policy) provides a strategic framework for emergency management in Western Australia, describing principles and objectives for the co-ordinated organisation of public authorities.

The policy is supported by a suite of documents that provide complete guidance on the strategic framework for Emergency Management in Western Australia.

Under s. 20(4) of the EM Act, a public authority that is given a role and responsibilities under a State EM Policy is to comply with the State EM Policy[8].

- State Emergency Coordinator (SEC)
- District Emergency Coordinators (DECs);
- Local Emergency Coordinators (LECs) (WAPOL officer for the City of Kalamunda); and
- Local Emergency Management Committee - oversees local emergency management activities PPRR, through articulation of stakeholder responsibilities in the Local Emergency Management Arrangements (LEMA).

A local government is to establish one or more Local Emergency Management Committees (LEMCs) for its area to ensure that effective Local Emergency Management Arrangements (LEMA) are prepared. The LEMA is to be consistent with the State Emergency Management policies and the State Emergency Management plan. The LEMA addresses all emergencies, but special considerations within the LEMA include the bushfire season.

It addresses the roles and responsibilities of public authorities and persons involved in emergency management (stakeholders) and includes the Hazard Management Agency (comprising the Shire , WAPOL, and DBCA) in addressing the emergency management concepts of Prevention, Preparation, Response, and Recovery.

The LEMAs are reviewed every 5 years.

Shire of Kojonup Local Emergency Management Arrangements, September 2017

Shire of Broomehill-Tambellup Local Emergency Management Arrangements, September 2021

Local Government Fire Management Planning

Activities in which local government is engaged, in addition to the LEMA, that relate to development planning include:

> Administration of the *Bush Fires Act 1954* and enforcement of the annual fire break notice to limit the ignition and spread of bushfire. It also provides the basis for declaring total fire ban days and the offences for causing a bushfire. It plays an important role in maintaining awareness of the bushfire risk, measures to reduce the spread of a bushfire and measures to reduce the ignition of a bushfire. Local governments also use the Act to require the provision of cleared space around buildings and structures.
>
> In regard to the importance of policing to prevent bushfire ignition the Bushfire Cooperative Research Centre *Fire Development, Transitions and Suppression* study 2014, studied urban and peri-urban areas around Perth and compared DFES incident data. It was noted that in the study, there was a 50% decline in the number of annual ignitions due to proactive arson reduction programs in cooperation between Local government and WAPOL[9].

The Shire of Kojonup firebreak order provides:

> RURAL LAND
>
> *Homesteads, Buildings, Haystacks, Bulk Fuel, Drums and Liquid Petroleum.*
>
> > *"During the period from 14th December to the 31st May inclusive you shall have firebreaks at least 20 metres wide"*
>
> It also provides, for harvesting and hot works:
>
> > *It is compulsory that an engine powered pumping unit and not less than 600 litres of water must be in attendance during grain harvesting operations. Trailed units must have the towing vehicle attached at all times. The firefighting unit must be located in or immediately adjacent to the paddock being harvested at all times*

[8] State Emergency Management *A Strategic Framework for Emergency Management in Western Australia* October 2019

[9] A L Sullivan et al *Bushfire Cooperative Research Centre Fire Development, Transition s and Suppression study CSIRO 2014 p 17*

The Shire of Shire of Broomehill-Tambellup firebreak order provides

LAND ZONED FARMING

> *"During the period from 31st October 2021 to 15th April 2022 inclusive, completely surrounding the perimeter of any homestead building (excluding isolated non-flammable buildings), fuel installation…… you shall have firebreaks at least 5 metres wide (if provided by burning, cultivating or chemical spraying), or 10 metres wide (if provided by being closely grazed or mowed)"*

Land >40 ha

> *"The owner/occupier must have a mobile firefighting unit (self-propelled, towed or slip-on) in good working order, with a minimum capacity of 400 litres."*

Administration of the *Planning and Development Act* 2005, includes the preparation of development policy and assessment supporting Development Approval, and compliance with the bushfire protection criteria.

The Planning and Development Act through the State Planning Policy is a risk management arrangement regulates the potential introduction of land uses that may increase the threat of bushfire, and ensure future development reduces the consequence of bushfire, through siting and design. It works in unison although separately with the Building Act 2011, which addresses the construction standard of the habitable building.

Responsibility for the ongoing enforcement of the development authorisation is provided through section 214 of the *Planning and Development Act* 2005.

Administration of the *Building Act 2011* and the requirements of the *National Construction Code*, specifying construction standards in declared bushfire prone areas. Not all structures require development approval or building approval. The *Planning and Development (Local Planning Scheme) Regulations 2015*, Deemed Provisions at clause 78E (1) states bushfire construction standards provided in the *National Construction Code* can be applied by development approval if not in conflict with the *Building Act 2011*.

Bushfire Risk Management Plans

The Shire of Kojonup is in the process of preparing a Bush Fire Risk Management Plans (BRMP) following the OBRM *Bushfire Risk Management System and Bushfire Risk Management Plan template*.

The aim of the BRMP is to document a coordinated and efficient approach to the identification and treatment of assets exposed to bushfire and the coordination and prioritisation of tenure blind bushfire reduction initiatives.

Utilities

Telecommunications

The telecommunications coverage within 5 km of the wind farm provides for mobile phone communication, although a black spot analysis was not available. All residents are also understood to have landline connection.

Calls may be received by the Shire directly from members of the public, or through the '000' service and DFES Communications Centre (ComCen) requesting a turn out message be sent

All brigades are registered with DFES SMS Callout system which is used to:

- Notify a Brigade to respond to a fire
- Notify Brigade members of meeting and training activities

Both Shires also have an SMS system for advising:

- Implementing and removing Harvest and Vehicle Movement Bans
- Notifying the community of Total Fire Bans
- Notifying the community of a fire
- Notifying the community of road closures

In addition to the SMS service it is understood the landowners within the vicinity of the wind farm also receive warnings based on 'WhatsApp' messages etc, to mobilise local farmer resources immediately.

Firefighting facilities, appliances, are sparsely distributed in the district. Most fires are addressed initially by local farmers/lot owners contributing their time and firefighting facilities to apply a quick suppression response.

Aerial support is available from Manjimup and Albany

Water resources

A reticulated water supply is not available. Potable water is to be provided by water tank. Production water requirements will also be provided by tanked water. Throughout the sites surface dams are provided at a frequency of 1 per 1 ha.

Power Supply

The work construction compound and batching plant will be connected to the reticulated power supply. On site power generation is not proposed at the construction compound but will be required at the individual turbine sites through construction.

Road Network

The site is framed by Albany Highway (primary access west of the wind farm - sealed) Broomehill-Kojonup Road (north of the site - sealed) Brit Road (east of the site – unsealed -joins Warrenup Road to meet Broomehill Kojonup Road) and Tambellup Road (south- sealed). The site is serviced through the centre by Warrenup Road (north south - unsealed).

An internal road network will be created to provide construction and ongoing connection to each turbine site.

Consequence Criteria

This risk assessment has followed AS/ISO 31000:2018 risk management and in turn the National Emergency Risk Assessment Guidelines (NERAG 2020) and has adapted it to a local scale.

For the purpose of this assessment, it is assumed a bushfire arriving at the wind farm is an insignificant consequence, that other than shutting down for the period of the bushfire, it will not delay a return to energy production[10]. A fire however can be fatal to people that are exposed to it, but the potential consequence can be reduced by management practices and human behaviour. The safety of isolated workers *will be addressed through the emergency management plan.*

The assessment has instead assessed the consequence of a nacelle fire, and a fire escaping a turbine site.

The risk assessment follows objective 5.1 from SPP 3.7

> 5.1 Avoid **any increase** in the threat of bushfire to people, property and infrastructure. The preservation of life and the management of bushfire impact are paramount.

The purpose is to consider the consequence of introducing a development within an area, and to avoid an increase in the threat of bushfire above that which currently exists, noting that pasture/agricultural production around and within the site also presents an existing degree of risk, a fuel potentially vulnerable to lightning strike, mechanical failure of equipment (harvesters), the exposure of hot surfaces from vehicles passing over grasses, and hot works i.e. welding and grinding in the field.

Grassfires are characterised as locationally predictable because they do not generally disperse embers far in front of the fire front. Resources are therefore deployed directly to the fire front.

The wind turbine wake effect, unless shut down during the bushfire event, has the potential to disperse ignitions down wind.

[10] As identified by Australasian Fire and Emergency Service Authorities Council Wind Farms and Bushfire Operations 2018

External Consequence Assessment

Human settlement

The site is adjoined by agricultural pasture land within 5 km of the wind farm. The associated residential density is 1 dwelling per 90 km^2. The nearest township is Kojonup 19 km to the north east.

Fire scenario, Risk bushfire, fire **escaping** from the site			
North	East	South	West
5 residences	6 residences	9 residences	9 residences

INJURY SEVERITY	DESCRIPTION
FATAL	Mortally injured, is certain to lead to death regardless of available treatments Counted among deaths, not injuries
CRITICAL	Injuries that pose an immediate life threatening condition if not treated adequately and expeditiously Examples include uncontrolled bleeding, a punctured organ, other internal injuries, spinal column injuries or crush syndrome
SERIOUS	Injuries requiring a greater degree of medical care and use of medical technology such as X-rays or surgery, but not expected to progress to life threatening status Examples include full thickness burns across a large part of the body or partial thickness burns to most of the body, loss of consciousness, fractured bones, dehydration or exposure
MINOR	Injuries requiring basic medical aid that could be administered by paraprofessionals, which would require bandages or observation Examples include a sprain, a severe cut requiring stitches, a minor burn (partial thickness on a small part of the body) or a bump on the head without loss of consciousness

Generally, agricultural residential properties within pastural area have separation spaces effective for preventing direct flame contact against the residence. The land owners are also provided with an annual firebreak notice. Aerial observation also finds the dwellings within 5 km are separated from pasture grasses by cleared land for driveways and gardens. As a general principle if a building survives a bushfire, then fatalities can be avoided if refuge can be taken in the dwelling.

Whilst grassfires are fast moving up to 25 km/h[11] the landscape is open affording visibility to avoid an approaching fire.

The potential consequence is classed as 'serious – Moderate', the consequence is reduced by the conditions, grassland is a moderate bush fire hazard level, not extreme, and the landscape is open providing the opportunity to see an approaching fire and take early action.

[11] P.Cheney Grassfires Fuel, weather and fire behaviour 2008.

Economic

Fire scenario, Risk bushfire, fire **escaping** from the site			
North	East	South	West
Agriculture production pasture	Agriculture production pasture	Agriculture production pasture	Agriculture production pasture

LEVEL	IMPACT ON IMPORTANT INDUSTRY
CATASTROPHIC	Failure of a significant industry or sector in area of interest as a direct result of emergency event
MAJOR	Significant structural adjustment required by identified industry to respond and recover from emergency event
MODERATE	Significant industry or business sector is significantly impacted by the emergency event, resulting in medium-term (i.e. more than one year) profit reductions directly attributable to the event
MINOR	Significant industry or business sector is impacted by the emergency event, resulting in short-term (i.e. less than one year) profit reductions directly attributable to the event
INSIGNIFICANT	Inconsequential business sector disruption due to emergency event

A fire is likely to occur from only one part of the development. A fire at a turbine site, a fire at the substation and the permanent operation and maintenance building, a fire from the construction compound, or a fire from a vehicle. The fire will expand downwind in an elliptical shape from the source of ignition. The extent of loss of pasture will be determined by the wind strength and the event duration. Suppression intervention will reduce the extent of loss.

The most extreme fires conditions occur through the summer, after the harvest. Traditionally summer season fires are not a significant loss of pasture production, and whilst fires can occur outside the summer season the fire spread can be slower (a lower fire danger index< 50 potentially controllable) or restricted before pasture grasses have cured.

The consequence is classed as 'minor'. A fire from the nacelle has the potential to spread downwind (elliptical) destroying a season's crop and disrupting the livelihood of a landowner by a year, in addition there is a potential for damage to fences and other infrastructure. It is assumed existing controls promoted through the firebreak notice to provide a separation of buildings from grassland has been applied

.(

Environmental

Fire scenario, Risk bushfire, fire **escaping** from the site			
North	East	South	West
Contiguous pasture grasses	Contiguous pasture grasses and isolated bush blocks	Contiguous pasture grasses and isolated bush blocks	Contiguous pasture grasses

LEVEL	IMPACT ON ENVIRONMENTAL VALUES
CATASTROPHIC	Permanent destruction of environmental values of interest
MAJOR	Severe damage to environmental values of interest
MODERATE	Significant damage to environmental values of interest
MINOR	Minor damage to environmental values of interest
INSIGNIFICANT	Inconsequential damage to environmental values of interest

The site is largely surrounded by land cleared for agricultural purposes with the exception of isolated bush block that are representative of pre-European settlement.

The Flora, Vegetation and Fauna Assessment of the Flat Rocks Wind Farm Survey Area Prepared by Mattiske from field survey found no declared rare or priority flora to be present.

The consequence is classified as 'insignificant'.

Cultural

Fire scenario, Risk bushfire, fire **escaping** from the site			
North	East	South	West
Nil	Nil	Nil	Nil

LEVEL	IMPACT ON CULTURAL ASSETS
CATASTROPHIC	Widespread and permanent loss of objects of identified cultural significance
MAJOR	Widespread damage or localised permanent loss of objects of identified cultural significance
MODERATE	Damage or localised widespread damage to objects of identified cultural significance
MINOR	Damage to objects of identified cultural significance
INSIGNIFICANT	Minor damage to objects of identified cultural significance

The report on an Ethnographic Survey of the Proposed Flat Rocks Wind farm site between Kojonup and Broomehill found "As a result of the inspections the indigenous representatives were satisfied that the Project area contains no sacred or significant Aboriginal heritage sites".

The consequence is classified as 'insignificant'.

Likelihood Level

Notwithstanding the FDI (see section 4) has a similar occurrence of days over FDI 50, as the Perth CBD as a comparison, it has a low likelihood history.

Event likelihood is guided by the fire history, and the climatic precursors, which may lead to a landscape and uncontrollable fire. Not all fires are considered damaging, however a landscape fire threatens life and property.

LIKELIHOOD	ANNUAL EXCEEDANCE PROBABILITY (AEP)	AVERAGE RECURRENCE INTERVAL (ARI) (INDICATIVE)	FREQUENCY (INDICATIVE)
Almost certain	63% per year or more	Less than 1 year	Once or more per year
Likely	10% to <63% per year	1 to <10 years	Once per 10 years
Unlikely	1% to <10% per year	10 to <100 years	Once per 100 years
Rare	0.1% to <1% per year	100 to <1000 years	Once per 1000 years
Very rare	0.01% to <0.1% per year	1000 to <10,000 years	Once per 10,000 years
Extremely rare	Less than 0.01% per year	10,000 years or more	Once per 100,000 years

(NERAG 2020)

The likelihood level is classed as 'unlikely.' There is no identified history of landscape fire affecting the site and whilst turbine fires (nacelle fires) have occurred it is rare, with 5 having occurred in Australia between 2004 and 2018. International studies find a typical wind farm with 150 turbines may experience one or two fires during 20 years of operation.[12]

Risk Level

	CONSEQUENCE LEVEL				
LIKELIHOOD	INSIGNIFICANT	MINOR	MODERATE	MAJOR	CATASTROPHIC
ALMOST CERTAIN	Medium	Medium	High	Extreme	Extreme
LIKELY	Low	Medium	High	Extreme	Extreme
UNLIKELY	Low	Low	Medium	High	Extreme
RARE	Very low	Low	Medium	High	High
VERY RARE	Very low	Very low	Low	Medium	High
EXTREMELY RARE	Very low	Very low	Low	Medium	High

(NERAG 2020)

A comparison of the proposal with the current situation, both are classed as 'unlikely' as an indication of frequency of event. There is always the potential for a grassland fire to occur if the fuel is present.

The wind farm is expected to present a similar level of risk of ignition that exists within the locality. The overall risk level is classed as 'medium'. Whilst construction materials and APZs can ensure a building survival, the potential for injury to humans if caught in the open is serious.

The particular feature of the wind farm is the significance is not the frequency of ignition, or the intensity of the fire, rather it is how the ignitions could be distributed, as multiple ignitions at a distance from the source. This will require a different firefighting approach that may stretch resources. Whilst a grassfire requires suppression focused upon the fire line, if a fire is to occur at a turbine site spot fires may occur downwind due to the height of the nacelle. A fire at a turbine site will require a consciousness to plan to fight spot fires that may ignite downwind in addition to suppression at the fire line.

[12] Firetrace international 2020 citing studies into the frequency of turbine ignitions https://www.firetrace.com/hubfs/_img/reports/Firetrace-Report-In-The-Line-Of-Fire.pdf

2.4 Risk Evaluation

The risk evaluation is used to decide and prioritise a range of risk treatments that had been identified to reduce the risk level. The highest priority risk treatments are applied first, to fit with the resources available, and become part of the risk controls identified in the first review. The second tier risk treatments then become the priority outcomes in the subsequent review.

This assessment however is part of a development assessment and has followed an approach to minimise the risk to *As Low as Reasonably Practical* (ALARP). The measures are to be implemented and complete as part of the authorisation.

Whilst the wind farm may contribute an additional ignition source, it is considered a comparable frequency and consequence to that of pasture farming operations. An ignition will result in a spreading grassfire.

The risk profile can also be considered in two phases. The construction phase involves a range of activities that could result in ignitions and grassfire but is likely to have people in close attendance to respond effectively if provided with suppression facilities. The operational phase has a different set of potential ignition causes that may be remotely detected and will take time to respond to.

2.5 Risk Treatment

The attached Risk Register has identified the risk items and a corresponding treatment arranged in order following preparations and response. Each treatment has been identified for its practicality and effectiveness in reducing the residual risk, after treatment through construction and operation to a Low level risk.

As part of a continuous improvement model the risk level is recalibrated in the risk register is recalibrated to high as an objective to achieve and *As Low as Reasonably Practical* (ALARP) risk following treatments that are within the owner's control. In this approach there is a point of declining benefit where it becomes impractical. The risk treatments are therefore nominated for their practicality, benefit, and acceptance (expediency) and effectiveness (confidence). The NERAG risk assessment method is an orderly method of qualitative assessment, residual risk is also a qualitative estimate.

Risk Register and Residual Risk

Risk Register					
Risk statement	**Risk Level**	**Risk Treatment**	**Expediency/ priority[13]**	**Confidence level[14]**	**Risk Residual**
TURBINE SITE - APPROACHING FIRE					
Construction All the turbine sites are located within pastural grasses. Grassfire is fast moving, potentially fatal to exposed persons and may cause the ignition and loss of flammable objects. The turbine sites are open isolated and distant to the construction compound Up to 20 persons are expected at the construction site and will arrive at the site by private vehicle. Transportable buildings in the construction compound will provide amenities and ablutions Assembly machinery may be significantly damaged by flame contact and extreme heat Turbine components in the laydown area may be significantly damaged by flame contact and extreme heat. There is only one egress route from the turbine sites until reaching Warrenup Road (east). This may limit the opportunity to evacuate a turbine site in the event of a short onset fire arriving from the east.	**High**	**Preparation** – The supervisor at the turbine site is to be aware of the emergency procedures and trained in the operation of firefighting equipment[15]. – At induction all workers and visitors are to receive a summary of the emergency procedures. **Managing the fuels** – Establish an APZ around the turbine compound 30 m. – Establish the compound as low threat (no vegetation within the compound) and flammable materials separated by 6 m. – Firefighting appliance 1@ 1000 L is to be stationed at the compound. **Response** – Evacuate when safe: or – Shelter in open the open space in areas furthest from the approaching fire (Passenger vehicles may be used for shelter, parked and moved in the open space to maintain the furthest distance from the fire) – Extinguish small fires.	**High**	**High**	**Low**

13 Each item is a potential consequence or external risk which forms part of the authorisation to be implemented as part of the authorisation, it is not a matter of choice between treatments.

14 There is a high certainty of the cause and direct consequence

15 Western Australian Department of Fire and Emergency Services *Guidelines for Operating Private Equipment at Fires* March 2022

Risk Register					
Risk statement	**Risk Level**	**Risk Treatment**	**Expediency/ priority[13]**	**Confidence level[14]**	**Risk Residual**

<u>Operation</u>
The turbine site upon completion will be open and clear of objects at ground level
The turbines are distant to the operations room the nearest turbine is 10 km away and furthest is 20 km away.
Occasional isolated work, attended by private vehicle except for times of exceptional maintenance.
There is only one egress route from the turbine sites until reaching Warrenup Road (east). This may limit the opportunity to evacuate a turbine site in the event of a short onset fire arriving from the east.
	High	**Managing the fuels**
		– Establish an APZ around the turbine base:
		  – 20 m diameter area compacted limestone
		  – 40 m diameter area grass < 100 mm
		Response at turbine site
		– Evacuate if safe.
		– Shelter on the lee side of the pylon.
		– Evacuate when safe.
		Operation response
		– The Operations Manager is to shut down the rotation of the turbines upon notice of a bushfire within 5 km of the wind farm until the 'all clear' is given by emergency services.
		– The turbine is to be inspected after the 'all clear' is issued.
			High	**High**	**Low**

Risk Register					
Risk statement	**Risk Level**	**Risk Treatment**	**Expediency/ priority[13]**	**Confidence level[14]**	**Risk Residual**
CONSTRUCTION COMPOUND - APPROACHING FIRE					
Construction The construction compound is isolated and located within an area of pastural grass. It comprises the site camp, the batch plant, crane pad and vestas laydown are Up to 120 persons may be in attendance and will arrive by private vehicle The site contains potentially flammable objects: transportable buildings, fabric awnings over shipping containers, laydown area and materials, refuse bins and fuel store (regulated management of hazardous material under the *Dangerous Goods Safety Act 2007*) There is only one egress route from the turbine sites until reaching Warrenup Road (east). This may limit the opportunity to evacuate a turbine site in the event of a short onset fire arriving from the east.	**High**	**Preparation** – The supervisor at the construction compound is to be aware of the emergency procedures and trained in the operation of the of the firefighting equipment. – At induction (upon attending the windfarm) all workers and visitors are to receive a summary of the emergency procedure. **Managing the fuels** – Establish an APZ around the site camp 30 m. – Establish the site camp as low threat (no vegetation within the compound) and flammable materials separated by 6 m. – Establish the Batch Plant, Crane Pad and Vestas laydown as low threat, grass maintained at less than 100 mm or a mineral or paved surface. – Firefighting appliance 2 @ 1000 L will be stationed at the compound. – 50 000 L water tank retained on site for firefighting. **Minimising Exposure** – All persons are to gather at the site camp if safe to reach – The amenities building is capable of accommodating all attending personnel. – If it is not safe to reach the site camp from the Batch Plant, Crane Pad and Vestas laydown **Response** – Shelter within compound if not safe to leave. – Extinguish small fires. – Evacuate when safe.	**High**	**High**	**Low**

Risk Register					
Risk statement	**Risk Level**	**Risk Treatment**	**Expediency/ priority[13]**	**Confidence level[14]**	**Risk Residual**
SUBSTATION AND PERMANENT OPERATIONS BUILDING AND MAINTENANCE COMPOUND - APPROACHING FIRE					
Construction The substation and operations building, and maintenance compound is located within pastural grasses. Grassfires are fast moving, are potentially fatal to exposed persons and may cause the ignition and loss of flammable objects. Vulnerabilities to ignition are: – The site will contain equipment awaiting installation. – The site include the storage of oils Up to 40 persons are expected during construction and will arrive at the site by private vehicle. The substation and operation's compound location has through road options Tambellup Road West (east-west) and is close to Albany Highway (north-south). Options are available to evacuate away from an approaching fire.	**High**	**Preparation** – The supervisor at the turbine site is to be aware of the emergency procedures and trained in the operation of the of the firefighting equipment. – At induction (upon attending the windfarm) all workers and visitors are to receive a summary of the emergency procedure. **Managing the fuels** – Establish an APZ around the construction compound 30 m. – Establish the compound as low threat (no vegetation within the compound) and flammable materials separated by 6 m. **Response** – Evacuate when safe. – Shelter within open area if not safe to leave. – Extinguish small fires.	**High**	**High**	**Low**

Risk Register					
Risk statement	**Risk Level**	**Risk Treatment**	**Expediency/ priority[13]**	**Confidence level[14]**	**Risk Residual**
<u>Operation</u> Up to 10 persons may be in attendance at the operations building at any one time, including field technicians and routine maintenance equipment. Vulnerabilities to ignition are: – Oil reservoirs (for substation) – Operations building – Workshop, equipment and maintenance materials. The substation and operations compound has through road options Tambellup Road West (east-west) and is close to Albany Highway (north-south). Options are available to evacuate away from an approaching fire.	**High**	**Preparation** – At induction (upon attending the windfarm) all workers and visitors are to receive a summary of the emergency procedure. – A Firefighting appliance 1000 L is to be stationed at the maintenance compound (to be taken to site works). – A 50 000 L tank is to be provided at the maintenance compound for firefighting – grassfires. **Managing the fuels** – Maintain an APZ around the substation 30 m. – Maintain the area within the substation clear of vegetation. – Maintain an APZ zone 21 m around the operations building and maintenance compound. – The operations building is to be constructed to BAL 29 bushfire standard. **Response** – Evacuate if safe. – Shelter in the operations building. – Evacuate when safe. – Trained personnel, in attendance, may attend to grassfire suppression if safe to do so.	**High**	**High**	**Low**

Risk Register					
Risk statement	**Risk Level**	**Risk Treatment**	**Expediency/ priority[13]**	**Confidence level[14]**	**Risk Residual**
THE MAKING OF ROADS					
Personnel may be injured by exposure to bushfire attack, extreme heat, smoke and airborne particles. Work is undertaken in the open, within pasture grass.	**High**	**Preparation** – At induction (upon attending the windfarm) all workers and visitors are to receive a summary of the emergency procedure. **Response** – Evacuate to the site camp if safe. – Evacuate to the nearest turbine construction compound if the site camp cannot be reached.	**High**	**Medium**	**Medium[16]**
TRENCHING AND INSTALLING POWERLINES					
Personnel may be injured by exposure to bushfire attack, extreme heat, smoke and airborne particles. Work is undertaken in the open, within pasture grass.	**High**	**Preparation** – At induction (upon attending the windfarm) all workers and visitors are to receive a summary of the emergency procedure. **Response** – Evacuate to the site camp if safe. – Evacuate to the nearest turbine construction compound if the site camp cannot be reached.	**High**	**Medium**	**Medium[17]**

[16] A safe space may be distant.
[17] A safe space may be distant

Risk Register					
Risk statement	**Risk Level**	**Risk Treatment**	**Expediency/ priority[13]**	**Confidence level[14]**	**Risk Residual**
TURBINE SITE - ESCAPING FIRE					
<u>Construction</u> Potential ignition sources from activities at the turbine compound • Hot works, open flame and spark generating activities • Cigarette disposal • Vehicle movements to the site, hot elements or vehicle mechanical failure • Mechanical or electrical failure at the site • Refuelling and flammable material spillage	**High**	**Preparation** – The supervisor at the turbine site is to be aware of the emergency procedures and trained in the operation of the of the firefighting equipment. – At induction (upon attending the windfarm) all workers and visitors are to receive a summary of the emergency procedure. **Managing the fuels exclusion** – Establish an APZ around the turbine compound 30 m. – Establish the compound as low threat (no vegetation within the compound) and flammable materials separated by 6 m. – Stationed a Firefighting appliance 1000 L is at the compound whilst construction works are being undertaken. **Response** – Report ignition immediately to the operations office. – Operations Manager is to report immediately to the Shire. – Operations manager is to advise the land owner firefighting appliances to assist suppression of ignition. – Extinguish fires with firefighting appliance.	**High**	**High**	**Low**

<u>Operation</u>
• Nacelle fire
The turbine nacelle has a fire detection and suppression system but there have been instances where a mechanical failure has overwhelmed the suppression system and a nacelle fire has occurred.
Given the height of a nacelle and the wake effect, there is a potential for embers from the turbine fire to be deposited up to 5 km down wind and potentially igniting a grassfire.
	High	**Preparation**
		– The Operations Manager is to be aware of the emergency procedures and communication contacts.
		– At induction (upon attending the windfarm) all workers and visitors are to receive a summary of the emergency procedure.
		– The landowners, hosting the turbine, are to be trained in the event of a nacelle fire, to establish and not to enter the 75 m exclusion area, to suppress the fire line and monitor for spot fire igniting downwind from the turbine.
		Managing the fuels
		– Maintain the APZ around the turbine base:
		  – 20 m diameter area compacted limestone
		  – 40 m diameter area grass < 100 mm
		– Firefighting appliance 1000 L is to accompany any undertaking of hot works at a turbine site.
		– Establish 3@ 50 000 L standalone water tanks
		  ▪ Inside the access gate to WTGs 13,14,15,17
		  ▪ Inside the access gate to WTGs 1,2,3,4,5,6,7,55
		  ▪ Inside the access gate to WTGs 8,9,10,11,16
		Response
		– Report ignition immediately to the operations office.
		– Move clear 75 m from the turbine base (away from falling debris).
		Operation Response
		– The operation manager is to shut down the rotation of the turbines upon notice of a bushfire within 5 km of the wind farm until the 'all clear' is given by emergency services.
		– The affected turbine should if possible be oriented head to wind and shut down.
		– Operations Manager to immediately report the incident to the land owner for the undertaking of the first response including
		  ▪ Establishing the 75 m exclusion zone from the base of the turbine.
		  ▪ Suppressing the fire line; and
		  ▪ Monitoring for ignitions down wind
		– Operations Manager is to report immediately to the Shire.
			High	**Moderate**	**Medium**

Risk Register					
Risk statement	**Risk Level**	**Risk Treatment**	**Expediency/ priority[13]**	**Confidence level[14]**	**Risk Residual**
<u>Operations Maintenance</u> Technicians attending the turbines and associated infrastructure. Sources may include: • Hot works, open flame and spark generating activities • Vehicle mechanical failure		**Preparation** – The Operations Manager is to be aware of works being undertaken at the site. – All workers attending the site are to have mobile phones and contacts. – All worker attending the site are to report their attendance to the Operation manager or delegate before entering the site. – At induction (upon attending the windfarm) all workers and visitors are to complete a risk assessment and receive a summary of the emergency procedure. – Fire extinguishers are to be collected from the operations building and taken on site. – Hot works are not to be undertaken on total fire ban or harvest ban days without a permit. **Response** – Fire extinguishers are to be used to suppress the spread and extinguish a grassfire ignited by the activity at the site. – Report the incident to the operations manager			

Risk Register					
Risk statement	**Risk Level**	**Risk Treatment**	**Expediency/ priority[13]**	**Confidence level[14]**	**Risk Residual**
CONSTRUCTION COMPOUND – ESCAPING FIRE					
<u>Construction</u> Sources of ignition • Hot works, open flame and spark generating activities • Cigarette disposal • Vehicle movements to the site, hot elements or vehicle mechanical failure • Mechanical failure at the site • Refuelling and flammable material spillage	**High**	**Preparation** – The supervisor at the construction compound is to be aware of the emergency procedures and trained in the operation of the of the firefighting equipment. – At induction all workers and visitors are to receive a summary of the emergency procedure. – A firefighting appliance 1000 L stationed at the compound. – A 50 000 L tank is to be provided at the site camp for firefighting – grassfires. **Managing the fuels** – Establish an APZ around the construction compound 30 m. – Establish the compound as low threat (no vegetation within the compound) and flammable materials separated by 6 m. **Response** – Report ignition immediately to the operations office – Operations Manager is to report immediately to the Shire – Extinguish fires with firefighting appliance	**High**	**High**	**Low**

Risk Register					
Risk statement	**Risk Level**	**Risk Treatment**	**Expediency/ priority[13]**	**Confidence level[14]**	**Risk Residual**
SUBSTATION AND PERMANENT OPERATIONS BUILDING AND MAINTENANCE COMPOUND - ESCAPING FIRE					
<u>Construction</u> Sources of ignition • Hot works, open flame and spark generating activities • Cigarette disposal • Vehicle movements to the site, hot elements or vehicle mechanical failure • Mechanical failure at the site • Refuelling and flammable material spillage	**High**	**Preparation** – The supervisor at the turbine site is to be aware of the emergency procedures and trained in the operation of the of the firefighting equipment. – At induction all workers and visitors are to receive a summary of the emergency procedure – A Firefighting appliance is to be 1000 L stationed throughout the construction **Managing the fuels** – Establish an APZ around the substation 30 m – Maintain the area within the substation clear of vegetation – Establish an APZ 21 m around the operations building and maintenance compound. – The operations building is to be constructed to BAL 29 bushfire standard – Maintain the area within the workshop area clear of vegetation **Response** – Report ignition immediately to the operations office – Operations Manager is to report the incident immediately to the Shire – Extinguish grassfires with firefighting appliances (water is not to be applied to an electrical fire)	**High**	**High**	**Low**

Risk Register					
Risk statement	**Risk Level**	**Risk Treatment**	**Expediency/ priority[13]**	**Confidence level[14]**	**Risk Residual**
<u>Operation</u> Sources of ignition • Transformer, or electrical shorting • Building fire • Vehicle movements over grass • Hot works undertaken at the workshop	**High**	**Preparation** – At induction (upon attending the windfarm) all workers and visitors are to receive a summary of the emergency procedure – A Firefighting appliance 1000 L is to be stationed at the maintenance compound. – A 50 000 L tank is to be provided at the maintenance compound for firefighting – grassfires. **Managing the fuels** – Maintain the APZ around the substation 30 m – Maintain the area within the substation clear of vegetation – Maintain the APZ 21 m around the operations building and maintenance compound. Maintain the operations building at the BAL 29 bushfire construction standard **Response** – The Operations Manager is to report the incident immediately to the Shire – Extinguish grassfires with firefighting appliances (water is not to be applied to an electrical fire)	**High**	**Moderate**	**Medium**

Risk Register					
Risk statement	**Risk Level**	**Risk Treatment**	**Expediency/ priority[13]**	**Confidence level[14]**	**Risk Residual**
USE OF ACCESS ROADS					
Operation Sources of ignition • Vehicle movements to the site, hot elements or vehicle mechanical failure igniting a grassfire.	**High**	**Preparation** – Attendance on the site is to be reported to the Operations Manager. – At induction (upon attending the windfarm) all workers and visitors are to receive a summary of the emergency procedure. – Fire extinguishers are to be collected from the operations building and taken on site. **Managing the fuels** – A 20 m cleared access road is to be maintained with a minimum 6 m carriageway. **Response** – Operational procedures are to restrict vehicles to the made access roads and cleared compounds, unless required for firefighting. – Mechanical failure of vehicles are to park in the centre of the access road. – Fire extinguishers are to be used to suppress the spread and extinguish a grassfire ignited by the activity at the site. – Report the incident to the Operations Manager.	**High**	**High**	**Low**

APPENDIX 1 - EMERGENCY MANAGEMENT PLAN

EMERGENCY MANAGEMENT PLAN

The following Emergency management Plan follows the Emergency Management System Approach, Planning, Preparation, Response and Recovery.

1. **PREPARATION**

Roles and responsibilities – fire preparedness

Emergency Planning Committee (EPC)

The Emergency Planning Committee represents the wind farm owners and management together with the Chief Warden. During the construction phase representatives for each function may be included on the EPC.

Prior to the commencement of construction the EPC is responsible for ensuring consistency is achieved between the work practices and emergency procedures of each function contractor.

The Emergency Planning Committee is responsible for:

- overseeing the preparation of the site buildings and grounds prior to the approaching bushfire season including the operational readiness of all fire suppression systems , alarms and communications.
- reviewing the EMP and ensuring all information is up to date
- liaising with Shire emergency services
- establishing the Emergency Management Team and assigning roles and responsibilities to staff; and
- overseeing the undertaking of education and training.

The **Emergency Planning Committee** evaluates the outcomes of any drills and ensures appropriate resources are provided to prepare for the bushfire season.

Emergency Management Team (EMT)

The Emergency Management Team shall comprise staff assigned to the following positions:

- Chief Warden

The Chief Warden

The Chief Warden will be the Site Manager in attendance during the construction phase and subsequently the Operations Manager, during operation of the wind farm.

A Deputy Chief Warden may be appointed as a representative at each work site during the construction phase; to be coordinated by the Chief Warden.

Chief Warden responsible for:

- Coordinating response to a bushfire event.
- Ensure the induction of emergency procedures for all Visitors/ Contractors undertaking work at a site
- Overseeing practice exercises and reporting to the EMC – continuous improvement
- Overseeing the training of all staff on emergency shut down procedure, and emergency service notification
- Overseeing the training of all staff, on evacuation and shelter procedures
- Overseeing the training of the EMT, communication and emergency service liaison, facility evacuation, firefighting and the use of facilities

  Note: Personnel attending the site are responsible for fire prevention and extinguishing minor fires caused by works on site - where it is safe to do so
- Providing event control
- Maintaining records

Alarm system

Each wind turbine is monitored for excessive heat and each nacelle is equipped with a fire suppression system that is automatically activated in the event of detection of fire, smoke or excessive heat.

The wind farm's fire detection system is monitored from the operations room.

Evacuation plan

Construction

The construction of the wind farm will result in multiple activities and works across the site. Each working area will be provided with a nominated fire warden.

All attending workers at induction will be made aware of the emergency procedures to be followed at the site.

An alarm may be raised at each working area and immediately reported to the site operations manager (Chief Warden).

An alarm may be raised by the site operations manager (Chief Warden) or delegate, alerting personnel at each working area to implement the emergency procedures.

Communications between the site operations manager (Chief Warden) and the nominated fire warden at each working site will be by two way radio (Primary), in addition to mobile phone.

Operation

All attending workers at induction will be made aware of the emergency procedures to be followed at the site.

All employees working remotely on the site will maintain communications with the operations manager (Chief Warden) by two way radio (Primary), in addition to mobile phone

Emergency evacuation routes

Construction

The emergency evacuation routes are the nearest public road or the nearest turbine compound (cleared space), whichever is in the opposite direction to an approaching fire (safest opportunity)

Operation

The emergency evacuation from the operations building and substation is to Albany Highway.

Field workers, isolated, are to evacuate to the nearest public road or take shelter at the nearest turbine base (the access road network on completion should provide the opportunity in most instance to evacuate the site and avoid the passage of a fire).

Assembly points

Construction

The main Assembly Point is the construction compound (between turbine sites T3 and T4).

In an emergency each nominated fire warden will report to the site operations manager (Chief Warden), to advise of their destination and account for all personnel.

A daily log of personnel and visitors to the construction compound and all work sites should be maintained by the site manager (or nominated delegate).

The site manager (Chief Warden) will undertake a roll call and all personnel are to be accounted for.

Operation

The permanent operations building is the main Assembly Point

Command centre

Construction

The initial operations management will be coordinated from the construction compound (between turbine sites T3 and T4). It will provide the command centre in an emergency.

Operation

The permanent operations building will provide the command centre in an emergency.

Training

All site employees, at induction are to be aware of the emergency procedures

- Identify access and egress options and safer places.
- To report an incident immediately.
- Stay in contact, maintain access to radio communication at all times.
- Determine the safest action evacuate or take shelter.
- Report destination.

Each working area will have at least one person present who is trained in basic fire operations and will be responsible for managing the operation of the firefighting appliance 1000 L.

Operation

Regular employees at the site will be trained in basic firefighting and the operation of firefighting appliances.

Workers and technicians prior to entering the site are required to collect a fire extinguisher and operation instructions, to extinguish a grassfire and report an incident before entering the site.

The Chief Warden is to be aware of attendance at the site.

Emergency drills

Through both the construction phase and during operation an emergency drill is to be undertaken prior to the bushfire season (August) and again mid-season (January). All employees are to be notified prior to an alarm being tested or a drill exercise.

A debriefing shall be held as soon as practically possible, after each drill.

Resources

Internal suppression systems

Each turbine is fitted with a fire detection system, and internal suppression system.

On site equipment

The following equipment

Construction

- Each working area is to be provided with a 1000 L fire appliance in attendance

Example of a 1000 L slip on unit, it can be loaded on a vehicle or on a trailer

- A 1000 L fire appliances (1000 L Slip on unit) is to be retained at the construction compound to be dispatched to assist fire suppression at a working area.
- A 50 000 L standalone tank is to be provided at the site construction compound.
- 3 @50 000 L water tanks are ae to be distributed though the windfarm to provide a reliable water supply to be used to supress grassfires.

Operation

- A 50 000 L standalone tank is to be provided at the and the permanent operation and maintenance building.
- A 1000 L fire appliances (1000 L Slip on trailer units) are to be retained at the permanent operation and maintenance building; to be used to accompany field /turbine works.
- Each attending technician vehicle is to carry the equivalent of one 9 kg fire extinguisher per vehicle and a first aid kit when on site. (These can be collected from the permanent operations building).
- The permanent operations building (construction and operation) will be equipped with two larger first aid kits.

Communication

Within site

Two way radio communication is to be provided with each working area and remote employee during operation.

External

Contact information for all adjoining properties is to be prepared and maintained up to date. This may include an SMS register, or another communication means e.g. WhatsApp.

Shire notification contacts and in turn emergency services contacts are to be confirmed.

Chemical storage and handling

All chemicals will be stored in a designated chemical store during construction and operation. A register is to be kept and provided to any attending emergency services.

A register will be kept at the construction compound and the operations building.

Hazardous materials will be stored following the requirements of:

- Dangerous Goods Safety Act 2007
- Dangerous Goods Safety (Storage and Handling of Non-explosives) Regulations 2007 (bulk >500 L)
- Dangerous Goods Safety (Storage and Handling of Non-explosives) Regulations 2007
- Dangerous Goods Safety (Storage and Handling of Non-explosives) Regulations 2007

Hazardous materials at the substation are bunded with sufficient capacity to contain the volume of stored material and around the transformer in the event of a major oil leak.

Hot works

No hot works will be undertaken outside on Total Fire Ban Days or harvest ban days without a permit.

Any planned hot works to be undertaken in the field are to follow a risk assessment and be accompanied by a 1000 L fire appliance.

Fire preparedness review

A Fire Preparedness Inspection is to be undertaken in September each year and confirmed with the Emergency management committee

- An inspection of the APZ s

  The following APZ s apply

  - Around the site camp (Construction compound) a30 m wide area of grass maintained at less than 100 mm and no grass within the compound.
  - Around the Turbine construction compound a 30 m wide area of grass maintained at less than 100 mm and no grass within the compound.
  - Around the base of the Turbine (operational) a 20 m diameter area of compacted limestone or equivalent, and a 40 m diameter area of grass maintained at less than 100 mm.
  - Around the Substation a 30 m wide area of grass maintained at less than 100 mm and no grass within the substation area
  - Around the Operations building and maintenance compound a 21 m wide area of grass maintained at less than 100 mm and no grass within the maintenance compound. The operational building is to be constructed and maintained to the BAL 29 standard.
  - Access route easements are 20 m wide
- Turbine suppression systems in operating order.
- An inspection of the on-site firefighting equipment to be in operating order: Firefighting appliance, fire extinguishers, first aid and PPE.
- A review of currency this Emergency Management Plan (update contacts and learnings from drill exercises or bushfire events).
- Confirm firefighting arrangements with the Shire and neighbouring properties.
- Confirm landowners are aware of the fire fighting procedures in the event of a nacelle fire.

Throughout the fire season

All employees are to report any defects

- Continual observation of the condition of the roads and cleared areas: grass is fast growing and will require regular attendance. Maintenance works should be accompanied by a 1000 L fire appliance

2. RESPONSE

In the event of a fire the following priorities will be observed:

1. Protect and rescue human life.
2. Report incident – land owner
3. Report incident – Shire
4. Render assistance in affected areas.

2.1 Chain of command

The chain of command on site in the case of a fire is as follows:

1. Chief Fire Warden (Operations Manager) or proxy
2. Nominated staff to undertake firefighting (construction phase)
3. Land owner
4. Emergency Services upon arrival will have authority to deal with the fire.

The landowner, during operation, is in closest proximity to apply suppression to extinguish a grassfire; until the brigade arrives. Landowners are to be trained in responding to a Nacelle fire event, to establish an exclusion zone, apply suppression to the fire line outside of the exclusion zone, and monitor for spot fires downwind, up to 5 km.

FIRE RESPONSE ACTIONS

Key contacts		
Community Emergency Services Manager	Cindy Pearce	0417 071 567
Kojonup Fire Brigade	Tony Fisher (Chief)	0428 311 504
Broomehill and Tambellup Fire Brigade	Kim Oliver (Chief)	0427 258 157
Turbine land owners		
WTG	TBA	
WTG	TBA	
WTG	TBA	

Alarm	Obtain information about the type and nature of the fire, including the direction of travel. – Determine need for shut down of turbines. – Alert adjoining residents (SMS contact/WhatsApp) – Instruct evacuation or shelter of personnel on site – Report incident to the Shire and DFES – Dispatch site fire services to assist with suppression
Approaching Fire	**If a fire is likely to encroach within 5 km of the Wind farm assets.** Construction Phase – Direct the shutdown turbines and lock in the Y position – Vehicles and equipment are to be moved out of the path of any fire to and parked on clear ground. – All personnel not directly involved in the fire response are to evacuate the site. – Alert adjoining residents (SMS contact/WhatsApp) Operation Phase **If a fire is within 5 km of the Wind farm assets** Construction Phase <u>Determine the impact to the area</u> – Direct the shutdown turbines and lock in the Y position, until the' all clear is received' <u>Determine the impact at the site</u> – Determine the severity of the fire. If there is potential endangerment of the site. – Workers at a turbine (if not safe to evacuate) should park vehicles at the base of the turbine at the lee side of the approaching fire – Guide personnel at risk to safety (evacuate or take shelter) – All personnel not directly involved in the fire response are to evacuate the site to a safe location as directed by the management team in coordination with public emergency services. – The Chief Warden (operations manager), and designated personnel, will ensure the evacuation of personnel has been successfully completed and that all personnel are accounted for.

Turbine Fire	Report fire – Shut down turbine, Y position and head to wind if possible – Shut down other turbines – Alert the turbine land owner – Alert the Shire. The Shire will alert the community (SMS contact/WhatsApp) and mobilise the local brigade response
Substation Fire	– Shut down the wind farm and electricity supply to the substation – Do not apply water to electrical fires. – Contain fires within the APZ. (This procedure does not account for structural fire procedures at substation; this is to prevent the escape and a spread of bushfire from the substation).
Access route fire	All technicians attending the site are to acknowledge the emergency procedures (incident reporting) by induction certification before proceeding onto the wind farm. All technicians attending the site are to collect an extinguisher and first aid kit from the operations building before proceeding onto the wind farm. At induction, technicians attending the site should be aware in the event of a mechanical failure the vehicle should be parked immediately within the road way or on a cleared space. Do not drive over cured grass. The fire extinguisher should be used to suppress any fire escaping into or spreading into the adjoining grass. Immediately report the incident to the Operations Manager.
Building Fire **Workshop Fire**	Follow structural fire procedures Evacuate buildings Account for all staff Set up an exclusion zone. Contain fires with the fire appliance to within the APZ to prevent the spread of fire to become a bushfire
If evacuations of staff is expected to extend beyond the normal work shift, communicate an expected return	

3. RECOVERY

After the 'all clear' is announced by emergency services (Shire or DFES)

Contaminated fire-fighting water

Contaminated fire-fighting water should not be permitted to enter the watercourse or contaminate the ground that supports the surface flows into a dam – bund and remove.

Dealing with the media

All enquiries are to be directed to the Project Manager.

Restore operation

If the site has not been adversely affected by fire, and an all clear has been issued down wind of the wind farm, up to 5km, the operation can commence.

If the facility is affected damaged by fire, it may be possible to restore operation to the areas that were not damaged. Damage to affected areas should not be interfered with until any required investigations are completed.

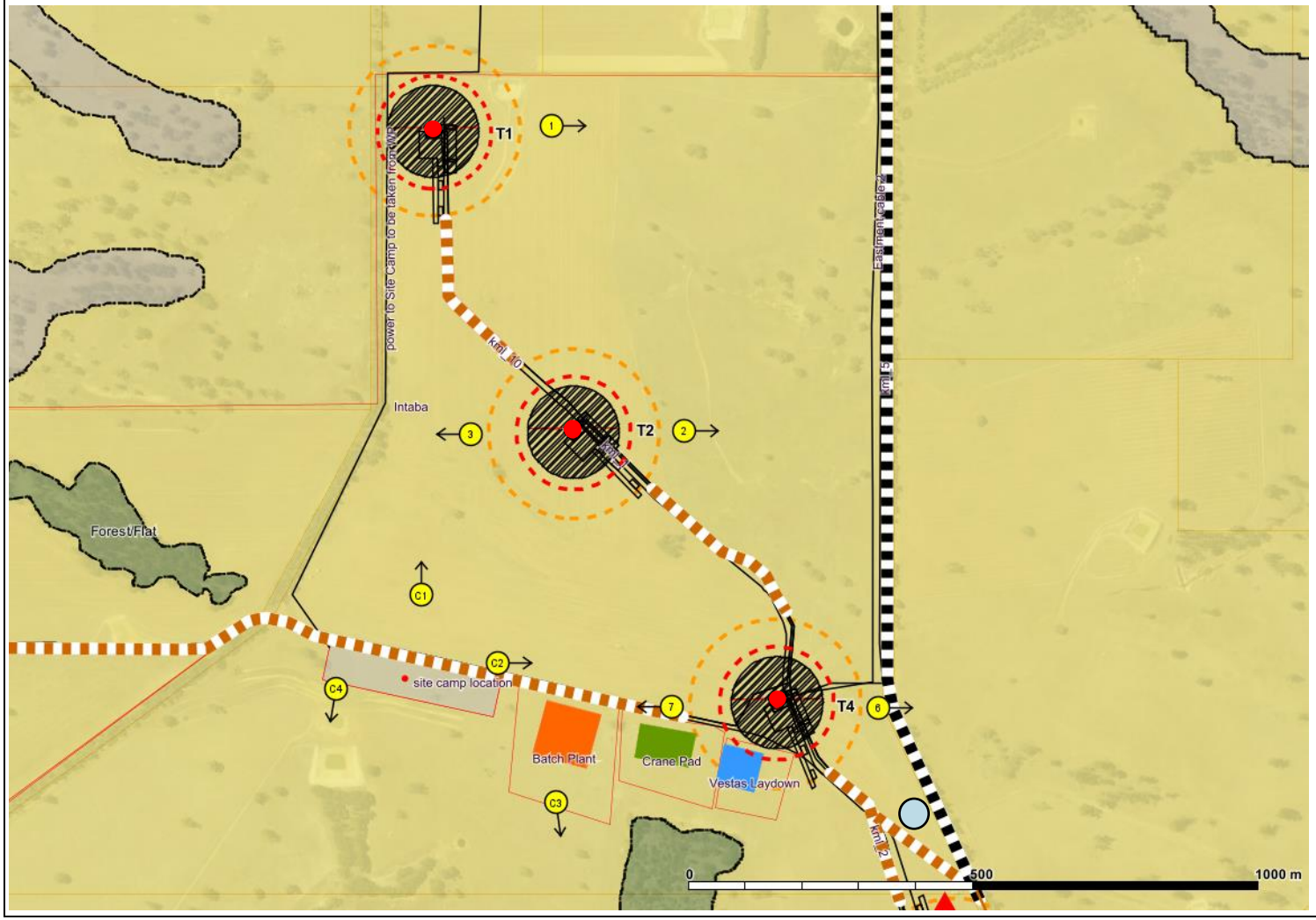
Debriefing and continuous improvement

A debriefing of staff will be held after the incident and opportunities for improvement identified.

A debriefing of staff, Emergency service and the local community should also be held after the incident and opportunities for improvement identified.

APPENDIX 2 - VEGETATION CLASSIFICATION

Figure 1a Vegetation Classification



Construction boundary

150 m assessment area

100 m assessment area

Class A Forest

Class B Woodland

Class G Grassland

Photo point

Public road

Access road (21 tonne)

Access gate (push through)

Turbine Base APZ
20 m compacted limestone
40 m grass < 100 mm

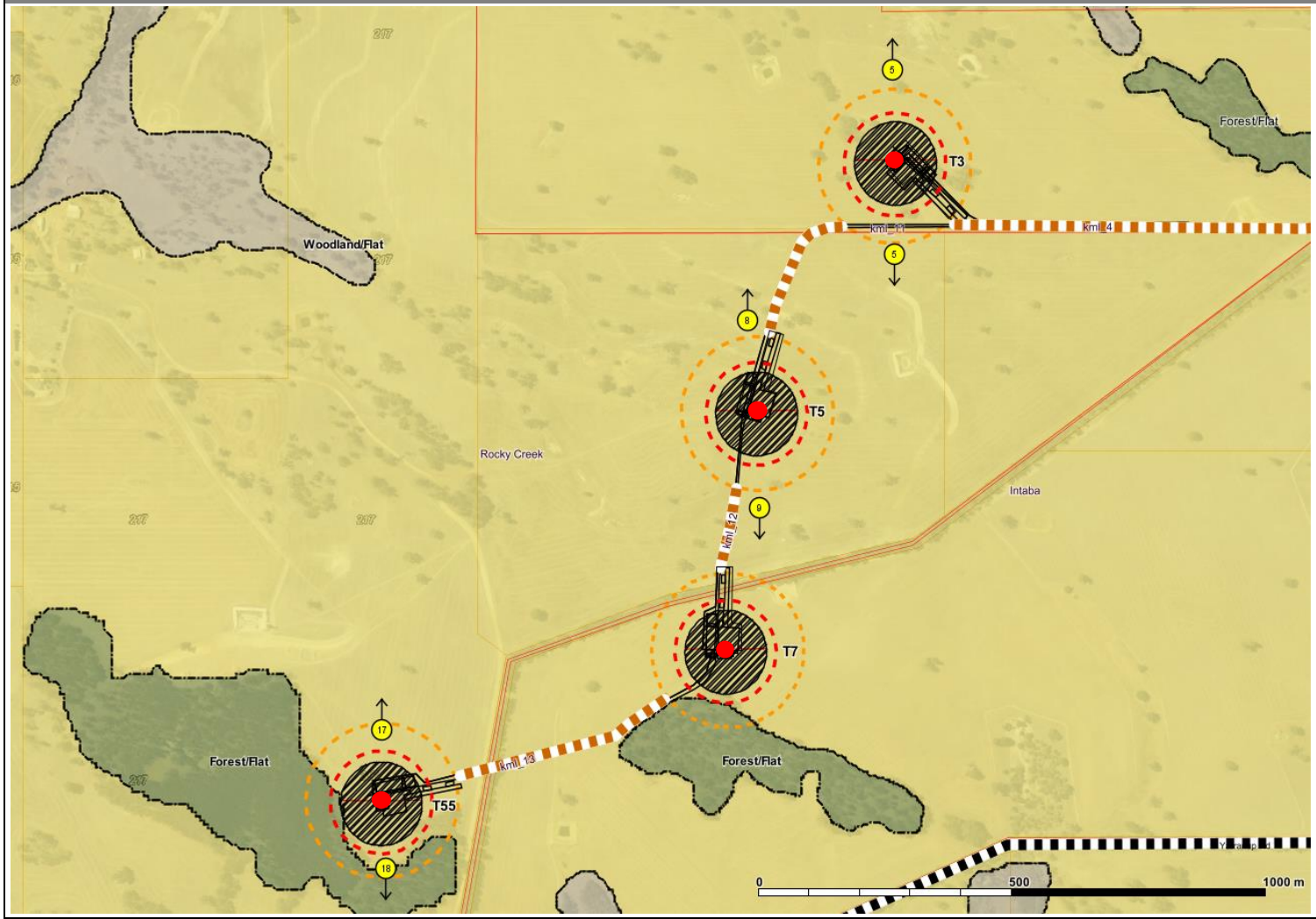
75 m Exclusion Zone

50 000 L water tank

Assessment Date: 13/06/2022
Prepared: Anthony Rowe
Accreditation Level: BPAD L3
Accreditation Number: 36690
Accreditation Expiry: Dec 2022
FPAA FIRE MAP 2022
GADA 1994 MGA Zone 50

© 2022 Any conclusions drawn, or recommendations made in this report are made in good faith. No responsibility is taken for how this information and the report are used subsequently by others.

Figure 1b Vegetation Classification



Construction boundary

150 m assessment area

100 m assessment area

Class A Forest

Class B Woodland

Class G Grassland

Photo point

Public road

Access road

Access gate

Turbine Base APZ
20 m compacted limestone
40 m grass < 100 mm

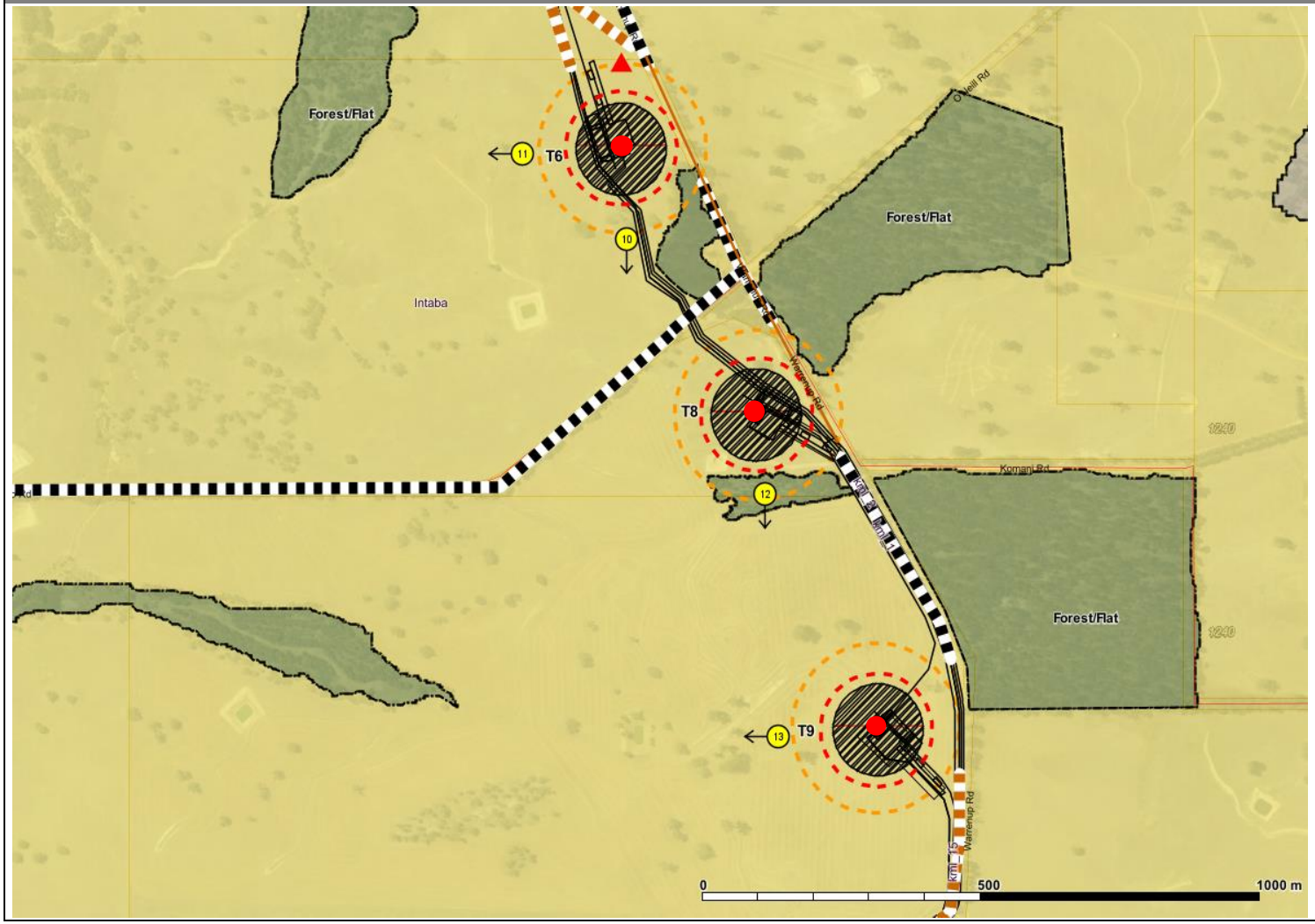
75 m Exclusion Zone

50 000 L water tank

Assessment Date: 13/06/2022
Prepared: Anthony Rowe
Accreditation Level: BPAD L3
Accreditation Number: 36690
Accreditation Expiry: Dec 2022
FPAA FIRE MAP 2022
GADA 1994 MGA Zone 50

© 2022 Any conclusions drawn, or recommendations made in this report are made in good faith. No responsibility is taken for how this information and the report are used subsequently by others.

Figure 1c Vegetation Classification



Construction boundary

150 m assessment area

100 m assessment area

Class A Forest

Class B Woodland

Class G Grassland

Photo point

Public road

Access road

Access gate

Turbine Base APZ
20 m compacted limestone
40 m grass < 100 mm

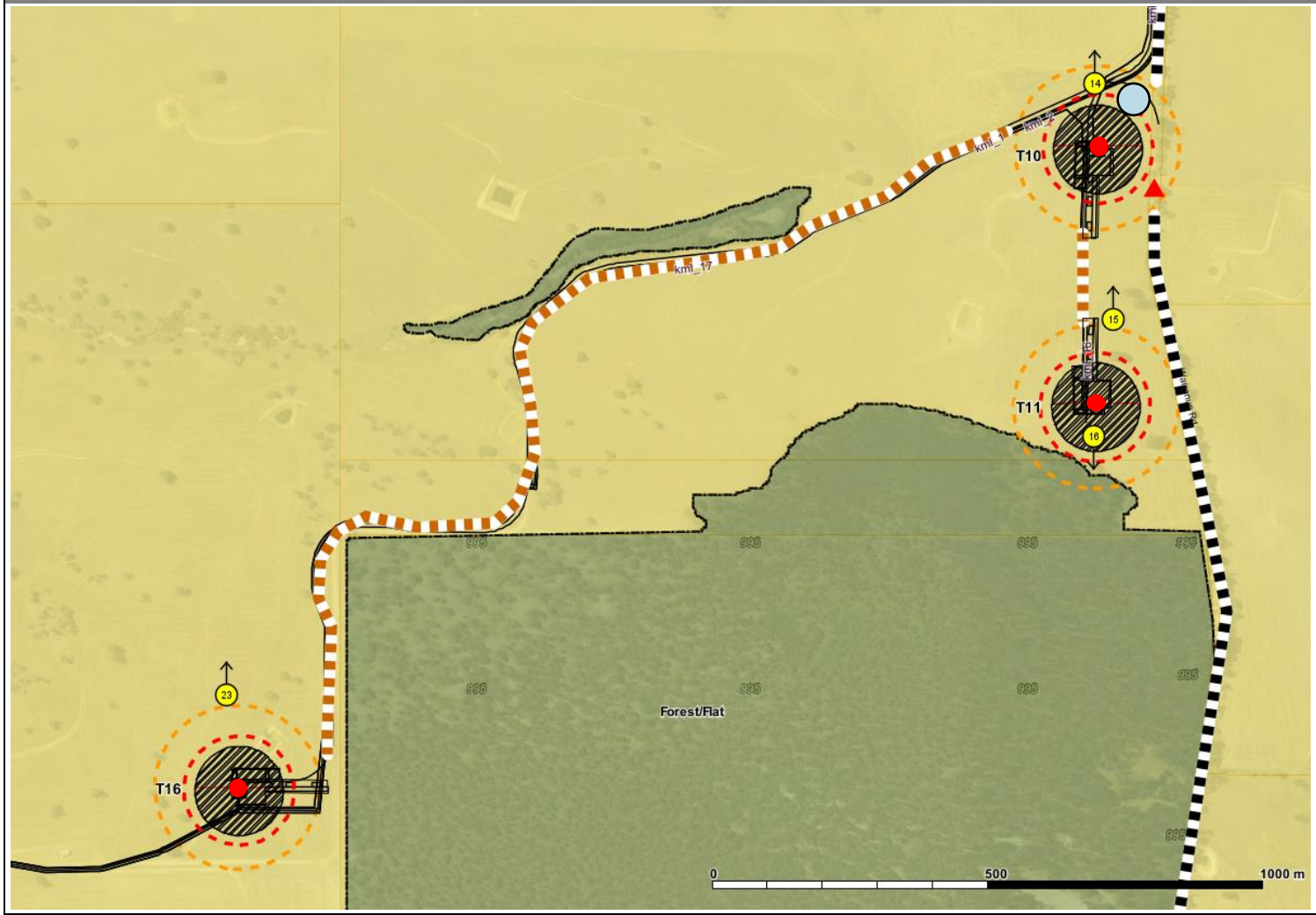
75 m Exclusion Zone

50 000 L water tank

Assessment Date: 13/06/2022
Prepared: Anthony Rowe
Accreditation Level: BPAD L3
Accreditation Number: 36690
Accreditation Expiry: Dec 2022
FPAA FIRE MAP 2022
GADA 1994 MGA Zone 50

© 2022 Any conclusions drawn, or recommendations made in this report are made in good faith. No responsibility is taken for how this information and the report are used subsequently by others.

Figure 1d Vegetation Classification



Construction boundary

150 m assessment area

100 m assessment area

Class A Forest

Class B Woodland

Class G Grassland

Photo point

Public road

Access road

Access gate

Turbine Base APZ
20 m compacted limestone
40 m grass < 100 mm

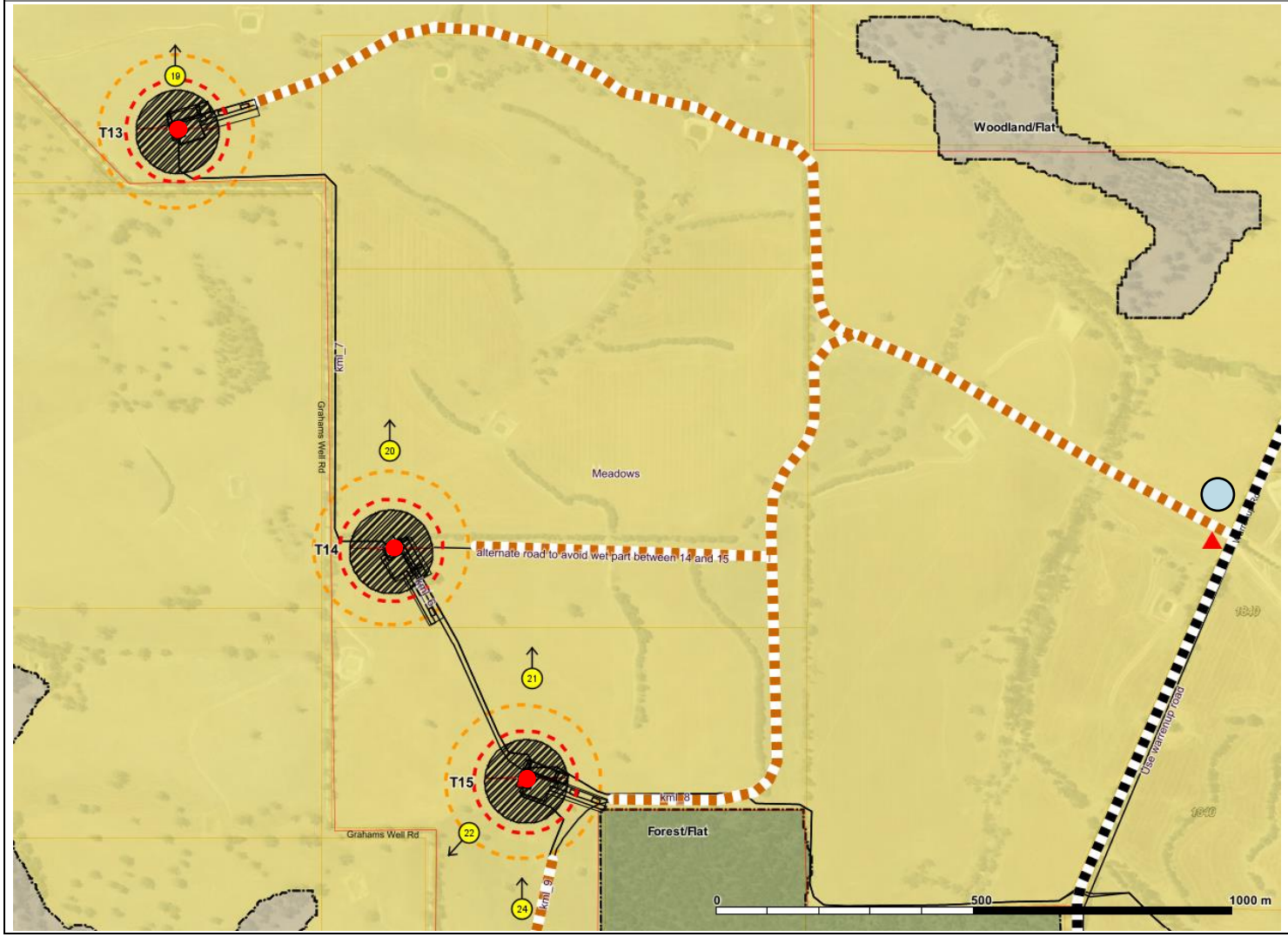
75 m Exclusion Zone

50 000 L water tank

Assessment Date: 13/06/2022
Prepared: Anthony Rowe
Accreditation Level: BPAD L3
Accreditation Number: 36690
Accreditation Expiry: Dec 2022
FPAA FIRE MAP 2022
GADA 1994 MGA Zone 50

© 2022 Any conclusions drawn, or recommendations made in this report are made in good faith. No responsibility is taken for how this information and the report are used subsequently by others.

Figure 1e Vegetation Classification



Construction boundary

150 m assessment area

100 m assessment area

Class A Forest

Class B Woodland

Class G Grassland

Photo point

Public road

Access road

Access gate

Turbine Base APZ
20 m compacted limestone
40 m grass < 100 mm

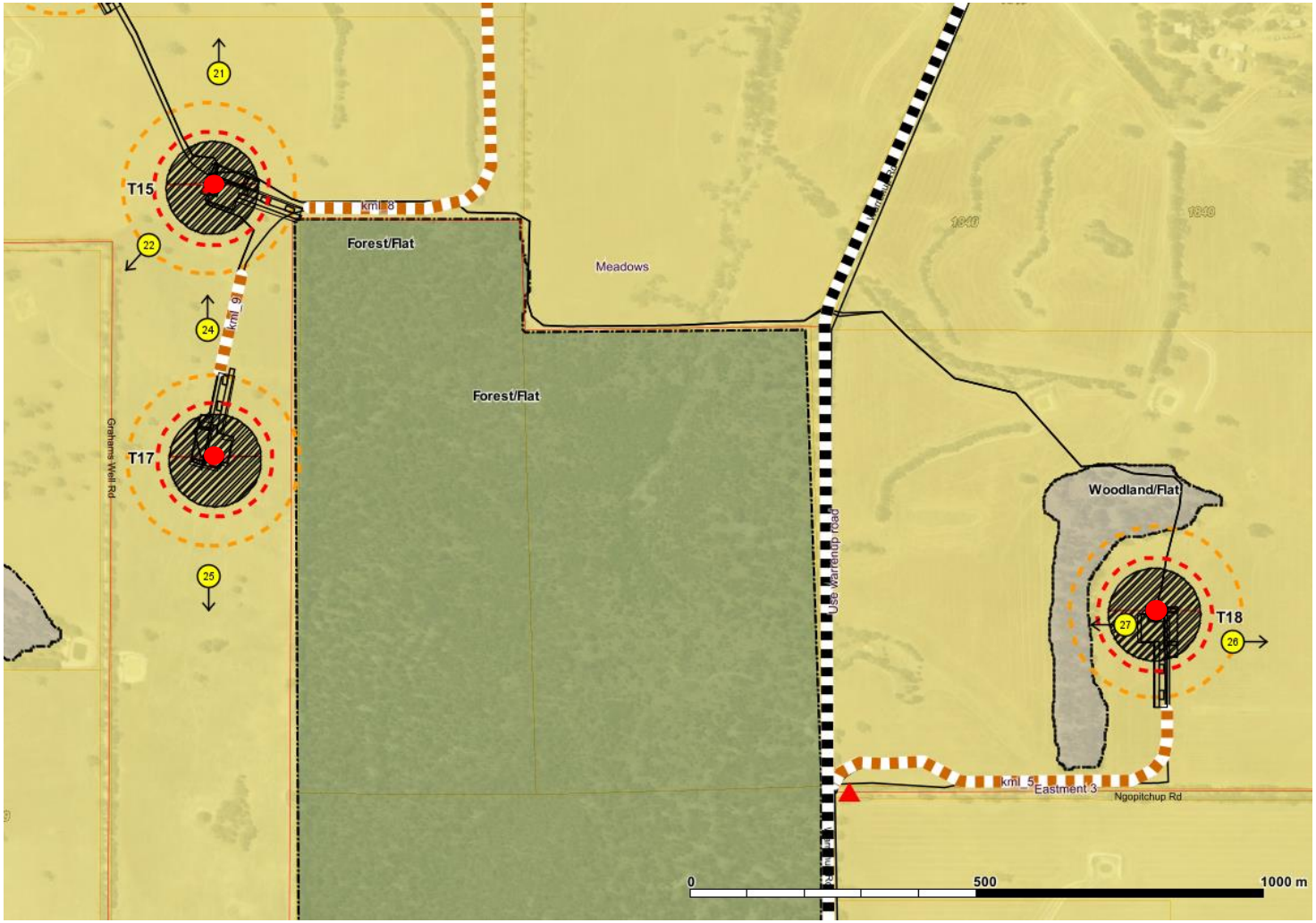
75 m Exclusion Zone

50 000 L water tank

Assessment Date: 13/06/2022
Prepared: Anthony Rowe
Accreditation Level: BPAD L3
Accreditation Number: 36690
Accreditation Expiry: Dec 2022
FPAA FIRE MAP 2022
GADA 1994 MGA Zone 50

© 2022 Any conclusions drawn, or recommendations made in this report are made in good faith. No responsibility is taken for how this information and the report are used subsequently by others.

Figure 1f Vegetation Classification



Construction boundary

150 m assessment area

100 m assessment area

Class A Forest

Class B Woodland

Class G Grassland

Photo point

Public road

Access road

Access gate

Turbine Base APZ
20 m compacted limestone
40 m grass < 100 mm

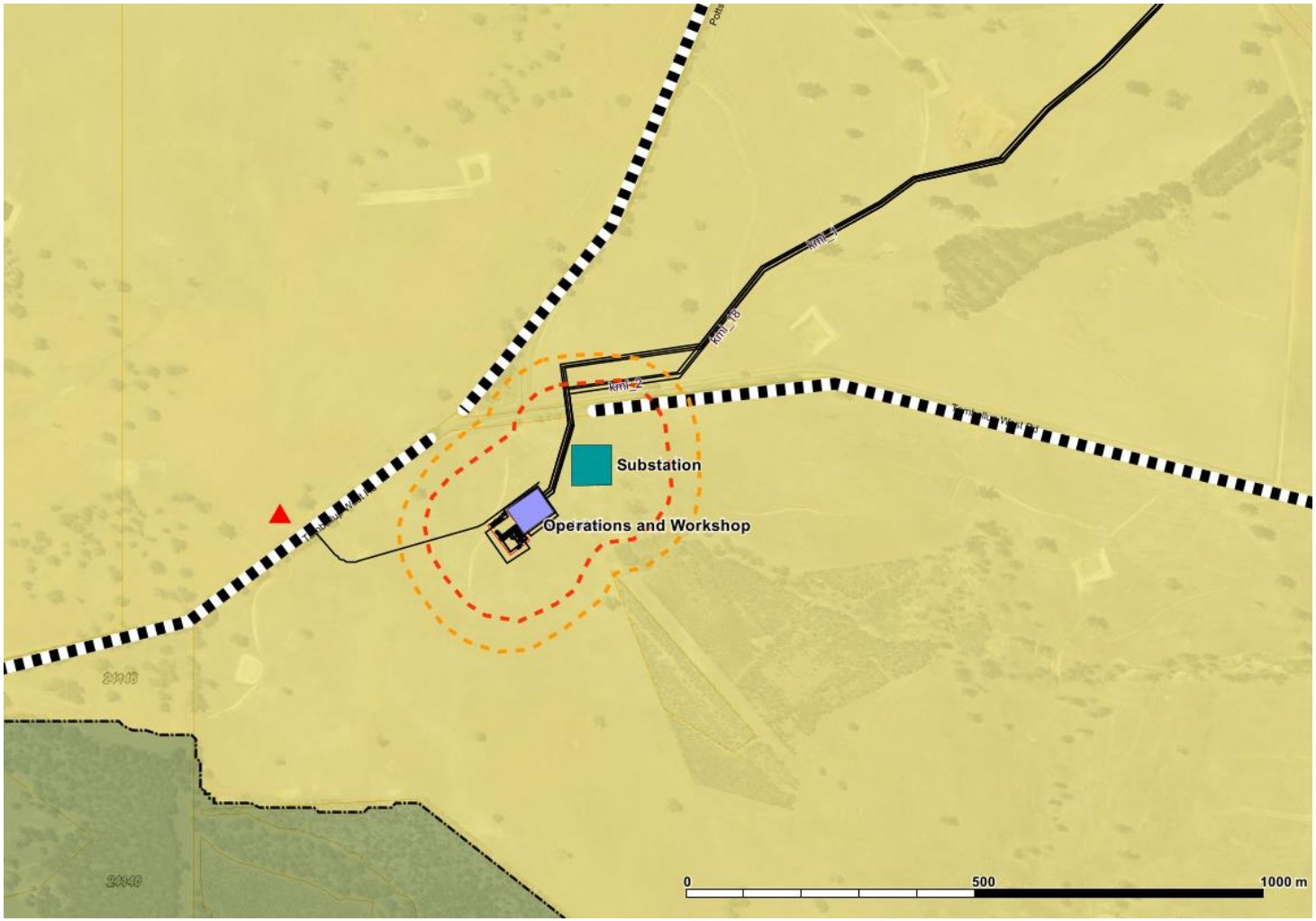
75 m Exclusion Zone

50 000 L water tank

Assessment Date: 13/06/2022
Prepared: Anthony Rowe
Accreditation Level: BPAD L3
Accreditation Number: 36690
Accreditation Expiry: Dec 2022
FPAA FIRE MAP 2022
GADA 1994 MGA Zone 50

© 2022 Any conclusions drawn, or recommendations made in this report are made in good faith. No responsibility is taken for how this information and the report are used subsequently by others.

Figure 1g Vegetation Classification



Construction boundary

150 m assessment area

100 m assessment area

Class A Forest

Class B Woodland

Class G Grassland

Public road

Access road

Access gate

75 m Exclusion Zone

50 000 L water tank

Substation 50 m grass < 100 mm

Operations building 21 m grass < 100 mm

Assessment Date: 13/06/2022
Prepared: Anthony Rowe
Accreditation Level: BPAD L3
Accreditation Number: 36690
Accreditation Expiry: Dec 2022
FPAA FIRE MAP 2022
GADA 1994 MGA Zone 50

© 2022 Any conclusions drawn, or recommendations made in this report are made in good faith. No responsibility is taken for how this information and the report are used subsequently by others.

Photograph verification of vegetation at the construction compound and turbine sites

C1 Construction compound	C2 Construction compound
C3 Construction compound	C4 Construction compound
Photo 1: T1	Photo 2: T2

Photo 3: T2	Photo 4: T3
Photo 5: T 3	Photo 6: T4
Photo 7: T4	Photo 8: T5
Photo 9: T5	Photo 10: T6
Photo 11: T6	Photo 12: T8

Photo 13: T9	Photo 14: T10
Photo 15: T11	Photo 16: T11
Photo 17: T55	Photo 18: T55
Photo 19: T13	Photo 20: T14

Photo 21: T15	Photo 22: T15
Photo 23: T16	Photo 24: T17
Photo 25: T17	Photo 26: T18
Photo 27: T18	

APPENDIX 3 – SCENARIO RESPONSE PLAN

Turbine	Predominant Vegetation								
	North	East	South	West	North	East	South	West	Houses
T1									
<150 m	G	G	G	G	G	G	G	G	
151 m - 2.5 km	G,F	G	G	G	Grahams Well Road 1 km	Warrenup Road 780 m	Work Camp Road 900 m		1.7 N, 1.3 NE
2.5 km - 5 km	G	G	G	G	T15 access and T 13 access	O'Neil Road 3.2 km	Yarranup Road 2.1 km	Bilney Road 3.2 km	
T2									
<150 m	G	G	G	G	Grahams Well Road 2.1 km	Warrenup Road 540 m			1.6 NE, 2.3 N, 2.4 SE
151 m - 2.5 km	G	G	G	G		O'Neil Road 2.4 km	Work Camp Road 480 m Yarranup Road 1.5 km	Bilney Road 3.3 km	
2.5 km - 5 km	G	G	G	G					
T3									
<150 m	G	G	G	G					
151 m - 2.5 km	GW	G	G	G	Grahams Well Road 2.1 km	Warrenup Road	Yarranup Road		1.7. E
2.5 km - 5 km	G	G	G	G				Potts Road 3.6 km	2.7 N, 2.8 N, 3.7 SE,,
T4									
<150 m	G	G	G	G					
151 m - 2.5 km	G	G	G	G	Grahams Well Road 2.1 km	Warrenup Road	Yarranup Road		1.9 N. 1.8 SW
2.5 km - 5 km	G	G	G	G		O'Neil Road 1.4 km	Tambellup Road 6.4 km	Potts Road 5.4 km	2.8 N 4.3 NE. 3.4 W

Turbine	Predominant Vegetation								
	North	East	South	West	North	East	South	West	Houses
T5									
<150 m	G	G	G	G					
151 m - 2.5 km	G w	G	GF	G		Warrenup Road 2.4 km	Yarranup Road 1.2 km	Potts Road 3.4 km	
2.5 km - 5 km	G	G	G	G	Grahams Well Road 2.7 km	O'Neil Road 3.2 km			
T6									
<150 m	G	G	G	G		Warrenup Road	Yarranup Road		
151 m - 2.5 km	G	G	G, F(SE)	G		O'Neil Road 600 m			1.3 NE, 2.3 NE
2.5 km - 5 km	G	G	G	G	Grahams Well Road 3.1 km	Birt Road 5.1 km		Potts Road 5.5 km	3.9 W, 4.7 E, 4.3 NE, 3.5 N 3.1 S 3.3 S, 4.7 SW
T7									
<150 m	G	G	G	G					
151 m - 2.5 km	G	G	G	G			Yarranup Road 700 m		1.4 NW
2.5 km - 5 km	G	G	G	G	Grahams Well Road 3.1 km	Warrenup Road 2.6 km	Tambellup Road 4.9 km	Potts Road 3.2 km	3.8E, 3.7 NE, 3.8 NE, 4.8 W, 3.1 SW, 3.2 SW, 3.5 SW, 4.1 SE, 4.3 SE.
T8									
<150 m	G	G, F(NE)	G	G		Warrenup Road 113 m			
151 m - 2.5 km	G	G	G	G	Yarranup Road 200 m				1.1E, ,2.4 S
2.5 km - 5 km	G	G	G	G	Ngopitchup Road 4.1 Grahams Well Road 3.6 km	Birt Road 5.1 km	Tambellup West Road 5.7 km	Potts Road 4.8 km	2.8 N, 3.8 N 4.6 E, 5.4 E , 2.7S 4.6 SW, , 5.01SW, 5.2 SW, 4.1W

Turbine	Predominant Vegetation								
	North	East	South	West	North	East	South	West	Houses
T9									
<150 m	G	G	G	G		Warrenup Road 140 m			
151 m - 2.5 km	G	G, F(NE)	G	G	Yarranup Road 800 m				1.1NE, 1.8S, 2.2 S
2.5 km - 5 km	G	G	F,G	G	Ngopitchup Road 4.6 km Grahams Well Road 4.1 km	Birt Road 5.9 km	Tambellup West Road 5.1 km	Potts Road 5.0 km	3.3N, 3.8 N 4.7 NE , 4.3E 4.7SW,5.1SW, ,5.1SW, 4.8NW
T10									
<150 m	G	G	G	G		Warrenup Road 100m			
151 m - 2.5 km	G	G	F(SE)	G	Yarranup Road 1.2 km				1.3NE, 1.4S, 21.7 S
2.5 km - 5 km	G	G	G	G	Ngopitchup Road 4.6 km Grahams Well Road 4.1 km	Birt Road 6.4km	Tambellup West Road 4.6 km	Potts Road 5.0 km	3.9N, 5.2NE, 4.9E , 4.4SW, 4.8SW, 4.9SW, 4.7NW
T11									
<150 m	G	G	F	G		Warrenup Road 140m			
<2.5 km	G	G	G	G	Yarranup Road 1.5 km				1.7NE, 1.1S, 1.3S
<5.0 km	G	G	G	G	Ngopitchup Road 5.5 km	Birt Road 6.6 km	Tambellup West Road 4.1 km	Potts Road 4.9 km	4.3N, 5.5NE, 4.4E , 4.9E, 4.4W, 4.7W, 4.8W 4.9NW
T12									
<150 m	G	G	G	F					
151 m - 2.5 km	G	G	G	G			Yarranup Road 800m		1.1nw
2.5 km - 5 km	G	G	G	G	Grahams Well Road 5.0 km	Warrenup Road 3.5 km	Tambellup West Road 4.5 km	Potts Road 4.9 km	4.3NE, 4.4E, 4.3SE, 4.7SE, 2.6S,2.6S,3.0S, 4.1SW

Turbine	Predominant Vegetation								
	North	East	South	West	North	East	South	West	Houses
T13									
<150 m	G	G	G	G	Grahams Well Road 120 m		Grahams Well Road 120 m		
151 m - 2.5 km	G	G	G	G		Warrenup Road 2.5 km			2.5SE,1.3SW, 1.6NW, 1.8NW
2.5 km - 5 km	G	G	G	G	Broomehill-Kojonup Road 5.1 km	Palomar Road 5.1 km	Yarranup Road 6.4 km	Potts Road 4.9 km	3.4NE, 5.0SE. 3.9S, 2.9S, 3.5W,3.7W, 4.6NW
T14									
<150 m	G	G	G	G				Grahams Well Road 120 m	
151 m - 2.5 km	G	G	G,F(SW)	G		Warrenup Road 1.5 km			1.9E. 1.4S, 1.8W
2.5 km - 5 km	G	GG	G	G	Broomehill-Kojonup Road 6.0 km	Palomar Road 4.7 km	Yarranup Road 5.6 km	Potts Road 5.4 km	3.7NE, 4.4E, 5.0SE, 3.0S, 3.7W, 4.0W
T15									
<150 m	G	G	G	G					
151 m - 2.5 km	G	G	F(SE)	G		Warrenup Road 1.2 km		Grahams Well Road 180 m	1.7E. 148S, 1.5W
2.5 km - 5 km	G	G	G	G	Broomehill-Kojonup Road 6.0 km	Palomar Road 4.4 km	Yarranup Road 5.2 km	Potts Road 5.4 km	4.0NE, 4.0E, 4.6SE, 2.6S, 4.0W, 4.4W
T16									
<150 m	G	F	G	G					
151 m - 2.5 km	G	G	G	G	Yarranup Road 1.2 km				1.6E, 1.9E
2.5 km - 5 km	G	G	G	G	Ngopitchup Road 4.6 km Grahams Well Road 4.1 km	Birt Road 6.4 km	Tambellup West Road 4.6 km	Potts Road 5.0 km	5.2N, 3.2NE, 4.4E , 4.9E, 2.5W, 3.0W, 3.1W 4.1NW

Turbine	Predominant Vegetation								
	North	East	South	West	North	East	South	West	Houses
T17									
<150 m									
151 m - 2.5 km		F				Warrenup Road 1.1 km		Grahams Well Road 160 m	1.8NE. 1.0S, 12.0W
2.5 km - 5 km					Broomehill-Kojonup Road 6.0 km	Palomar Road 4.4 km	Yarranup Road 4.7 km	Potts Road 5.5 km	4.5NE, 4.1E, 5.1SE, 4.8S, 4.0W, 4.4W
T18									
<150 m	G	G	G	W					
151 m - 2.5 km	G	G	G	G		O'Neil Road/ Palomar Road 1.8 km	Ngopitchup Road 0.3 km	Warrenup Road 0.6 km Grahams Well Road 1.8 km	1.0N, 2.4E, 1.6S, 2.0e
2.5 km - 5 km	G	G	G	G	Broomehill-Kojonup Road 6.4 km		Yarranup Road 4.7 km	Potts Road 7.3 km	4.3N, 4.8E, 4.2E,4.4S, 3.9W,4.7NW, 4.4NW.
Construction									
<150 m	G	G	G	G					
151 m - 2.5 km	G,	G	G	G		Warrenup Road 0.5 km	Yarranup Road 1.2 km	O'Neil Road 1.2 km	2.1N, 2.2E
2.5 km - 5 km	G,F(N)	G	G, F(SW)	G	Grahams Well Road 2.8 km Broomehill-Kojonup Road 611 m	Birt Road 5.9 km	Tambellup West Road 6.0 km	Potts Road 5.0 km	2.8N,4.7N, 4.6NE, 5.6E, 3.6S, 3.9S, 4.6SW, 4.8SW,5.1SW
Substation									
<150 m	G	G	G	G	Tambellup West Road 150 m			Potts Road 150 m	
151 m - 2.5 km	G	G	G	G				Albany Highway 2.4 km	1.8N,2.2,N,2.3N
2.5 km - 5 km	G	G	G	G	Yarranup Road 3.1 km	Warrenup Road 5.3 km	Albany Highway 4.1 km		4.5SE, 4.6SE,3.8SW, 3.1W,3.9NW

APPENDIX 4 – NACELLE SUPPRESSION SYSTEMS

Technical description and data for fire suppression system

Document no.: 0079-9639 V00
Class: RESTRICTED
Type: T09
Date: 2018-12-04

Original Instruction: T09 0079-9639 VER 00

T09 0079-9639 Ver 00 - Approved- Exported from DMS: 2019-03-27 by GUELU

Wind. It means the world to us.™

VESTAS PROPRIETARY NOTICE: This document contains valuable confidential information of Vestas Wind Systems A/S. It is protected by copyright law as an unpublished work. Vestas reserves all patent, copyright, trade secret, and other proprietary rights to it. The information in this document may not be used, reproduced, or disclosed except if and to the extent rights are expressly granted by Vestas in writing and subject to applicable conditions. Vestas disclaims all warranties except as expressly granted by written agreement and is not responsible for unauthorized uses, for which it may pursue legal remedies against responsible parties.

Original Instruction: T09 0079-9639 VER 00

Wind turbine type

Read the full document before you start to do work.

Send questions or concerns about the document to Vestas Wind Systems A/S.

Wind turbine type	Mk version
V117-4.0/4.2 MW	Mk 3E
V136-4.0/4.2 MW	Mk 3E
V150-4.0/4.2 MW	Mk 3E

Change description

Description of changes
First edition.

T09 0079-9639 Ver 00 - Approved- Exported from DMS: 2019-03-27 by GUELU

Table of Contents

1 Abbreviations and technical terms 4
2 Reference documents 4
3 Purpose 4
4 Weights and (overall) dimensions 4
5 Technical description and data 5
6 Location of the equipment 6
7 Technical and functional description 6
8 Key electrical data 7
9 Interfaces 7
10 Environmental and design data 7

Original Instruction: T09 0079-9639 VER 00

T09 0079-9639 Ver 00 - Approved- Exported from DMS: 2019-03-27 by GUELU

1 Abbreviations and technical terms

0020484495

Table 1.1: Abbreviations

Abbreviation	Explanation
AMT	Access and maintenance tools
APS	Auxiliary power supply system
CCI	Control and communication infrastructure system
FSS	Fire suppression system

Table 1.2: Explanation of terms

Term	Explanation
None	

2 Reference documents

0020484494

Table 2.1: Reference documents

Document no.	Title
0053-1210	Electrical diagram 4 MW Mk 3E
0063-3807	Novec 1230 safety datasheet

3 Purpose

0011516197

The purpose of the document is to give a detailed technical description of the FSS.

The objective of the Vestas FFS for the wind turbine is to provide suppression of fires in the components specified in section 7 *Technical and functional description*, page 6.

The system is intended to provide an additional layer of fire protection, together with the supplied arc detector technology, the lightning protection system, and the optional smoke/heat detection sensor package.

4 Weights and (overall) dimensions

0011516194

Table 4.1: Weights

Item no.	Description	Weight [kg]
29079139 29079260	Cylinder unit, CONV/CONTR/TRAFO	85.0
29079334 29079335	Cylinder unit, CONV/CONTR	36.0
29063707	PIPE FSS C3 ASM CONTR	2.55

Original Instruction: T09 0079-9639 VER 00

T09 0079-9639 Ver 00 - Approved- Exported from DMS: 2019-03-27 by GUELU

VESTAS PROPRIETARY NOTICE

Item no.	Description	Weight [kg]
29077542	FSS PIPE C3 ASM CONV	5.60
29077543	PIPE FSS C3 ASM TRAFO	9.09

5 Technical description and data

0011516199

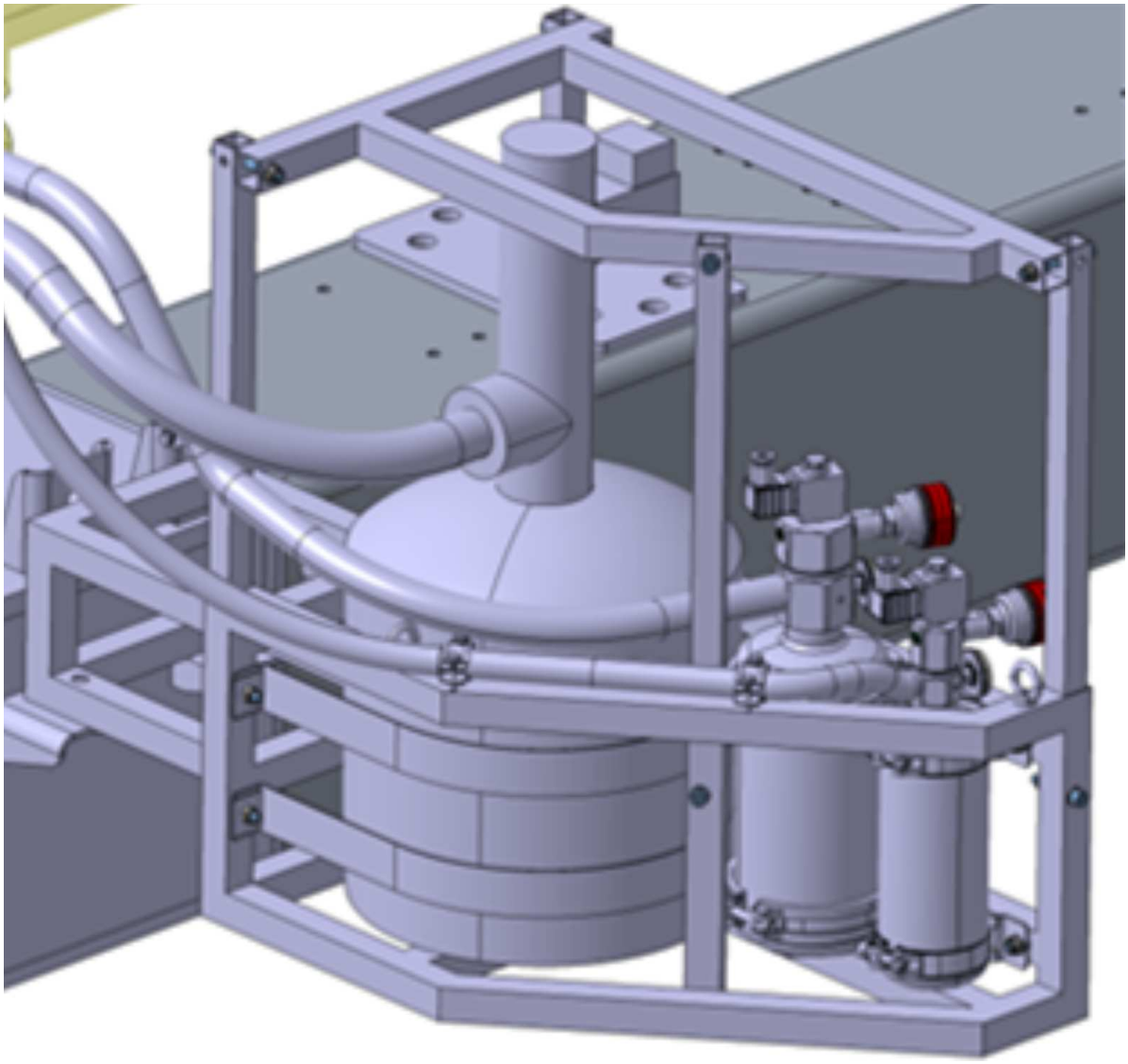


Figure 5.1: Illustration of cylinder unit

Original Instruction: T09 0079-9639 VER 00

T09 0079-9639 Ver 00 - Approved- Exported from DMS: 2019-03-27 by GUELU

Original Instruction: T09 0079-9639 VER 00

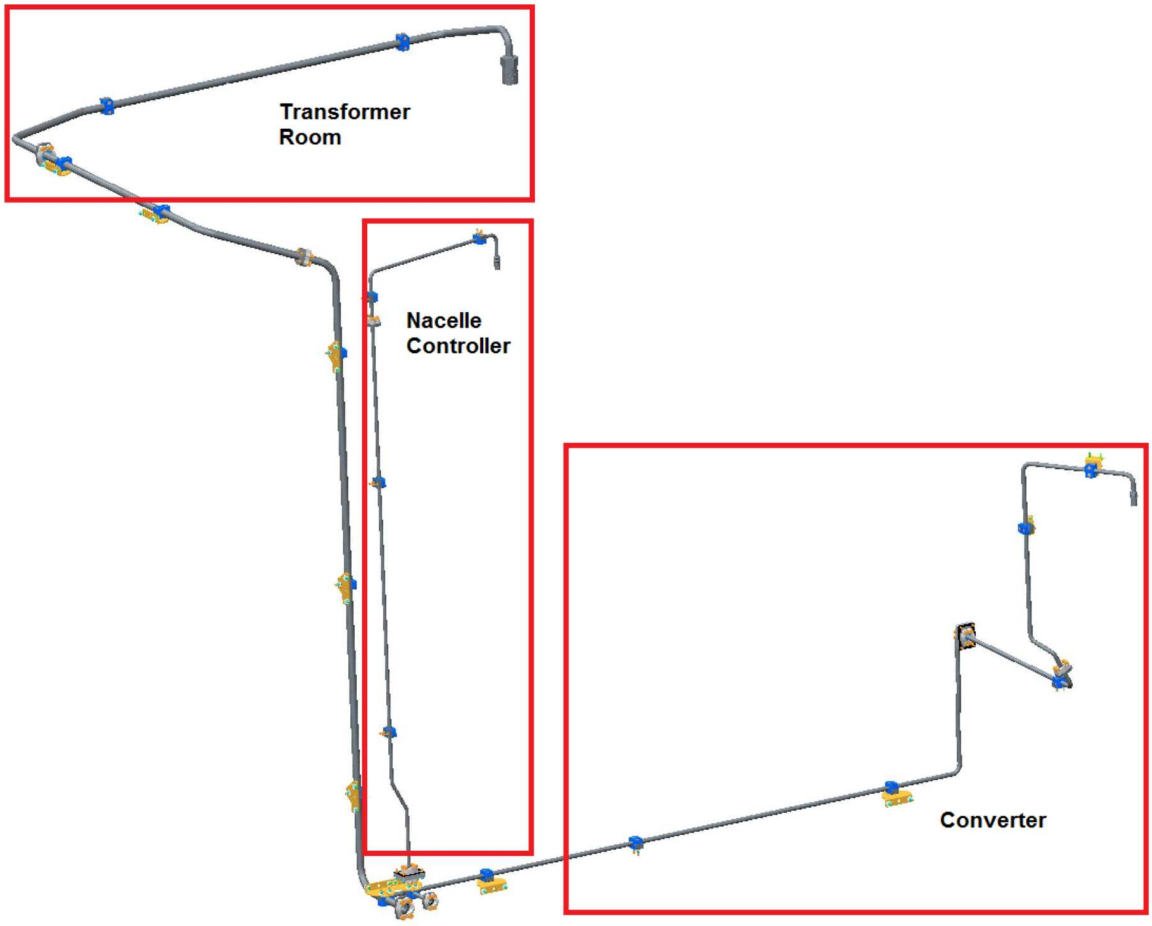


Figure 5.2: Illustration of pipe system

6 Location of the equipment

0011516196

The location of the equipment is in the nacelle.

7 Technical and functional description

0011516195

This FSS is a so-called electrically activated, fixed fire-fighting system.

When the FSS is activated by the smoke detection system, the cylinder valve in question is automatically opened by the valve actuator. This allows the agent inside the cylinder to flow through the pipe system and distribute the suppression agent into the fire hazard zones.

Upon actuation, the pressure switch, which is employed on all cylinders, must give a feedback signal to the wind turbine CCI to set an FSS alarm.

The fire hazard zones are as follows:

- Nacelle controller cabinet
- Converter cabinet
- Transformer room

The fire protection strategy is to individually detect and extinguish potential fires in the targeted compartments given above before the fire spreads to other components.

The system consists of the main components that follow:

T09 0079-9639 Ver 00 - Approved- Exported from DMS: 2019-03-27 by GUELU

1. Cylinder unit
2. Suppression agent
3. Pipe system with nozzles

A fire suppression event in all the fire hazard zones is triggered by the related smoke sensors.

8 Key electrical data

0020493502

Table 8.1: Key electrical data

Item	Data
See ‘Electrical diagram’ section -700-06-05	0053-1210

9 Interfaces

0011516210

The FSS has mechanical interfaces to the following modules and systems:

- Rear frame structure
- Trafo wall
- Nacelle controller
- Converter
- Trafo room

The electrical interfaces of the FSS are as follows:

- CCI
- APS
- Smoke detection system

The FSS also has interface to the wind turbine software and AMT.

10 Environmental and design data

0011516209

The 3M Novec 1230 fire protection fluid, according to ISO 14520-5:2006, was developed as a sustainable clean extinguishing agent for use in total flooding applications. This agent is a replacement for Halon and first-generation Halon replacement alternatives. Novec 1230 extinguishes principally by removal of heat from the fire. The agent/air mixture has a heat capacity much higher than that of air alone. A higher heat capacity means that this gas mixture will absorb more energy (heat) for each degree of temperature change it experiences than the same mass of air. This energy absorption causes the combustion zone to cool to the point that the fire is extinguished. Fires can be extinguished if any of the required components are removed: heat, oxygen, fuel source, or the chain reaction. Novec 1230 has the highest heat capacity of any commercially available Halon alternative, resulting in the lowest extinguishing concentrations for a given fuel.

Novec 1230 was also selected as a suppression agent for its environment-friendly characteristics. Novec 1230 has zero impact on ozone depletion and the same impact on global warming as that of carbon dioxide. Novec 1230 also leaves no residue for clean-up in the event of a false suppression event. Novec 1230 is electrically non-conductive and can be exposed to live circuits without side effects. The cost of a false suppression is limited to wind turbine downtime, service cost of the alarm, and the cost of replacement of the specific system (heat

Original Instruction: T09 0079-9639 VER 00

T09 0079-9639 Ver 00 - Approved- Exported from DMS: 2019-03-27 by GUELU

VESTAS PROPRIETARY NOTICE

reactive tubing and suppressant agent storage container), as there are no clean-up costs or damaged components to the suppression system that needs to be replaced.

Novec 1230 is safe for human presence in the event of an unintended suppression event without open flames.

In case of a fire event with open flames, special precautions shall be taken before you enter the fire hazard zone in question.

For further details in case of a fire event, see 0063–3807 ‘Novec 1230 safety datasheet’, section 5.

Original Instruction: T09 0079-9639 VER 00

T09 0079-9639 Ver 00 - Approved- Exported from DMS: 2019-03-27 by GUELU

VESTAS PROPRIETARY NOTICE

APPENDIX 5 – REFERENCES

GENERAL REFERENCES

Australian Institute for Disaster Resilience 2015, *Australian Disaster Resilience Handbook 10: National Emergency Risk Assessment Guidelines*, CC BY-NC

Australian Building Codes Board 2019, *Handbook: Bushfire Verification Method*, Commonwealth of Australia and States and Territories 2019, published by the Australian Building Codes Board.

Australian Building Codes Board 2014, *Information Handbook: Design and Construction of Community Bushfire Refuges*, 2014

Blanchi R., Whittaker J., Haynes K., Leonard J., Opie K., Holland M., Dreyfuss S., 2015 *Sheltering practices during bushfire,* CSIRO Land and Water Report to the Emergency Management Victoria Natural Disaster Resilience Grants Scheme.

P Cheney and Andrew Sullivan *Grassfires Fuel, weather and fire behaviour*, CSIRO 2008

Florec V., and Pannell D J. 2016, *Economic Assessment of bushfire risk management options in Western Australia: case studies in the Perth Hills and in south-west of Western Australia*, The University of Western Australia, Report Prepared for The State Emergency Management Committee Secretariat, attachment 2

SA Department of Environment and Natural Resources, Government of South Australia, 2012 *Overall Fuel Hazard Guide for South Australia*

Standards Australia 2010, *Australian Standard AS 3745:2010 Planning for emergencies in facilities*

Standards Australia 2009, *AS 3959:2018 Construction of buildings in bushfire-prone areas*, Sydney

Standards Australian and Standards New Zealand 2018, *Australian Standard / New Zealand Standard ISO 31000:2018 Risk management – principles and guidelines*

State Administrative Tribunal of Western Australia, HARMANIS HOLDINGS NO. 2 PTY LTD and WESTERN AUSTRALIAN PLANNING COMMISSION [2019] WASAT 43 (25 June 2019)

Sullivan A L., Cruz M G., Ellis F. M., Gould J S., Plucinski M P., Hurley R., and Koul V. 2014, *Fire Development, Transitions and Suppression, Final Project Report*, Bushfire Cooperative Research Centre, CSIRO Ecosystem Science and CSIRO Climate Adaptation Flagship.

Western Australian Department of Fire and Emergency Services *Guidelines for Operating Private Equipment at Fires* March 2022

Western Australian Planning Commission (WAPC) 2015, *State Planning Policy 3.7 Planning in Bushfire Prone Areas*, Perth.

Western Australian Planning Commission and Department of Fire and Emergency Services (WAPC), *Guidelines for Planning in Bushfire Prone Areas Version 1.4*, Western Australia. December 2021.

Western Australian Planning Commission (WAPC) 2019 *A Guide to developing a Bushfire Emergency Evacuation Plan* October 2019.

Western Australian State Emergency Management Committee *A Strategic Framework for Emergency Management in Western Australia* October 2019

WA Department of Planning Land and Heritage 2016*, Visual Guide for bushfire risk assessment in Western Australia*

Western Australian Planning Commission (WAPC) 2015, *State Planning Policy 3.7 Planning in Bushfire Prone Areas*, Western Australian Planning Commission, Perth, Perth

Whittaker J., Blanchi R., Haynes K., Leonard J., Opie K., 2017 *Experiences of sheltering during Black Saturday bushfire: Implications for policy and research*

Online references

Office of Bushfire Risk management (OBRM), Map of Bush Fire Prone Areas, viewed June 2022, < https://maps.slip.wa.gov.au/landgate/bushfireprone/>

Office of Bushfire Risk Management (OBRM), Bushfire Risk Management (BRM) Plan Guidelines, viewed June 2022

Overview of Problems and Solutions in Fire Protection Engineering of Wind Turbines January 2014 Fire Safety Science 11:983-995 https//iafss.org/publications/fss/11/983/view/fss_11-983.pdf

Rengel, B Computational analysis of fire dynamics inside a wind turbine (2017) https://core.ac.uk/download/pdf/87657371.pdf

Traffic Management Plan

Flat Rocks Wind Farm

CW1200337 / 304900741

Prepared for
ENEL Green Power Australia Pty Ltd

14 July 2022

Cardno
now
Stantec

Contact Information

Stantec Australia Pty Ltd
ABN 17 007 820 322

11 Harvest Terrace
West Perth WA 6005
PO Box 447

www.cardno.com
Phone +61 8 9273 3888
Fax +61 8 9486 8664

Document Information

Prepared for	ENEL Green Power Australia Pty Ltd
Project Name	Flat Rocks Wind Farm
File Reference	CW1200337-304900741-TR-R01-B-Flat_Rocks_TMP-V1BS.docx
Job Reference	CW1200337 / 304900741
Date	14 July 2022
Version Number	B

Author(s):

Brian Sii
Traffic Engineer

Effective Date 14/07/2022

Approved By:

Ray Cook
Business Leader – Traffic and Transport Planning

Date Approved 14/07/2022

Document History

Version	Effective Date	Description of Revision	Prepared by	Reviewed by
A	11/07/2022	DRAFT	BS	RJC
B	14/07/2022	FOR ISSUE	BS	RJC

© Cardno. Copyright in the whole and every part of this document belongs to Cardno and may not be used, sold, transferred, copied or reproduced in whole or in part in any manner or form or in or on any media to any person other than by agreement with Cardno.

This document is produced by Cardno solely for the benefit and use by the client in accordance with the terms of the engagement. Cardno does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by any third party on the content of this document.

Our report is based on information made available by the client. The validity and comprehensiveness of supplied information has not been independently verified and, for the purposes of this report, it is assumed that the information provided to Cardno is both complete and accurate. Whilst, to the best of our knowledge, the information contained in this report is accurate at the date of issue, changes may occur to the site conditions, the site context or the applicable planning framework. This report should not be used after any such changes without consulting the provider of the report or a suitably qualified person.

Table of Contents

1	Introduction		1
	1.1	Background	1
	1.2	Objective	1
	1.3	Related Documents	2
	1.4	Development Approval Condition	2
2	Existing Site Context		3
	2.1	Development Area and Locality	3
	2.2	Existing Road Hierarchy	4
	2.3	Existing Speed Zones	4
	2.4	Existing Road Seal Condition	5
	2.5	Existing Traffic Volumes	5
	2.6	Existing Road Users within Study Area	6
	2.7	Crash History	7
3	Proposed Development		8
	3.1	Site Layout (Stage 1)	8
	3.2	Temporary Access Roads (Private Land) and Access Gate	9
4	Haulage Routes		10
	4.1	External Route – Port of Bunbury to development area	10
	4.2	Local Government Roads	11
	4.3	Restricted Access Vehicles (RAV)	12
5	Traffic Assessment		13
	5.1	Site Inspection	13
	5.2	General Existing Road Condition	13
	5.3	Upgrades and modifications along Haulage Route	14
6	Traffic Management		17
	6.1	Construction Period and Working Hours	17
	6.2	Estimated Traffic Generation	17
	6.3	Vehicle Scheduling	18
	6.4	Heavy Vehicle Management	18
	6.5	Use of Escort Vehicles	18
	6.6	School Bus	18
	6.7	Farm Vehicles	18
7	Safety Plan		19
	7.1	Occupational Health and Safety	19
	7.2	Training and Site Induction	19
	7.3	Public Notification	19
	7.4	Worksite Traffic Management	20
	7.5	Measures to Ensure Safe Residential / Rural Access	20

8 Monitoring, Inspections & Auditing 21
8.1 Monitoring and Inspection 21
8.2 Road Signs Audit 21
8.3 Road Quality Audit 21

Tables

Table 1-1 Development Approval Condition 2
Table 2-1 Traffic Volume of Precinct Vicinity 5
Table 6-1 Estimated Construction Period Traffic Generation 17

Figures

Figure 2-1 Site Location and greater area 3
Figure 2-2 Local Road Network Hierarchy 4
Figure 2-3 Speed Zones 4
Figure 2-4 Road Seal Condition in Study Area 5
Figure 2-5 School Bus Route (2022) 6
Figure 3-1 Development Layout Plan 8
Figure 3-2 Temporary Access Road WTG locations 9
Figure 4-1 Light vehicles Route 11
Figure 4-2 Heavy vehicles Route 11
Figure 4-3 RAV Network – MRWA HVS Network Map 12
Figure 5-1 Wind Blade Transport Dimension 14
Figure 5-2 Warrenup Road – Private Access Road (WTG08, 09, 10, 11, 16) 14
Figure 5-3 Warrenup Road – Private Access Road (WTG01, 05, 06, 04, 05, 06, 07, 55) 15
Figure 5-4 Warrenup Road – Private Access Road (WTG18) 15
Figure 5-5 Warrenup Road – Private Access Road (WTG13, 14, 15, 17) 16

1 Introduction

1.1 Background

Cardno now Stantec has been commissioned by Enel Green Power Australia Pty Ltd to prepare a Traffic Management Plan (TMP) for the construction of the proposed Flat Rocks Wind Farm Stage 1 (development area). The proposed FRWF is located approximately 265km southeast of Perth and 25 km southeast of Kojonup Town, abutting various lots within the Shire of Kojonup and Shire of Broomehill-Tambellup.

1.2 Objective

This TMP has been prepared to address the Development Approval Condition 20 set out in both Shire of Broomehill-Tambellup *(IPA12112235)* and Shire of Kojonup *(OCR8220-DB.BDA.8),* which covers a total of 18 turbines (Stage 1).

Condition 20 of the DA approvals extracted below:

"Prior to commencing any works, the Application is to lodge a Traffic Management Plan for approval by the local government. The Traffic Management Plan is to be prepared by a suitably qualified traffic consultant and in the context of the construction phase of the development is to include –

(a) Haulage routes;

(b) Heavy vehicle movements scheduling;

(c) Use of escort vehicles;

(d) Interaction with other road uses, for example, school bus routes;

(e) A Pre-Construction Road Condition Report along the proposed haulage routes, and the obligation to prepare a Post-Construction Road Condition Report once construction is complete."

This TMP aims to:

- Provide a safe environment for all persons working on and traffic travelling along Local Governments' roads within the project scope **(Study Area)**, which includes:
  - Tambellup West Road (between Albany Highway and Great Southern Highway)
  - Warrenup Road (SLK 0.00 – SLK 18.50)
  - Ngopitchup Road (SLK 3.32 – SLK 3.00)
  - Yarranup Road (SLK 8.51 – SLK 13.76)
  - Potts Road (SLK 13.6 – SLK 16.98)
- Minimise impact of the works required for the Flat Rock Wind Farm on the road network and adjacent landowners / occupiers.
- Cater for the needs of all road users
- Communicate the arrangements for, and impacts of, any activities affecting traffic.

All contractors and subcontractors are required to conform to the requirements of this TMP, and in specific instances may be required to produce, to the Relevant Authority's satisfaction, a sub- TMP to demonstrate compliance and mitigation of impact to the local community.

1.3 Related Documents

This TMP has reference to and should be read in conjunction with the following related documentation as part of the broader Flat Rocks Wind Farm Project:

> *Flat Rocks Wind Farm Route Study – EX Port of Bunbury by Rex J Andrews Engineered Transportation (Rev 4 – 13/07/2022)*

> *Flat Rocks Wind Farm DRAFT Construction Management Plan by GHD Pty Ltd (Rev B – 07/07/2022)*

1.4 Development Approval Condition

The following **Table 1-1** summarises the requirements of the condition and relative traffic management references in this TMP report.

Table 1-1 Development Approval Condition

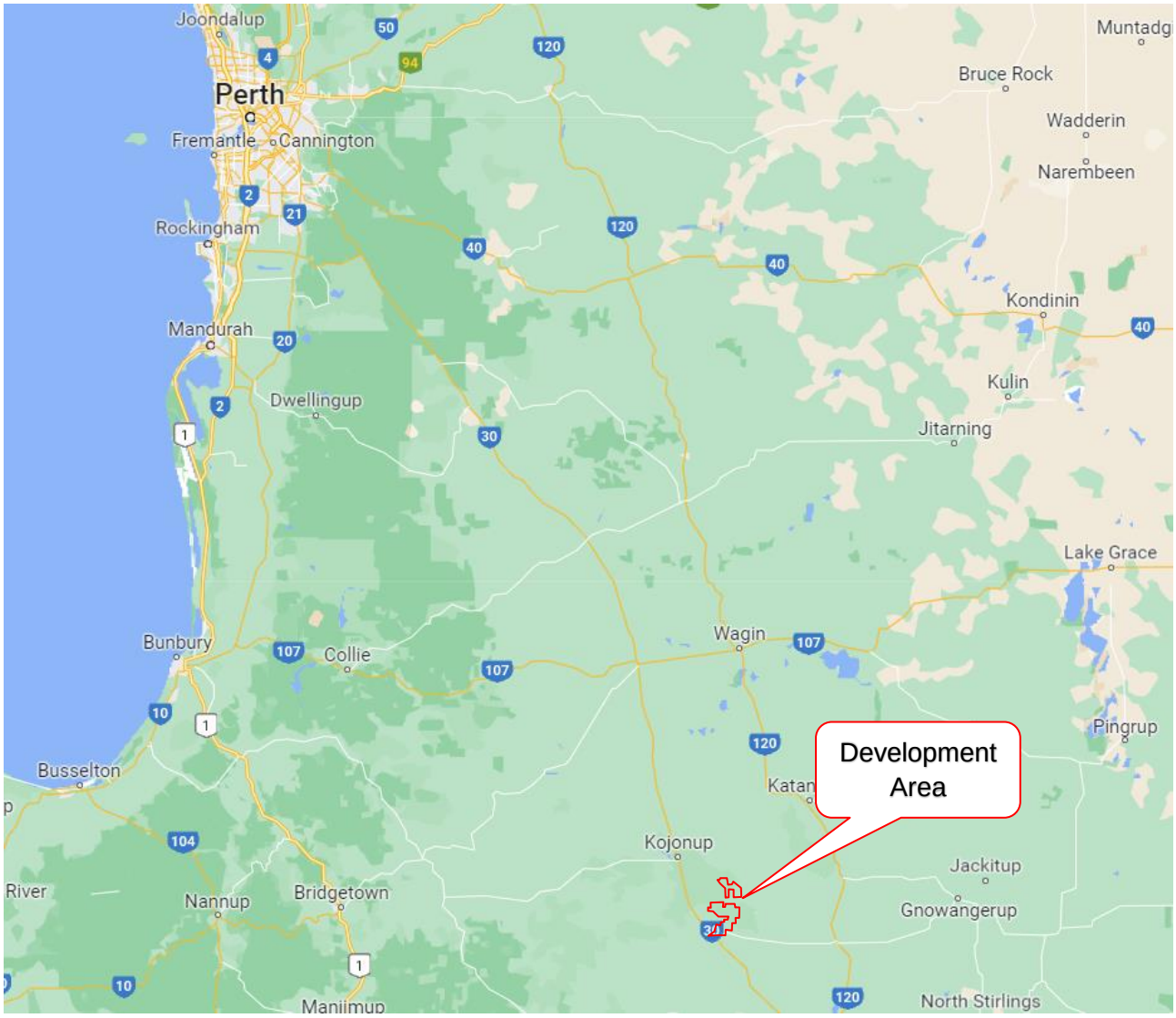
Number	Planning Permit Requirement Details	TMP Reference
20	Prior to commencing any works, the Applicant is to lodge a Traffic Management Plan for approval by the local government. The Traffic Management Plan is to be prepared by a suitably qualified traffic consultant and in the context of the construction phase of the development is to include -	
	(a) Haulage routes	**Section 4**
	(b) Heavy vehicle movements scheduling;	**Section 6**
	(c) Use of escort vehicles;	**Section 6**
	(d) Interaction with other road uses, for example, school bus routes;	**Section 2, 6**
	(e) A Pre-Construction Road Condition Report along the proposed haulage routes, and the obligation to prepare a Post-Construction Road Condition Report once construction is complete.	To be issued prior to construction start date

2 Existing Site Context

2.1 Development Area and Locality

The development area is located approximately 265km southeast of Perth and 25 km southeast of Kojonup Town, abutting various lots within the Shire of Kojonup and Shire of Broomehill-Tambellup.

Figure 2-1 Site Location and greater area

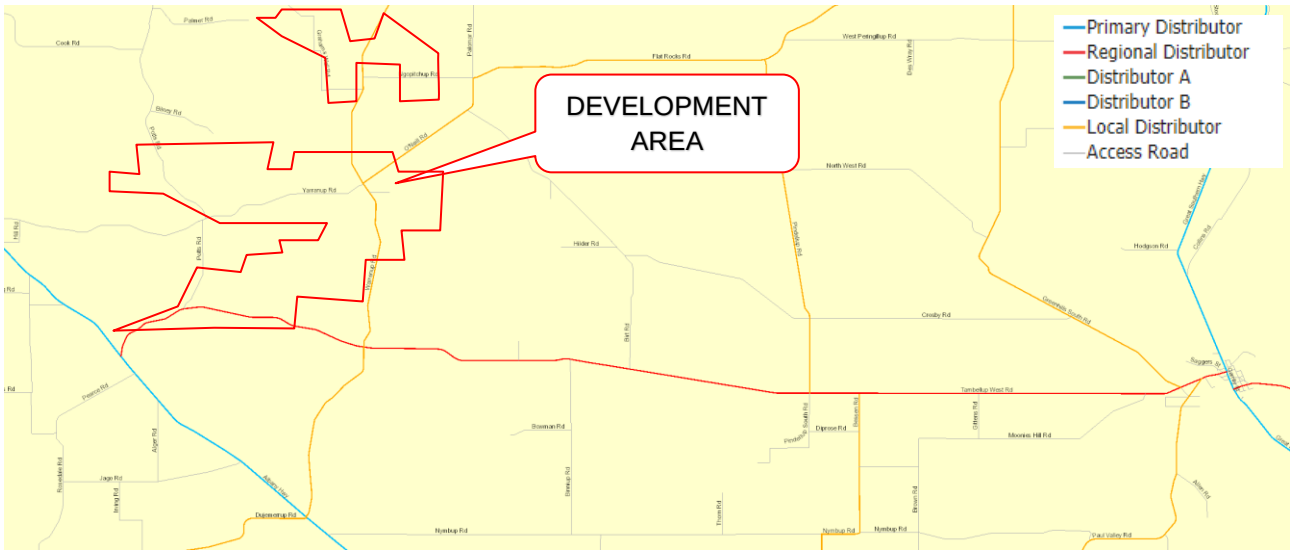


Source: Google Map

2.2 Existing Road Hierarchy

The road hierarchy of the road network in the vicinity of the development area is shown in **Figure 2-2**.

Figure 2-2 Local Road Network Hierarchy



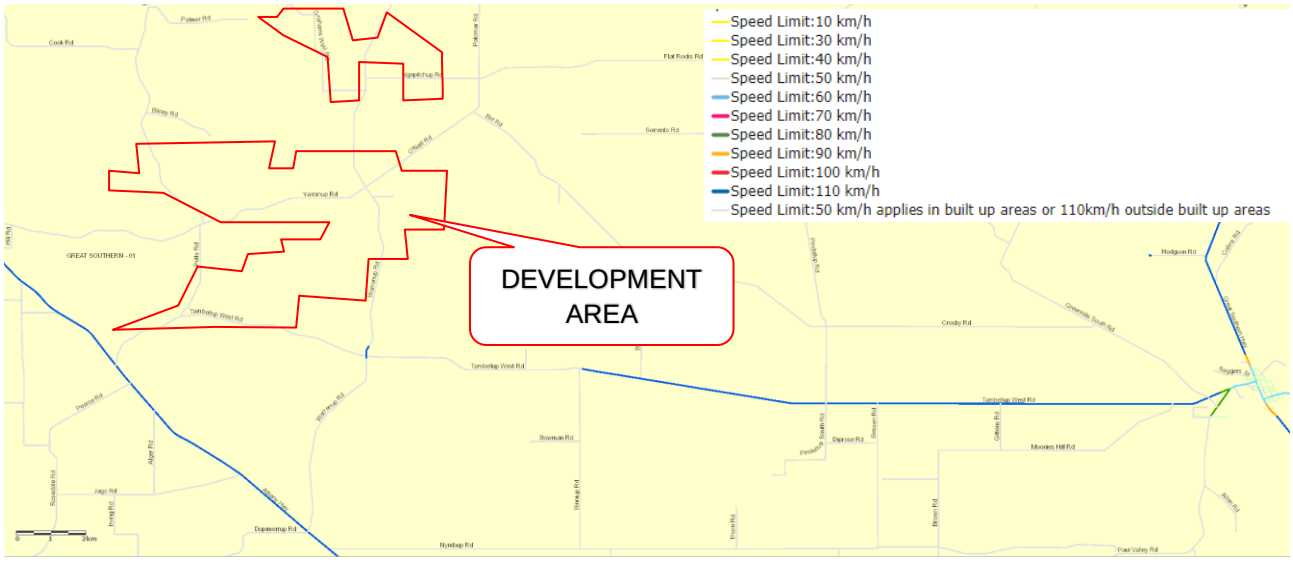
Source: Road Information Mapping System (mainroads.wa.gov.au)

2.3 Existing Speed Zones

The existing posted speed limit on Albany Highway, Great Southern Highway and eastern section of Tambellup West Road are 110km/h. Other access roads are not speed posted and default to 110km/h (outside of built-up areas). It is noted that speed limit signs are currently provided along Tambellup West Road only.

The posted speed limit of the road network in the vicinity of the development area is shown in **Figure 2-3.**

Figure 2-3 Speed Zones



Source: Road Information Mapping System (mainroads.wa.gov.au)

2.4 Existing Road Seal Condition

The existing road seal condition of the road within the Study Area is shown in **Figure 2-4**.

Figure 2-4 Road Seal Condition in Study Area

2.5 Existing Traffic Volumes

Traffic volumes on the road network in the vicinity of the development area has been sourced from the *Main Roads WA Traffic Map* and summarised in the table below.

Table 2-1 Traffic Volume of Precinct Vicinity

Road	Traffic Direction	Year of Data	Average Daily Traffic Volume
Albany Hwy (North of Tamballup West Rd)	North / South	2018/19	1,038 N & 1,055 S Total = 2,093 VPD (12.9% HV)
Albany Hwy (South of Tambellup West Rd)	North / South	2021/22	915 N & 996 S Total = 1,911 VPD (26.8% HV)
Tambellup West Road (East of Albany Hwy)	East / West	2019/20	25 E & 28 W Total = 53 VPD (20.8% HV)
Great Southern Highway (north of Toolbrunup Rd)	North / South	2019/20	256 N & 255 S Total = 511 VPD (23.5% HV)

Source: MRWA Traffic Map

2.6 Existing Road Users within Study Area

2.6.1 Light Vehicles

The light vehicles along the Local Government roads are expected to be used by local traffic (farm access) only, with minimal regional traffic. During the site inspection, the majority of the light vehicles were identified along Tambellup West Road with one vehicle spotted along Warrenup Road (south of Tambellup West Road).

2.6.2 Pedestrians and Cyclists

Pedestrian and cycling facilities are not provided on the road network. The inspection team did not observe any pedestrian or cyclists during the site inspection. It is expected that the demand for active transport facilities within the area is very low or nonexistence.

2.6.3 Farm vehicles

During the site inspection, the inspection team only observed one farm vehicle (tractor trailer) on the road. It is expected that the existing roads are currently used by occasional farm vehicles conducting day-to-day activity. However, it is noted that heavy vehicle volumes related to farming activity is seasonal and for example, will likely be higher during the summer months for harvest transportation.

2.6.4 Public transport services

Cardno now Stantec has contacted Kojonup Bus Service and was informed that the road network in the vicinity of the development area is not serviced by public bus services. Only school bus services are provided as required.

2.6.5 School Bus services

Cardno now Stantec contacted the *School Bus Services* and was provided information of the current school bus services. The current (2022) school bus routes in the vicinity of the development area is extracted from *Landgate Locate – public map viewer* and shown in **Figure 2-5**. It is noted that the school bus services generally operated between 6am – 8am and 3pm – 5pm on weekdays.

Figure 2-5 School Bus Route (2022)

2.7 Crash History

A study of the recent crash history has been conducted for the following roads within the Study Area.

- 3030297 (Tambellup West Rd) (0 to 29.45)
- 3100026 (Tambellup West Rd) (0 to 5.62)
- 3030058 (Warrenup Rd) (0 to 20.27)
- 3100034 (Yarranup Rd) (8.51 to 13.76)
- 3100019 (Potts Rd) (13.46 to 16.98)

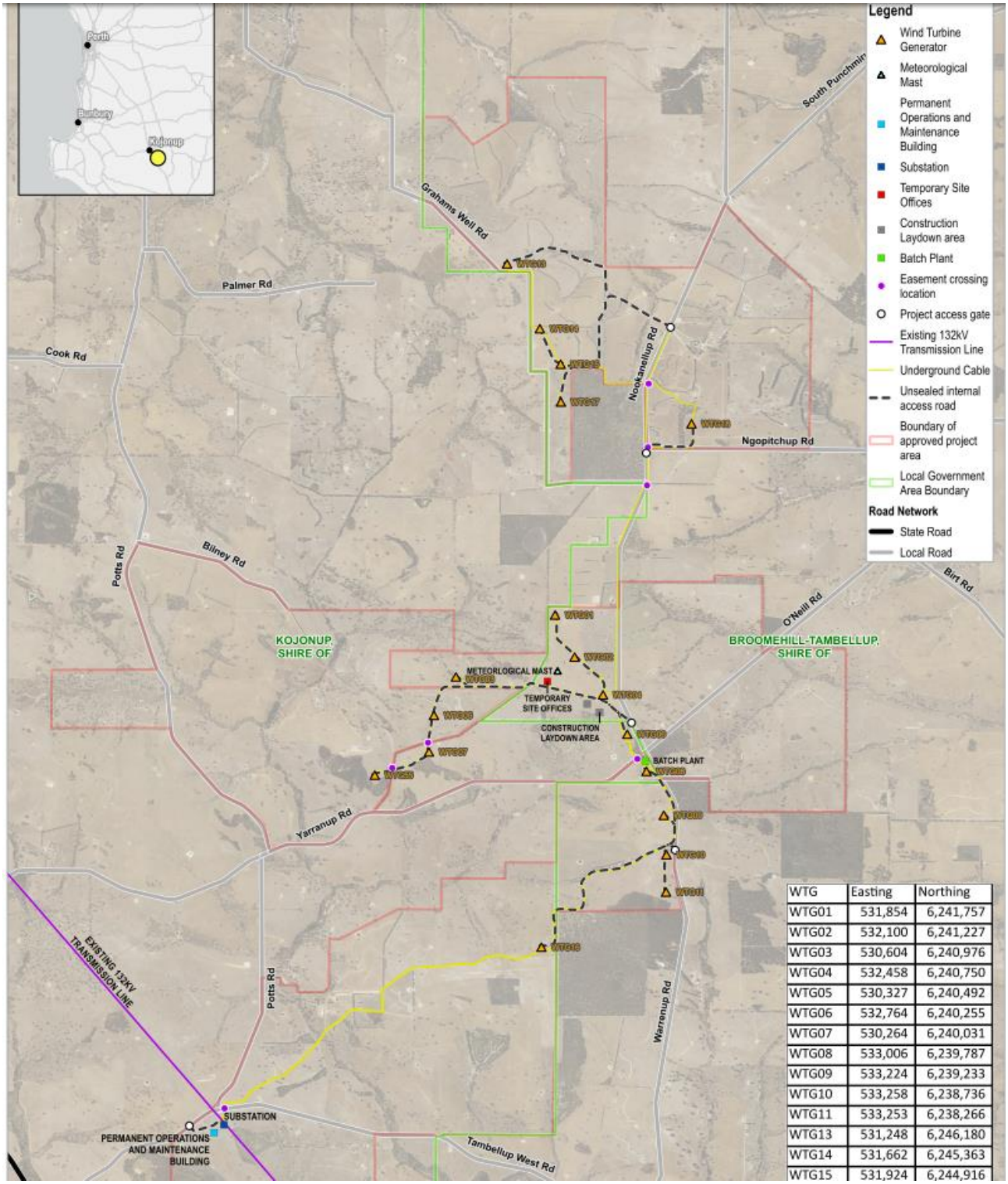
Historical crash data sourced from Main Roads WA Crash Map tool shows no crash data was recorded within the Study Area for the previous five-year period to the end of December 2021

3 Proposed Development

3.1 Site Layout (Stage 1)

The proposed site layout for Stage 1 of the project (total 18 WTG) is shown in **Figure 3-1**.

Figure 3-1 Development Layout Plan



WTG	Easting	Northing
WTG01	531,854	6,241,757
WTG02	532,100	6,241,227
WTG03	530,604	6,240,976
WTG04	532,458	6,240,750
WTG05	530,327	6,240,492
WTG06	532,764	6,240,255
WTG07	530,264	6,240,031
WTG08	533,006	6,239,787
WTG09	533,224	6,239,233
WTG10	533,258	6,238,736
WTG11	533,253	6,238,266
WTG13	531,248	6,246,180
WTG14	531,662	6,245,363
WTG15	531,924	6,244,916

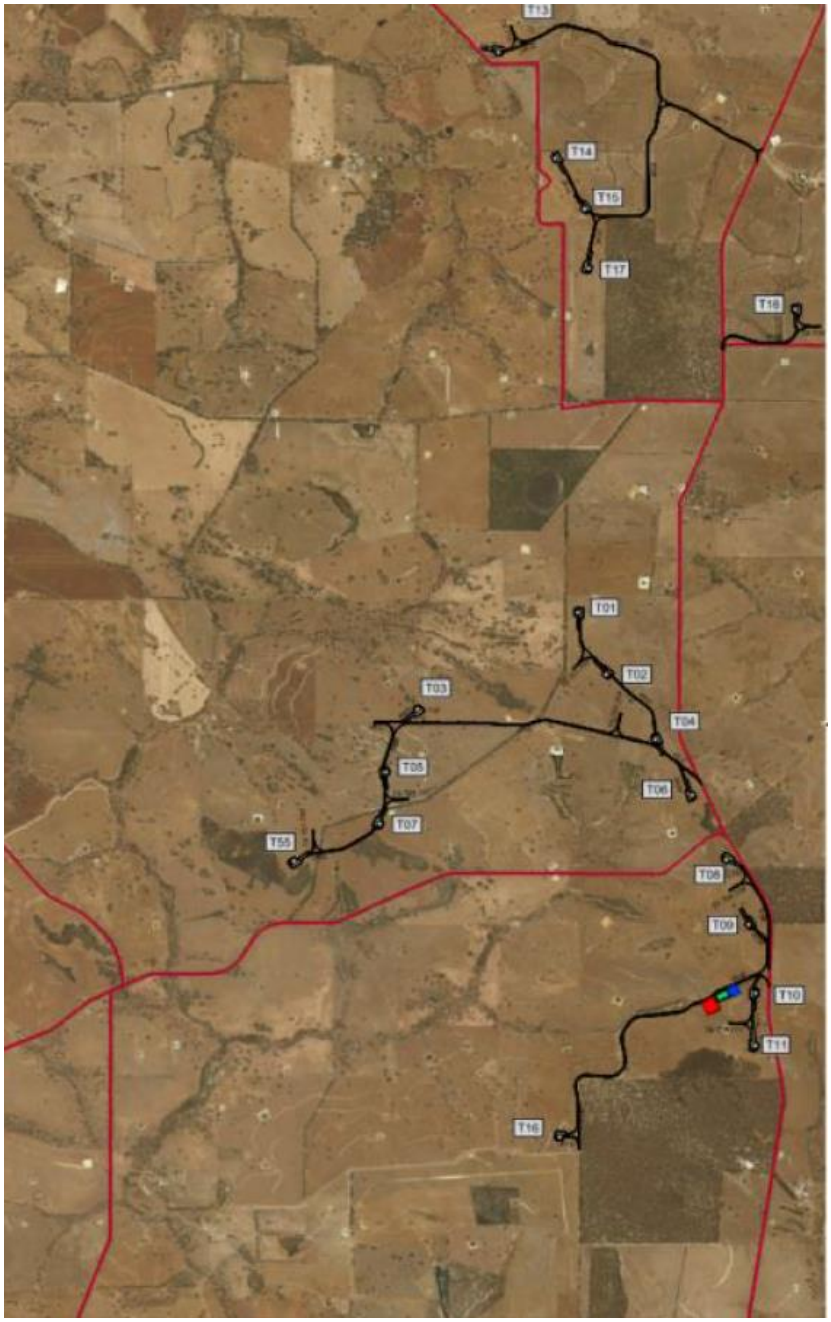
Source: Construction Management Plan, GHD

3.2 Temporary Access Roads (Private Land) and Access Gate

Temporary access roads will be constructed within the development area, with access gates at entry points from public (LG) roads listed below:

- Tambellup West Road – To substation and Permanent Operation and Maintenance Building
- Warrenup Road (South of Yarranup Road) – Access to WTG08, 09, 10, 11, 16
- Warrenup Road (North of O'Neil Road) – Access to temporary site facilities and WTG01, 02, 03, 04, 05, 06, 07, 55
- Warrenup Road (intersection of Ngopitchup Road) – Access to WTG18
- Warrenup Road (South of Nookanellup Road) – Access to WTG13, 14, 15, 17

Figure 3-2 Temporary Access Road WTG locations



Source: Construction Management Plan, GHD

4 Haulage Routes

This TMP covers the local roads between the two State Roads (Albany Highway and Great Southern Highway) leading to the development area only.

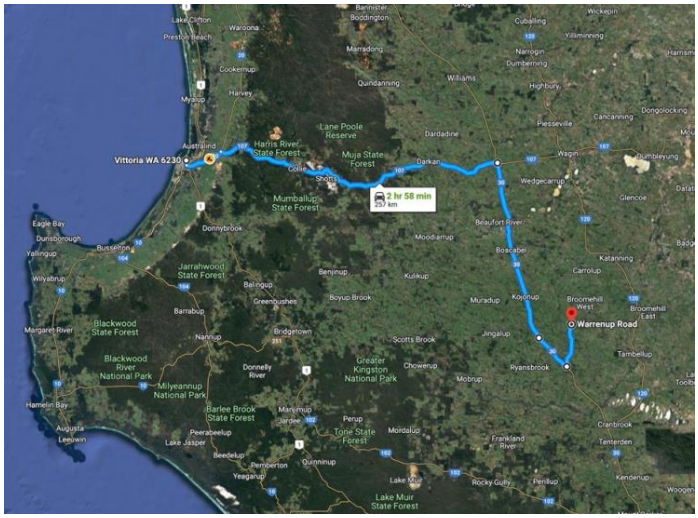
4.1 External Route – Port of Bunbury to development area

In reference to *Transport of Wind turbine equipment Route Study report prepared by Rex J Andrews Engineered Transportation*, the main turbine components (blades and towers) will be transported from the Port of Bunbury with the respective proposed route discussed below.

Two transport routes have been proposed for different WT components as identified in *RJA's Route Study Report*. Both routes proposed to enter the development area via Albany Highway and Warrenup Road intersection, in line with proposed construction heavy vehicle route. For detailed planning of the external route please refer to *RJA's Route Study Report (Rev 4).*

4.1.1 Route 1a: Loads under 5.2m in overall height

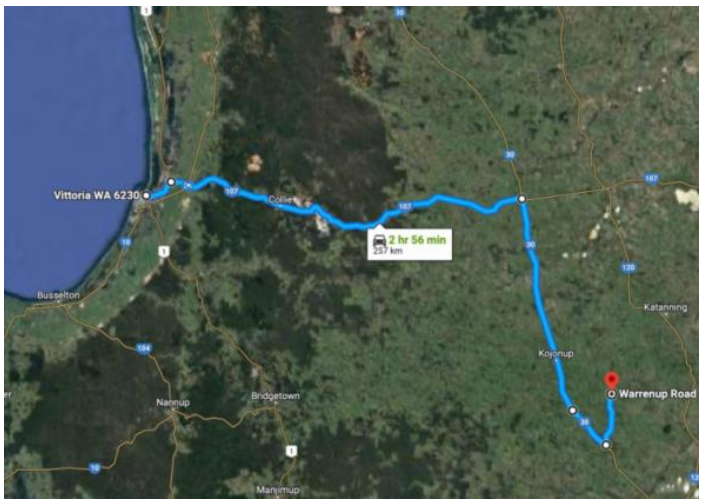
The proposed haulage route is via Leschenault Dr, Estuary Dr, Koombana Dr, Robertson Dr, S Western Hwy, Coalfields Hwy, Albany Hwy, Warrenup Road, with a total distance of approximately 257km.



Source: RJA Route Study

4.1.2 Route 1b: loads over 5.2metres in overall height

The proposed haulage route is via Leschenault Dr, Estuary Dr, Koombana Dr, Forrest Hwy, Raymond Rd, S Western Hwy, Coalfields Hwy, Albany Hwy, Warrenup Road, with a total distance of approximately 257km.



Source: RJA Route Study

4.2 Local Government Roads

4.2.1 Personnel Vehicle Routes (Light vehicles)

It is expected that the majority of light vehicles traffic will access the development area via Albany Highway / Tambellup West Road intersection, and via Great Southern Highway / Tambellup West Road intersection.

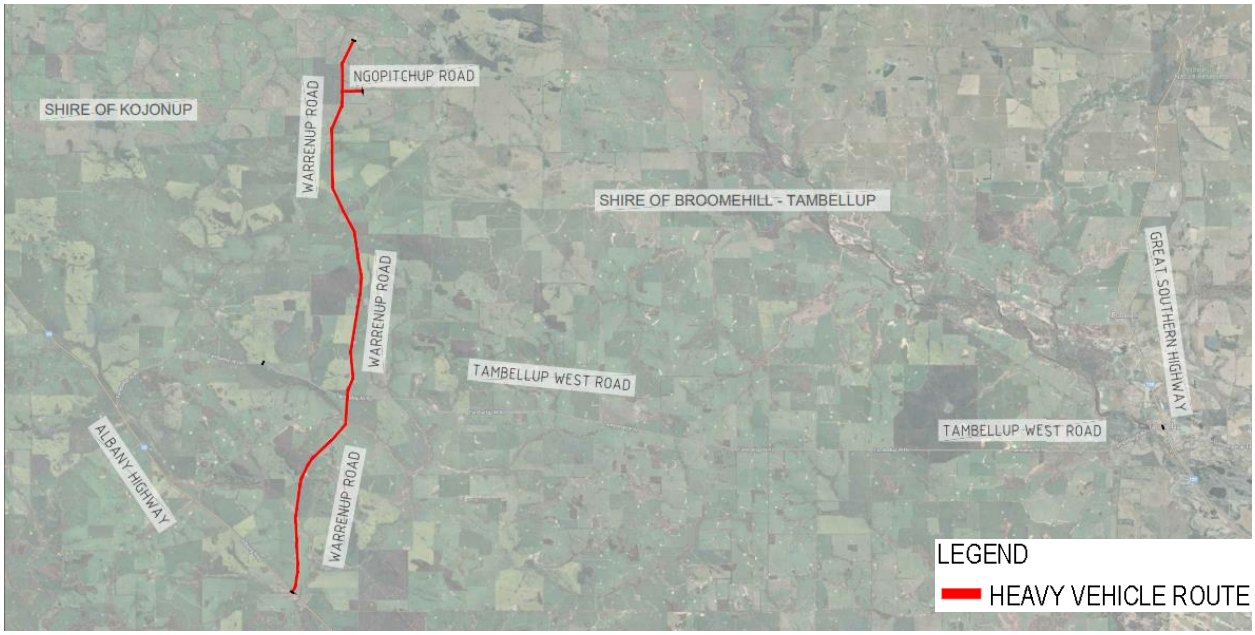
Figure 4-1 Light vehicles Route

4.2.2 Construction Vehicle Routes – Heavy Vehicles

It is noted that construction materials will be sourced from multiple locations outside of the development area.

At this stage, it is expected that majority of the heavy vehicles will access the development area from Albany Highway, via Warrenup Road, with some light vehicle deliveries accessing the development area via Great Southern Highway and Tambellup West Road.

Figure 4-2 Heavy vehicles Route

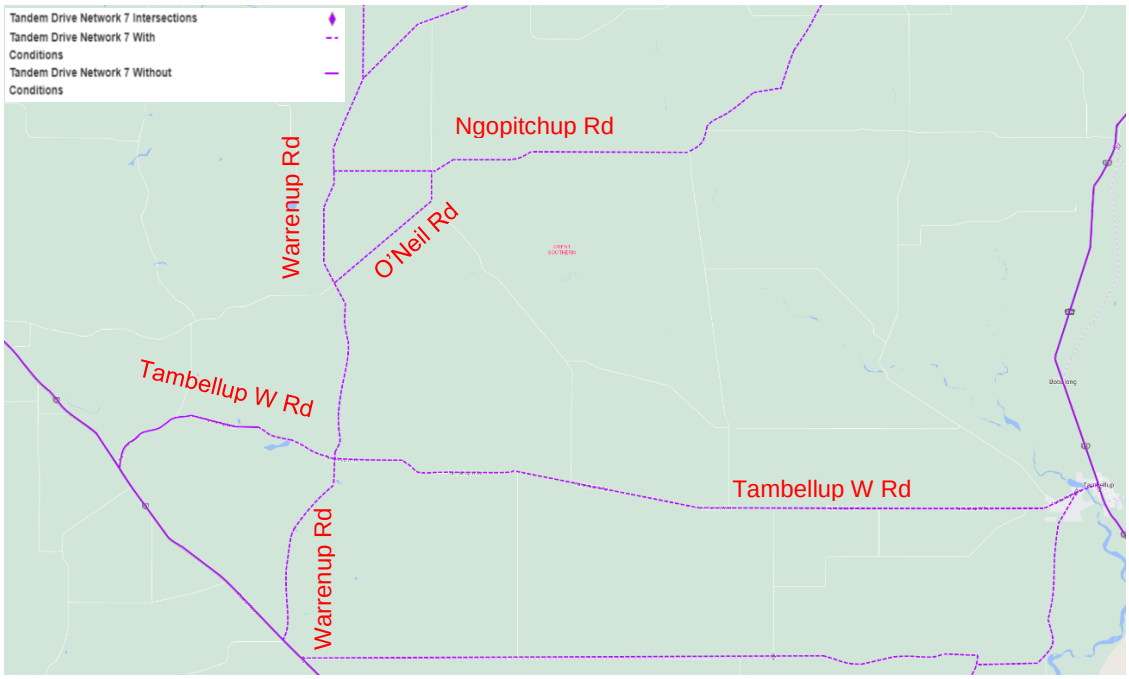


4.3 Restricted Access Vehicles (RAV)

4.3.1 Current RAV Network

The intended haulage routes for construction materials as discussed in **Section 4.2.2** are currently RAV 7 approved routes with and without condition as shown in **Figure 4-3**.

Figure 4-3 RAV Network – MRWA HVS Network Map



The existing RAV 7 network conditions of the proposed haulage routes are extracted from *MRWA HVS Network Map* and summarised below:

4.3.2 Tambellup West Road (3030297) [SLK 0.00 – 29.45]

> RAV vehicles' headlights to be switched on at all times – from the intersection of Great Southern Highway & North Terrace & Grarrity Street to the Kojonup LGA Boundary.

4.3.3 Warrenup Road (3030058) [SLK0.00 – 20.27]

> Maximum speed 80 km/h

> Direct radio contact must be maintained with other restricted access vehicles to establish their position on or near the road (suggested UHF channel 40).

> Headlights to be switched on at all times

> No operation on unsealed road segment when visibly wet, without road owner's approval.

> Low Volume (LV): When travelling at night, the RAV must travel at a maximum speed of 40km/h and display an amber flashing warning light on the prime mover.

4.3.4 Ngopitchup Road (3030049) [SLK0.00 – 3.32]

> Maximum speed 40 km/h

> Direct radio contact must be maintained with other restricted access vehicles to establish their position on or near the road (suggested UHF channel 40).

> For single lane road, the road must not to be entered until driver has established via radio contact that there is no other RAV on the road travelling in the oncoming direction.

> Headlights to be switched on at all times

> Low Volume (LV) When travelling at night, the RAV must travel at a maximum speed of 40km/h and display an amber flashing warning light on the prime mover.

5 Traffic Assessment

5.1 Site Inspection

Cardno now Stantec team visited the Site on 4th July 2022. At the time of the site visit, the weather was sunny with dry surface on the majority of the roads.

5.2 General Existing Road Condition

The road condition on sealed roads was generally acceptable with minor defects; unsealed roads were generally in poor condition with minor to medium corrugations throughout the entire length of roads. The following summarises the general road condition and suitability as a haulage route. ***A detailed road condition report will be provided in the Pre-construction Road Condition Report.***

5.2.1 Tambellup West Road

Tambellup West Road is sealed with sufficient width and line marking. The road geometry is suitable for all vehicles including high-wide loads.

5.2.2 Warrenup Road

Warrenup Road is sealed to the south of Tambellup West Road, and is unsealed north of Tambellup West Road. Warrenup Road is generally wide enough to accommodate heavy vehicle deliveries, including high-wide loads. Some locations where trees are located too close to the road (SLK 7.5), or with tree branches overhanging over the road carriageway (SLK 13.0) may need to be trimmed prior to high-wide load access.

5.2.3 Potts Road

Overhanging tree branches and trees located near the road carriageway are more significant along Potts Road. Major tree trimming may be required to accommodate large vehicle traffic. The road forms a vertical crest due to table drain on both sides of the road, reducing its effective width and is suitable for light vehicles and small heavy vehicles only.

5.2.4 Yarranup Road

Road condition similar to Potts Road, with reduced road width (~4m) due to table drain on both sides of the road. Tree branches overhanging the road carriageway may need to be trimmed and is suitable for light vehicles and small heavy vehicles only.

5.2.5 Ngopitchup Road

Road width suitable for one-way traffic only, with trees on both sides of the road. Trees may need to be removed to accommodate turning movements of high-wide loads.

5.3 Upgrades and modifications along Haulage Route

It is noted that at current stage, all heavy vehicles will travel along Warrenup Road to access the temporary access roads as suggested in **Section 3.2**. Swept path analysis for the largest truck (Wind blade transportation) was conducted along the intended haulage route to identify if any modifications such as tree removal is required. A custom Wind blade transport has been created for this swept path analysis, with a similar dimension to the *Blade diagram: V150* extracted from *RJA Route Study* report and is shown below in **Figure 5-1**.

Figure 5-1 Wind Blade Transport Dimension

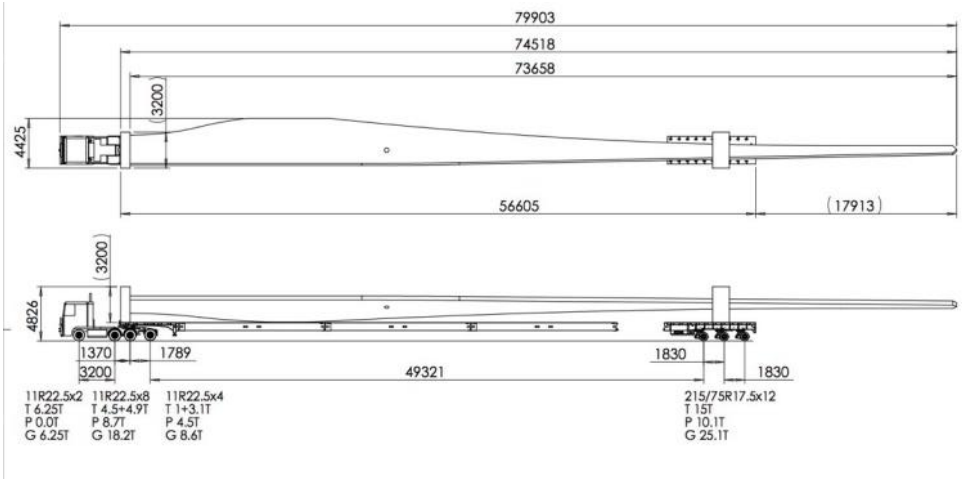


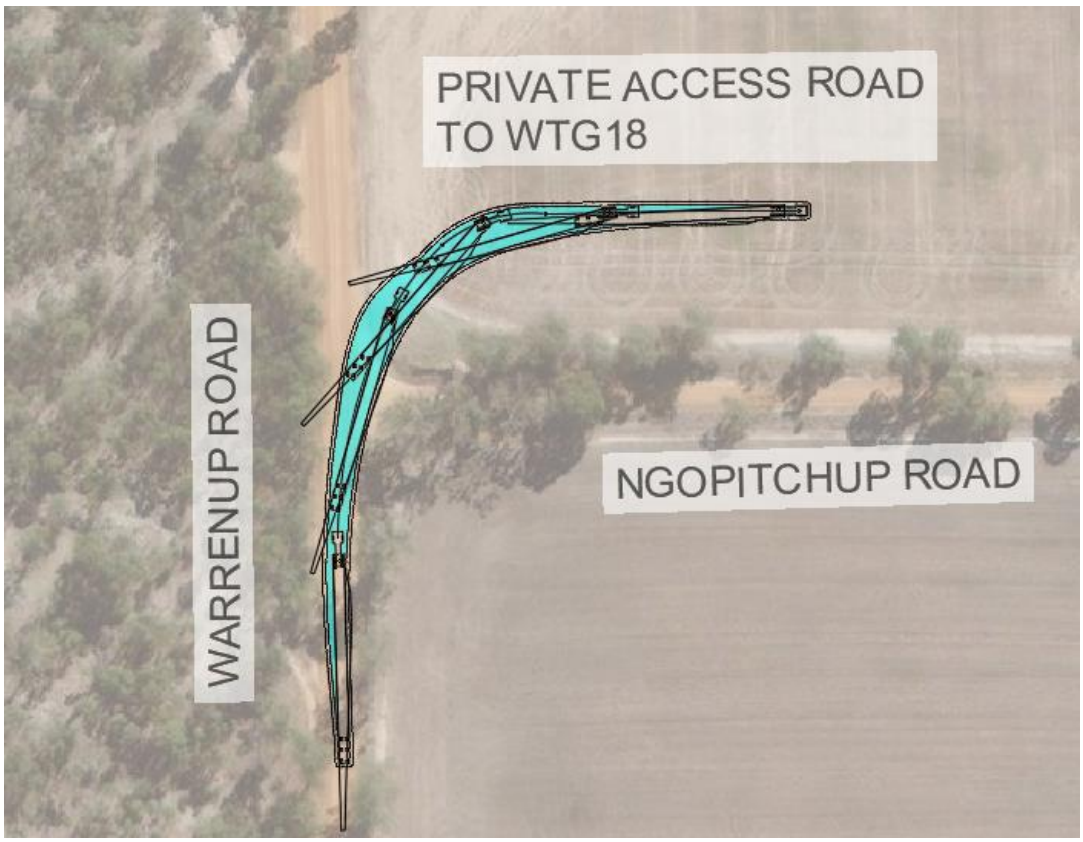
Figure 5-2 Warrenup Road – Private Access Road (WTG08, 09, 10, 11, 16)

Swept path analysis in **Figure 5-2** shows that existing trees within the (red) marked area may need to be removed at the proposed intersection into private access road to WTG08, 09, 10, 11, 16 via Warrenup Road.

Figure 5-3 Warrenup Road – Private Access Road (WTG01, 05, 06, 04, 05, 06, 07, 55)

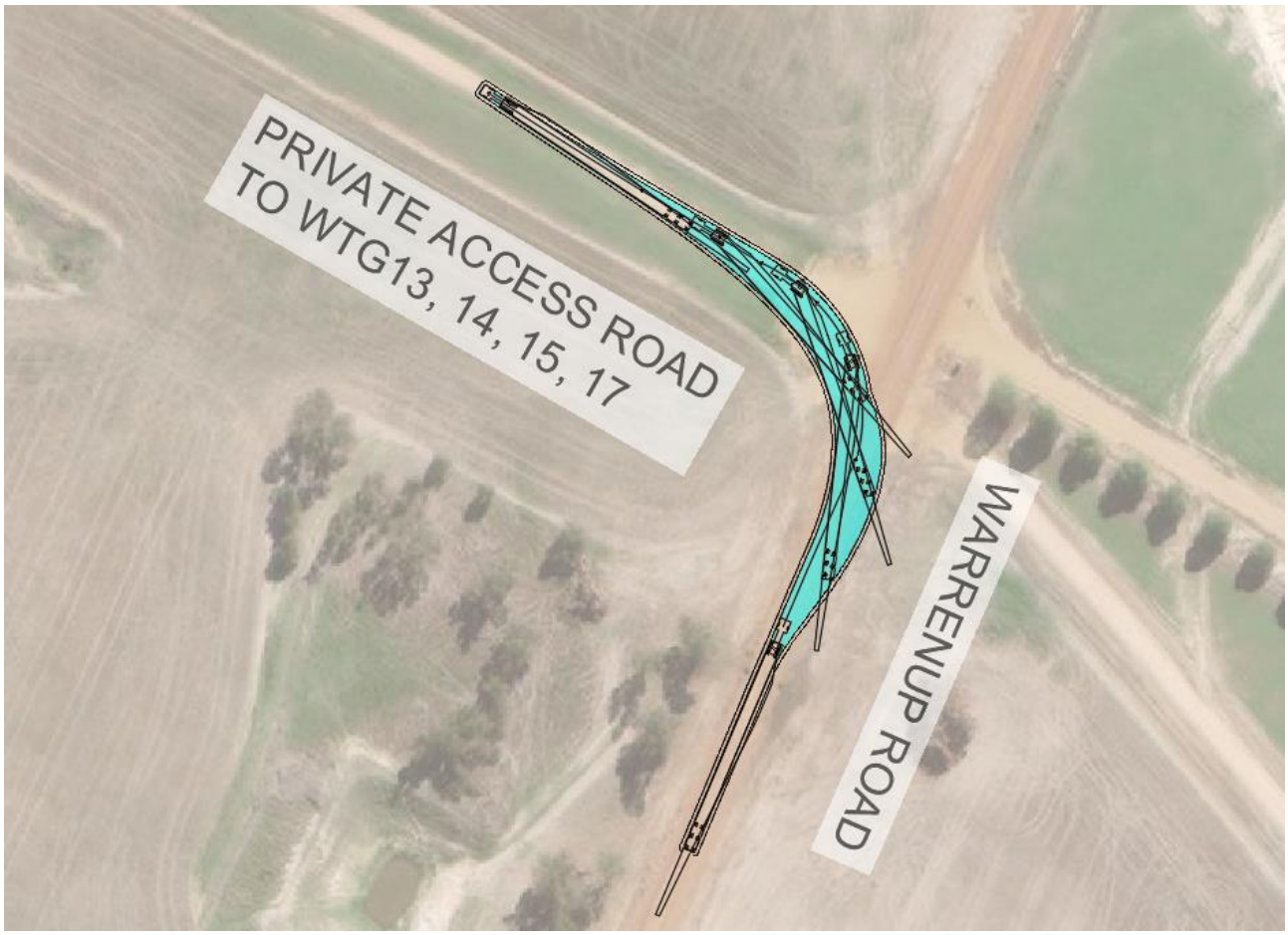
Swept path analysis in **Figure 5-3** shows that existing trees within the (red) marked area may need to be removed at the proposed intersection into private access road to WTG01, 02, 03, 04, 05, 06, 07, 55 via Warrenup Road.

Figure 5-4 Warrenup Road – Private Access Road (WTG18)



It is noted that a private access road will be created to access WTG18 instead of using the existing Ngopitchup Road access. **Figure 5-4** shows an indicative swept path where existing trees are avoided.

Figure 5-5 Warrenup Road – Private Access Road (WTG13, 14, 15, 17)



As shown in **Figure 5-5**, the proposed intersection for Private Access Road to WTG13, 14, 15, 17 is clear of existing trees and vegetation, with wide turning radius which could accommodate a high-wide load such as the wind blade transportation.

6 Traffic Management

6.1 Construction Period and Working Hours

Based on the indicative information provided by the client and respective contractors, the construction of the wind farm will start in July/August 2022, with expected peak construction activity from November 2022 to February 2023. Detailed construction timelines shall refer to the Construction Management Plan prepared by GHD Pty Ltd.

Construction work will be carried out between 6am and 6pm, 7 days a week with potential night works for critical construction work. Out-of-hours work will be conducted under an approved Noise Management Plan.

6.2 Estimated Traffic Generation

During the construction phase, traffic generated by the site will generally include but not limited to the following activities:

> Construction / staff / personnel travelling to and from the site.

> Raw materials for construction (i.e. sand, cement, fuel, steel) transported to the site.

> Major wind turbine components and substation equipment (i.e. transformers, turbine tower sections, turbine generators, nacelles and blades) transported to the site.

> Excavation and construction of the foundations and hardstands for the wind turbines.

> Erection of the wind turbine components and towers.

> Trenching and installation of electric cabling and stringing.

> Operational equipment and buildings

> Water tanks for fire-fighting

The estimated day-to-day traffic generation during the peak construction activities periods are summarised in **Table 6-1**. It is noted that this represent the potential worst-case scenarios, assuming all construction activities occurred simultaneously.

Table 6-1 Estimated Construction Period Traffic Generation

Vehicle Type	Vehicle per day (VPD)	Estimated Trip Generation (2-way trip)
Road trains (53m)	2	4 trips
Articulated vehicles (truck/prime with trailer)	10	20 trips
Rigid Trucks (including concrete truck – during concrete pour day)	15	30 trips
Watercart	2	As required
Light vehicles – contractors / construction personnel travelling to, from and within the development area	multiple	Depending on construction activities

All vehicles will travel to and from the site using the haulage route proposed in **Section 4**.

6.3 Vehicle Scheduling

6.3.1 Wind Turbine Components delivery and erection

It is also understood that the Wind Turbine (WT) component delivery and erection are to commence reasonably soon after completion of the initial site footing and access works. All construction related travels along the WT component delivery route shall be notified and prohibited during the delivery of WT components to minimise unnecessary traffic congestions.

6.3.2 Other deliveries during the construction phase

Various work phases may overlap with each other and be undertaken alongside each other where the construction schedule permits.

6.4 Heavy Vehicle Management

As part of this TMP, it is proposed that all heavy vehicles (including rigid trucks) should comply with the following conditions when accessing and egressing the development area on Local Government roads:

- Travel at maximum speed (in line with RAV condition):
  - Warrenup Road: 80km/h (40km/h when travelling at night)
  - Ngopitchup Road: 40km/h at all times
- When travelling at night, all construction related heavy vehicles must display an amber flashing warning light.
- Maintain direct radio contact to establish their position on or near the road (suggested UHF channel 40)
- Headlights to be switched on at all times

6.5 Use of Escort Vehicles

Pilot and escort vehicles shall be provided for all high-wide load deliveries on Local government roads. Requirements for a pilot and escort vehicle shall be in reference to and in accordance with *Main Roads WA Oversize Vehicle & Pilot Vehicle General Requirements*.

It is expected that the pilot and escort vehicle team on the external route leading to the development area will continue to be at service until the high-wide load (blades and towers) are delivered to the respective turbine locations.

6.6 School Bus

The contractors will liaise with and come to an agreement with school bus provider (School Bus Services – 08 9326 2063) to establish a traffic schedule to avoid potential conflicts with school bus during its morning and afternoon routes.

No truck movements associated with the haulage of material will be undertaken on roads during the times that the school bus services travel the area. Delivery can be resumed once the school bus driver confirms all school drop-off/pick-ups have been completed.

On the rare occasion where the school bus movements occur outside of the typical established times, truck drivers servicing the site will use UHF communication to communicate with the bus driver to ensure school bus operation is not impacted. A maximum speed limit of 40km/h will be required for any trucks that may inadvertently operate in proximity to the school bus service.

6.7 Farm Vehicles

The contractors will liaise with the farm owners to establish the use of UHF communication, especially during summer months where heavy vehicle volumes related to farming activity is likely to be higher. Farmers within the development area will be advised to follow the heavy vehicle management set out in **Section 6.4** of this report and maintain two-way UHF communication to reduce the risk of congestion. The schedule of high-wide-load delivery or construction activities that will take up the entire road width shall be distributed to the residents and farming community in the vicinity of the development area to avoid any unnecessary congestions or conflict. This information must include a contact number that residents can call to check on planned activity.

7 Safety Plan

7.1 Occupational Health and Safety

All persons and organisations undertaking works or attending the site have a duty of care under statute and common law to themselves, their employees, and all site users, lawfully using the site, to take all reasonable measures to prevent accident or injury.

The contractor shall prepare an OSH Risk Assessment and Treatment Register in for OSH hazards associated with the contract.

The OSH Risk Assessment and Treatment Register shall be prepared using competent occupational safety and health persons. The OSH Risk and Treatment Register shall be authorized by the Contractor's representative and the OSH MR, with the completed OSH Risk Assessment and Treatment Register forming part of the OSH Management Plan.

Further, should a formal OSH Management Plan not be prepared, it is expected that OSH hazards in the traffic environment be managed accordingly:

> Personal Protective Equipment (PPE) is to be worn at all times (high visibility clothing, appropriate footwear, sun protection, etc.).

> All plant and equipment must have suitable flashing lights and reversing alarms to warn motorists and personnel on foot of their presence.

> Procedures must be in place to effectively communicate the TMP and safety requirements to personnel and ensure that all pre-start inductions are conducted.

7.2 Training and Site Induction

7.2.1 Driver Induction Training

Prior to commencing construction activities, heavy vehicle drivers of rigid trucks and RAV involving in the construction activities are required to undertake a driver induction. The induction course will need to be developed early to ensure that it is ready prior to construction activity (including any site preparation works) commencing. Irregular and one-off drivers of pick-ups and deliveries would be considered exempt to this induction requirement.

The induction course would cover:

> Suitable and permitted routes to and from the site.

> Applicable traffic management procedures that will need to be in place prior to approaching or departing the site (if required).

> Communications and notification procedures.

> Speed restrictions (on the road network and the site).

> Safety procedures (during transportation and in the evident of an incident / emergency)

7.3 Public Notification

Further to correspondence with Main Roads WA and Local Governments, the following public notification should be conducted prior to the construction:

> Radio advertisements.

> Newspaper advertisements.

> Letter drops to be delivered to all properties in the vicinity of the development area which display a letterbox, including service stations and road houses.

> Variable Message Boards (VMS) are to be positioned on Albany Highway to alert vehicles of the OSOM loads travelling on the highway.

7.4 Worksite Traffic Management

Works personnel will be advised in advance of the location of entry and exit points within the works zone. Traffic controllers will be used to control traffic where construction vehicles entering or departing the work zone are likely to create a hazard for motorists.

7.5 Measures to Ensure Safe Residential / Rural Access

Residents and relevant stakeholders will be notified of construction commencing prior to the start date. Property access is to be maintained where possible, and it is understood that works will not require blocking property access at any point in the project. However, if blocking property access becomes unavoidable, proper notice will be given to the affected landowners, with consultation to arrange a suitable outcome and minimise disruption.

An internal management strategy will be established within the development area. This strategy will form part of the site induction that will be undertaken by all personnel on-site.

The following key items are to be implemented:

- Driving at appropriate and intended speeds on all roads
- Radio communication between construction vehicles available at all times.
- All loads to be correctly restrained.
- Warning signage to be provided critical areas/intersection points.

It is also noted that on-site parking will be provided within the construction compound, to provide a dedicated safe area where personnel can access their vehicles.

8 Monitoring, Inspections & Auditing

8.1 Monitoring and Inspection

In order to ensure the effectiveness of the TMP, the plan must be monitored and traffic management works inspected regularly.

The aim of the TMP is to reduce the impact of the construction traffic on the surrounding road network. Hence it is important to monitor that this is being achieved to reflect any physical or operational changes to the road network.

The monitoring of the TMP should generally occur:

> Before the start of work activities;

> During operation of construction works; and

> Conclusion of any operations occurring at the end of any work activities.

The TMP should also be updated if any notable changes affecting the expected or actual traffic volumes generated by site works occur, or if changes to working hours, delivery scheduling or other factors of consequence affecting site traffic and transport are proposed.

8.2 Road Signs Audit

Regular audit and maintenance of existing signs should be conducted to ensure all guide posts, hazard markers and signs are functional as per existing condition.

8.3 Road Quality Audit

With respect to *Condition 20* of the DA Condition, a Road Condition Report (dilapidation report) is to be prepared prior to the commencement of the project and following completion of the works (on Local Governments' roads).

The pre-construction road condition assessment report is being prepared and will be issued to relevant authorities prior to the commencement of construction works.

A post-construction road conditions assessment will also be undertaken and compared against the pre-construction assessment to determine what, if any, rehabilitation works are required on Council's road.

Pre- Construction Road Condition Report

Flat Rock Wind Farm Stage 1

CW1200337/304900741

Prepared for

Enel Green Power Australia Pty Ltd

3 August 2022

Cardno

now

Stantec

Contact Information

Cardno (WA) Pty Ltd
ABN 77 009 119 000

11 Harvest Terrace
West Perth WA 6005
Australia

www.cardno.com
www.stantec.com
Phone +61 8 9273 3888
Fax +61 8 9486 8664

Document Information

Prepared for	Enel Green Power Australia Pty Ltd
Project Name	Flat Rock Wind Farm Stage 1
File Reference	Pre Construction Road Condition Report-V3BS-RJC.docx
Job Reference	CW1200337/304900741
Date	3 August 2022
Version Number	A

Author(s):

Brian Sii
Traffic Engineer

Effective Date 3/08/2022

Approved By:

Ray Cook
Business Leader – Traffic and Transport Planning

Date Approved 3/08/2022

Document History

Version	Effective Date	Description of Revision	Prepared by	Reviewed by
A	3/08/2022	For Issue	BS	RJC

© Cardno. Copyright in the whole and every part of this document belongs to Cardno and may not be used, sold, transferred, copied or reproduced in whole or in part in any manner or form or in or on any media to any person other than by agreement with Cardno.

This document is produced by Cardno solely for the benefit and use by the client in accordance with the terms of the engagement. Cardno does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by any third party on the content of this document.

Our report is based on information made available by the client. The validity and comprehensiveness of supplied information has not been independently verified and, for the purposes of this report, it is assumed that the information provided to Cardno is both complete and accurate. Whilst, to the best of our knowledge, the information contained in this report is accurate at the date of issue, changes may occur to the site conditions, the site context or the applicable planning framework. This report should not be used after any such changes without consulting the provider of the report or a suitably qualified person.

Table of Contents

1	Introduction		1
	1.1	Background	1
	1.2	Limitations of the Report	1
	1.3	References	1
2	Site Description		2
	2.1	Study Area	2
3	Pre-construction Road Condition Assessment		3
	3.1	Site Inspection	3
	3.2	Assessment Process	3
4	Results of Investigation		4
	4.1	Tambellup West Road	4
	4.2	Warrenup Road	6
	4.3	Potts Road	7
	4.4	Yarranup Road	8
5	Conclusions and Recommendations		9
	5.1	Tambellup West Road	9
	5.2	Warrenup Road	9
	5.3	Potts Road	9
	5.4	Yarranup Road	9

Appendices

Appendix A Pavement Visual Assessment Summary – Field Notes

Tables

Table 2-1	Local Government Roads within Study Area	2
Table 4-1	Summary of the Tambellup West Road Inspection	4
Table 4-2	Summary of the Warrenup Road Inspection	6
Table 4-3	Summary of the Potts Road Inspection	7
Table 4-4	Summary of the Yarranup Road Inspection	8

Figures

Figure 2-1	Local Government Roads Inspected	2
Figure 3-1	SLK Reference within Study Area	3

1 Introduction

1.1 Background

Cardno now Stantec have been commissioned by Enel Green Power Australia Pty Ltd to prepare a Traffic Management Plan (TMP) for the construction of the proposed Flat Rocks Wind Farm Stage 1 (FRWF). The TMP has been prepared to address the Development Approval Condition 20 set out in both Shire of Broomehill-Tambellup (*IPA12112235)* and Shire of Kojonup (*OCR8220-DB.DBA.8)*. As part of the DA Condition, an initial visual pavement condition assessment has been carried out to determine the existing pavement condition of the local government roads intended to be used as haulage routes.

The purpose of the investigation was to assess the pre-construction condition of the pavements in order to provide a baseline of assessment. Following the construction of the wind farm, a post-construction visual assessment will be carried out. The objective of the post-construction assessment is to determine what areas are required to be rehabilitated to pre-construction conditions, if required.

This report summarises the findings of our investigation during the pre-construction phase which includes the following:

1. Visual assessment of the pavements along the proposed route;
2. Other visible geotechnical issues which may affect construction and performance of the pavement; and
3. Recommendations for further investigation, if required.

1.2 Limitations of the Report

The report is limited to a visual assessment of the pavement along the proposed route as identified by the client. This report does not include the following:

> Pavement structural assessment/investigations

> Pavement remaining design life projection

> Geotechnical investigation

> Inspection of bridges, culverts, or other road infrastructure assets.

1.3 References

The following documents have been referred to during the preparation of this report:

> Main Roads WA Road Note 9

> Austroads Guide to Pavement Technology Parts 5, 7, 6 and 2

> Austroads Guide to Road Design Part 5

2 Site Description

2.1 Study Area

Flat Rocks Wind Farm is located approximately 265km southeast of Perth and 25 km southeast of Kojonup Town, abutting various lots within the Shire of Kojonup and Shire of Broomehill-Tambellup.

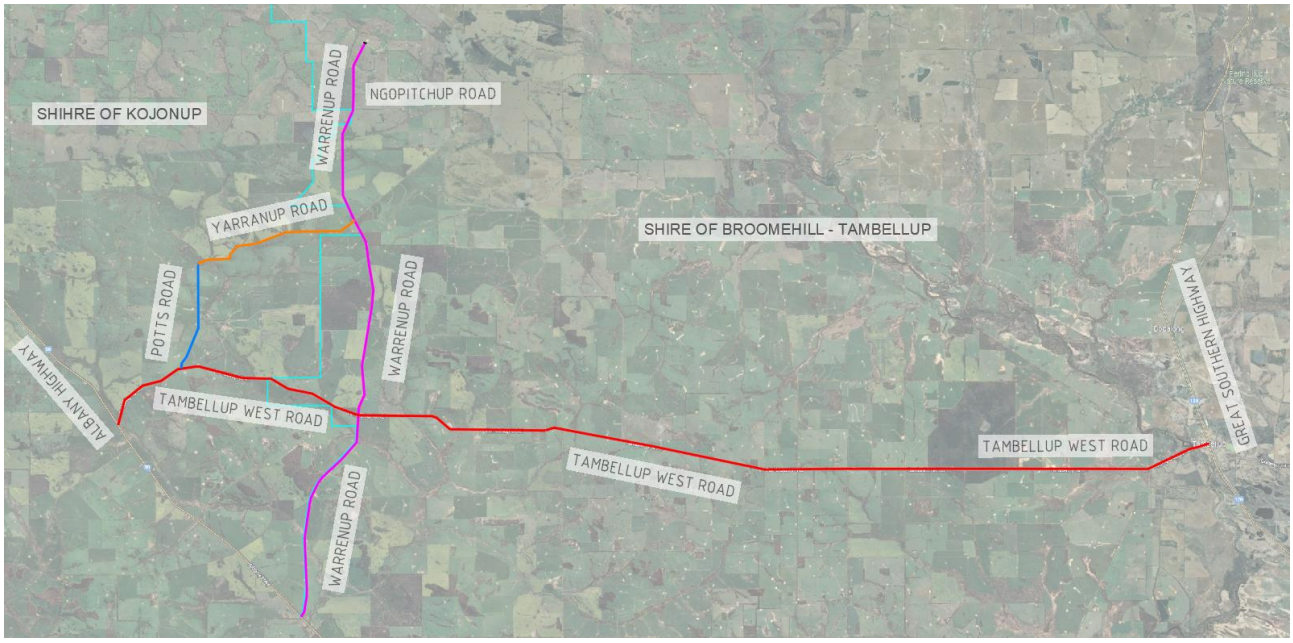
A summary of the road names, locations, lengths, sections, and road classification of the local government roads covered within this report (Study Area) is summarised in **Table 2-1**.

Table 2-1 Local Government Roads within Study Area

No	Road	Section Start	Section End	Sealed Length	Unsealed Length	Classification
1	Tambellup West Road (Red)	Great Southern Highway	Albany Highway	35.1km	-	Regional Distributor
2	Warrenup Road (Magenta)	Albany Highway	1.5km south of Nookanellup Rd	6.8km	11.7km	Local Distributor
3	Potts Road (Blue)	Tambellup West Road	Yarranup Road	0.2km	3.2km	Access Road
4	Yarranup Road (Orange)	Potts Road	Warrenup Road	-	5.25km	Access Road

A map of the roads in the Study Area inspected is shown in **Figure 2-1**.

Figure 2-1 Local Government Roads Inspected



**Existing Ngopitchup Road carriageway is not proposed to be used for construction and future WTG maintenance access. A private access road will be constructed, adjacent to Ngopitchup road for WTG18 access.*

3 Pre-construction Road Condition Assessment

3.1 Site Inspection

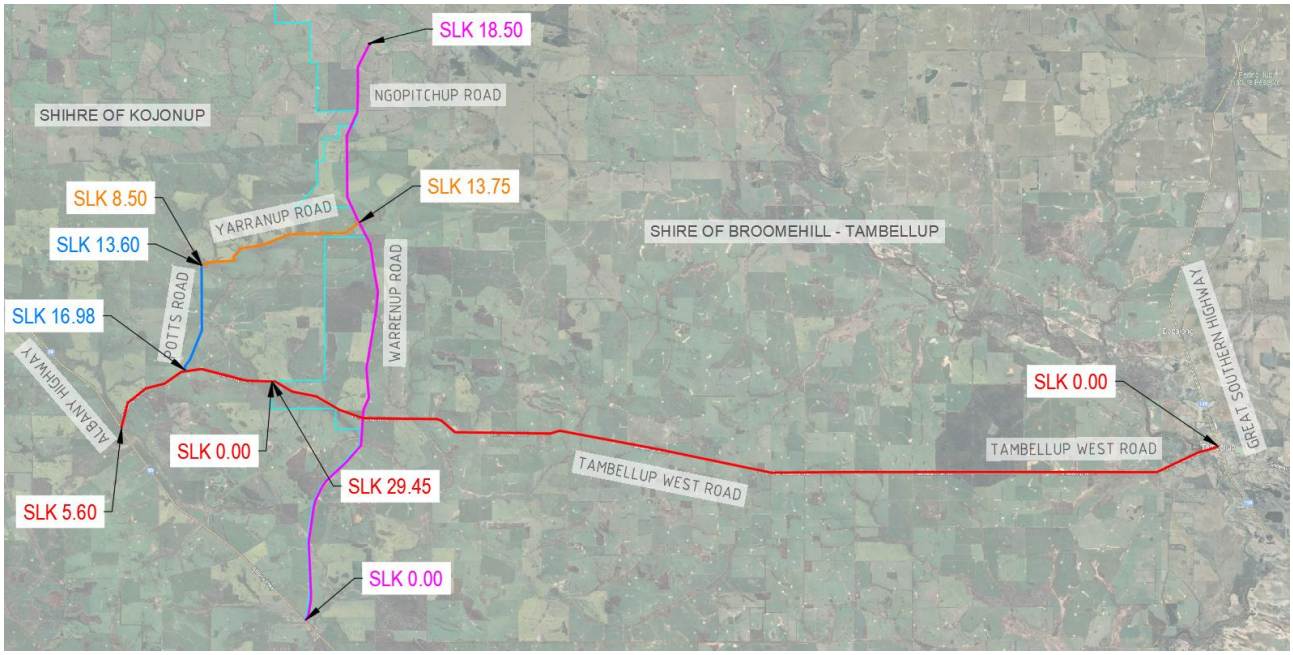
The Cardno now Stantec inspection team visited the site on 4th July 2022 and carried out an inspection of the road features and recorded the pavement features and details.

3.2 Assessment Process

In Western Australia, the statutory authority responsible for state highways is Main Roads WA. As a standard in WA, Main Roads uses SLK (Straight Line Kilo-metre) as the linear reference system, to ensure accuracy, define features along a road, and as an easy-to-use location services for Western Australian roads.

In this assessment, all inspection findings will be reference with the Straight-Line Kilometre (SLK) system as defined by **Main Roads WA GPS-SLK Map**. **Figure 3-1** shows the SLK reference of roads inspected within the Study Area.

Figure 3-1 SLK Reference within Study Area



4 Results of Investigation

4.1 Tambellup West Road

Table 4-1 Summary of the Tambellup West Road Inspection

Road Name	Tambellup West Road
Assessment Date	4/7/2022
Section Length	**~35.10 km** [~29.45km (Tambellup) + ~5.6km (Kojonup)]
Slope	Minimal gradient to Flat throughout the road section
Chainage Start / SLK Start	Intersection of Great Southern Highway **(SLK 0.00 -Tambellup)**
Chainage End / SLK End	Intersection of Albany Highway **(SLK 5.60 – Kojonup)**
Pavement Width	Approximately 6.0m – 7.5m
General Road Condition Comments	The road is seal paved with line marking throughout the road section. The road was generally in reasonable condition and with good rideability. Minor defects such as potholes, edge breaks, minor cracks and flushing were observed throughout the road length.
Defects	***SHIRE OF BROOMHILL-TAMBELLIUP*** ***SLK 0.00 – SLK 0.10 - Great Southern Highway Intersection*** The intersection was in good condition with minor seal wearing due to turning movements. Note: Overhead power cable and signs are installed near the intersection. ***SLK 0.10 – 3.00*** The pavement was generally in good condition with minor flushing (primarily on the Eastbound direction), with mild edge break near **SLK 0.80** and **SLK 3.00**. ***SLK 3.00 - SLK 3.50*** Moderate flushing on both sides of the roads: **SLK 3.00** – **SLK 3.30** for westbound and **SLK 3.00** – **SLK 3.50** for eastbound direction. ***SLK 3.50 – SLK 6.00*** Potholes forming near **SLK 4.20** along the existing pavement seal overlap. Mild edge break and flushing observed near **SLK 5.90** (Crossover). ***SLK 6.00 – SLK 10.00*** Road in good condition with minor flushing and minor edge break at several locations. ***SLK 10.00 – SLK 14.50*** Visible pavement seal failures with cracks and potholes forming on both sides of the road between **SLK 10.00** – **SLK 10.50**. Pavement seal failing with cracks and potholes forming at multiple locations, and edge breaks at crossover and intersections. ***SLK 14.50 – 17.50*** Road pavement generally in good condition with minor flushing only. ***SLK 17.50 – 21.50*** Minor flushing, minor ravelling with cracks and potholes forming along the seal joint in both directions at multiple locations. Minor rutting identified near **SLK 21.40 (WB)**. ***SLK 21.50 – 24.50*** Reasonable pavement condition with rutting and potholes forming near **SLK 24.10** and **SLK 24.20**. ***SLK 24.50 – 29.40 (End of Broomehill-Tambellup)*** Road in good condition with minor edge breaks and flushing at some location. No line marking between **SLK 26.30** and **SLK 26.50** with pothole observed near **SLK 26.30** (Change of seal).

Road Name	Tambellup West Road
	SHIRE OF KOJONUP ***SLK 0.00 – 5.60 (Kojonup)*** Overall in good condition with minor edge breaks and ravelling observed at some locations. Moss observed on pavement seal surface. ***SLK 5.50 – 5.60 – Albany Highway intersection*** The intersection was in good condition with minor ravelling.

4.2 Warrenup Road

Table 4-2 Summary of the Warrenup Road Inspection

Road Name	Warrenup Road
Assessment Date	4/7/2022
Section Length	**~18.50 km**
Slope	Minimal gradient to Flat throughout the road section on sealed section. Minor slop gradient along the travel direction on unsealed section.
Chainage Start / SLK Start	Intersection of Albany Highway (**SLK 0.00**)
Chainage End / SLK End	Existing Farm crossover (**SLK 18.50**)
Pavement Width	Approximately 5.5m – 7.5m
General Road Condition Comments	The road carriageway is sealed between Albany Highway and Tambellup West Road (approximately 6.8km) and is unsealed north of Tambellup West Road. The sealed section was not line marked and was in good condition with minimal defects. The unsealed section was generally corrugated with poor rideability and potholes forming at multiple locations
Defects	***SLK 0.00 – SLK 0.10 – Albany Highway Intersection (Sealed)*** The intersection was in good condition with minor pavement seal ageing. ***SLK 0.10 – 3.00 (Sealed)*** The road is sealed without line marking, and generally in good condition with minor edge break observed near **SLK 2.10**. ***SLK 3.00 - SLK 3.40 (Unsealed)*** Short section of unsealed road noted as being damaged or washed out. Poor rideability due to corrugations. ***SLK 3.40 – SLK 6.80 (Sealed)*** The road is sealed without line marking, and generally in good condition with minor edge and slight uneven road surface around the bend near **SLK 5.80** to **SLK 6.00**. Road intersects with Tambellup West Road at **SLK 6.80**. ***SLK 6.80 – SLK 7.10 (Sealed)*** Short sealed section north of Tambellup West Road, with visible edge breaks. ***SLK 7.10 – SLK 9.50*** Severe corrugations with ravelling and base course exposure along this section of road. Severe potholes were identified at multiple locations such as **SLK 8.00** and **SLK 8.50**. ***SLK 9.50 – 12.90*** Minor corrugations throughout the road section, with severe corrugation and ravelling at multiple locations resulting in poor rideability. Potholes forming at multiple locations, with severe pothole issue identified near **SLK 12.60**. Trees were present along both sides of the road, with some overhanging branches. ***SLK 12.90 – 14.50*** This section of road was in reasonable condition, with minor corrugations and minor ravelling. Moderate corrugations, ravelling and potholes forming around the bend near **SLK 13.70**. ***SLK 14.50 – 15.00*** Major potholes and base course exposure along this section of road. Severe corrugation resulted in very poor rideability. ***SLK 15.00 – 16.80*** Reasonable condition with minor corrugations and minor ravelling only. Moderate corrugation and poor rideability near **SLK 15.60** and **SLK 16.40**. ***SLK 16.80 – 18.50*** Severe potholes, ravelling and corrugations along this section of road resulting in poor rideability. ***SLK 18.50*** Site access was in reasonable condition with minor corrugation only.

4.3 Potts Road

Table 4-3 Summary of the Potts Road Inspection

Road Name	Potts Road
Assessment Date	4/7/2022
Section Length	**~3.40 km**
Slope	Reasonably flat with horizontal sag sections near the majority of the culverts
Chainage Start / SLK Start	Intersection of Yarranup Road **(SLK 13.60)**
Chainage End / SLK End	Intersection of Tambellup West Road **(SLK 16.98)**
Pavement Width	Approximately 5.5m – 7.5m
General Road Condition Comments	The road is unsealed with minor corrugation throughout the road section with poor rideability. Table drains are present for the majority of the road on both sides, forming a vertical crest reduces the effective width of the trafficable road width. Trees are also present on both sides of the roads, with overhanging branches and trees located close to the edge of carriageway.
Defects	***SLK 13.60 – Intersection of Yarranup Road (Unsealed)*** The intersection was slightly corrugated. ***SLK 13.60 – SLK 14.60 (Unsealed)*** Minor corrugation resulting in poor rideability with minor ravelling and potholes forming around **SLK 13.70**, approaching the intersection of Yarranup Road. ***SLK 14.60 – 15.80 (Unsealed)*** Minor corrugation throughout this road section with moderate rutting along the wheel path and moderate corrugation near **SLK 14.70** and **SLK 15.80**. ***SLK 15.80 – 16.80 (Unsealed)*** Reasonable condition with minor corrugation and minor ravelling only. Moderate corrugation and poor rideability identified near **SLK 16.40**. ***SLK 16.80 – SLK 16.98 (Sealed)*** Pavement seal in good condition without line marking.

4.4 Yarranup Road

Table 4-4 Summary of the Yarranup Road Inspection

Road Name	Yarranup Road
Assessment Date	4/7/2022
Section Length	**~5.25 km**
Slope	Reasonably flat with sag near the majority of the culverts
Chainage Start / SLK Start	Intersection of Potts Road **(SLK 8.50)**
Chainage End / SLK End	Intersection of Warrenup Road **(SLK 13.75)**
Pavement Width	Approximately 4.5m – 7.5m
General Road Condition Comments	The road is unsealed with minor corrugation and minor ravelling along the majority of the road sections. Some sections of the road are more corrugated, resulting in poor rideability. Table drains present for the majority of the road on both sides the road. The road forms a crest perpendicular to the direction of travel, reduces the effective width of the trafficable road width.
Defects	***SLK 8.50 – intersection of Potts Road (Unsealed)*** The intersection is slightly corrugated. ***SLK 8.50 – SLK 9.40(Unsealed)*** This road section is generally corrugated with potholes forming near **SLK 8.60** and minor rutting around the bend near **SLK 9.30**. ***SLK 9.40 – SLK 9.60 (Unsealed)*** Moderate corrugation and ravelling around the bend results in poor rideability. Large drainage drop-off with recoverable batter slope along the westbound direction ***SLK 9.60 – SLK 10.30 (Unsealed)*** Lightly corrugated throughout the road section with ravelling and rutting near **SLK 10.10**. ***SLK 10.30 – SLK 12.30 (Unsealed)*** Evidence of water ponding along the eastbound table drain near **SLK 10.40**. Table drain and perpendicular curve road alignment reducing the effective road width down to approximately 4.5m at the bend near **SLK 10.5**0. Moderate corrugations and rutting near **SLK 11.30** and **SLK 12.30** resulting in poor rideability. ***SLK 12.3 – SLK 13.75 (Unsealed)*** Moderate corrugation, rutting and ravelling resulted in uneven road surface and potholes forming near **SLK12.60** and **SLK 12.80**.

5 Conclusions and Recommendations

The contractors shall be responsible for the maintenance of the haulage roads during the construction phase, and the remediation of the roads upon completion of the construction to their pre-construction condition at minimum.

Consideration should be given to the following pre-construction road works that may assist contractors in their maintenance obligations during the construction phase.

5.1 Tambellup West Road

Tambellup West Road was generally considered to be in fair and reasonable condition for the works, despite evidence of minor pavement distress developing along the length such as pavement flushing and edge breaks.

Major upgrades are not likely to be necessary to cater for the increased heavy vehicle traffic of the wind farm construction. However, regular inspections and immediately after heavy rainfall, should be conducted during the construction period to maintain and monitor the existing pavement condition and identify any deterioration or safety issues.

5.2 Warrenup Road

The sealed section of Warrenup Road was generally in good condition and should not require any upgrades prior to the wind farm construction. However, noting that the road is proposed to be the main haulage route for heavy vehicles, it is suggested that regular inspections be conducted to monitor pavement condition.

It is recommended to regrade the unsealed road section with ~50mm of wearing course to protect the base course and improve the rideability prior to the construction activities. Potholes should be excavated and filled with appropriate crushed rock prior to resurfacing. Regular inspection, maintenance and resurfacing of the unsealed section is recommended to minimise the traffic damage and safety risk along the main haulage route.

5.3 Potts Road

Potts Road is not proposed to be the main haulage route but will be used for construction activity. Therefore, regrade of the road is not required based on the visual assessment.

The road may need to be regraded if increased heavy vehicle traffic is expected along the road. Potholes should be excavated and filled with appropriate crushed rock prior to regrading/resurfacing.

5.4 Yarranup Road

Yarranup Road is not proposed to be the main haulage route but will be used for construction activity. Therefore, regrade of the road is not required based on the visual assessment.

The road may need to be regraded if increased heavy vehicle traffic is expected along the road. Potholes should be excavated and filled with appropriate crushed rock prior to regrading/resurfacing.

APPENDIX

A

PAVEMENT VISUAL ASSESSMENT SUMMARY – FIELD NOTES

Cardno

now

Stantec

Tambellup West Road

SLK 0.80 – Mild edge break (EB Direction)

SLK 1.50 – Flushing near the intersection of Brown Street

SLK 2.30 - Flushing

SLK 3.00 to SLK 3.30 – Flushing

SLk 3.30 – Minor Rutting (WB Lane)

SLK 4.10 to SLK 4.20 – Flushing and potholes forming (WB Lane)

SLK 4.90 – Pavement seal patch failing with minor cracks

SLK 5.90 – Minor edge break and flushing near the crossover

SLK 7.70 – Flushing near the intersection of Gittens Road

SLK 8.50 – Pothole (EB Lane)

SLK 9.50 – Minor Flushing

SLK 10.40 – Pavement seal failing – rutting, cracking and edge breaks (WB Lane)

SLK 10.50 – Pavement seal patch failing with pothole and longitudinal crack (EB Lane)

SLK 11.30 – Edge break and potholes forming at Bessen Road intersection

SLK 11.40 – Pavement Seal Failing with cracks and base course exposure (EB Lane)

SLK 12.20 – Edge break near the crossover

SLK 12.80 – Edge break and ravelling at Pindellup Road intersection

SLK 13.90 – Rutting (EB Lane)

SLK 14.30 – Potholes forming (EB) and minor flushing (WB)

SLK 14.80 – Minor flushing

SLK 17.50 – Minor flushing

SLK 17.90 – Ravelling and potholes forming near the centre line

SLK 18.30 – Flushing and minor cracks forming near Birt Road Intersection

SLK 18.40 – Minor flushing (EB), crack and ravelling (WB)

SLK 18.80 to SLK 18.90 – Minor flushing, minor ravelling with potholes forming

SLK 19.00 to SLK 20.00 – Minor ravelling and rutting along seal joint (WB)

SLK 20.50 – Minor edge break (WB)

SLK20.00 – SLK 21.20 Minor flushing and minor ravelling along seal joint (EB)

SLK 21.40 – Rutting (WB)

SLK 24.20 – Potholes near the centre line

SLK25.00 – Minor edge break and potholes forming (WB)

SLK 26.30 – Pothole forming at change of seal, No Linemarking

SLK 26.50 – Flushing at Warrenup Road intersection

SLK 27.90 – Minor edge break (WB)

START OF KOJONUP

SLK 0.20 – Minor Edge break and minor ravelling

SLK 1.50 – Edge break at crossover

SLK 1.60 – Minor Ravelling

SLK 1.70 – Potholes forming on seal patch

SLK 1.80 – Edge break and crack forming – Change of seal

SLK 2.30 – Minor Edge break

SLK 4.30 – Minor Edge break

SLK 4.50 – Minor Ravelling (WB)

SLK 5.00 – Potholes forming

Warrenup Road

SLK 2.10 – Minor edge break

SLK 3.00 to 3.40 – Unsealed section, potentially washed out or damaged. Moderate corrugations

SLK 5.80 – Uneven road surface with minor ravelling (NB)

SLK 6.00 – Minor edge break (NB)

SLK 6.90 – Minor edge break

SLK 7.10 – End of sealed section. Ravelling and large pot holes near change of seal

SLK 7.40 to SLK 8.00 – Major Corrugation and base course exposure

SLK 8.00 – Corrugation and potholes

SLK 8.50 – Moderate corrugation and potholes

SLK 10.00 to SLK 11.10 – Trees on both sides of the road with overhanging branches

SLK 11.00 to SLK 11.20 – Severe corrugations and poor rideability with uneven surface

SLK 12.40 – Pothole forming

SLK 12.60 – Moderate corrugations with large potholes

SLK 12.80 – Yarranup Road Intersection

SLK 13.00 to 13.10 – Overhanging trees

SLK 13.70 – Corrugation, ravelling and potholes forming near the bend

SLK 14.20 – Large potholes near culvert

SLK 14.70 – Large potholes

SLK14.80 – Moderate corrugations with potholes

SLK 16.40 – Moderate corrugation, ravelling and potholes forming at Grahams Well Road intersection

SLK 16.80 to SLK 17.00 – Severe potholes near Ngopitchup Road intersection

SLK 17.20 – Potholes near culvert

SLK 17.90 to 18.10 – Moderate corrugation, ravelling and potholes forming

SLK 18.40 – Severe potholes

SLK 18.50 – Minor ravelling near site access

Potts Road

SLK 13.60 – Minor corrugations at the intersection of Yarranup Road

SLK 13.65 – Potholes and minor ravelling approaching Yarranup Road

SLK 13.70 – Ravelling and potholes forming

SLK 13.9 – Overhanging tree

SLK 14.2 – Potholes, rutting and base course exposure

SLK 14.70 – Rutting, corrugations, uneven road surface with poor rideability

SLK 14.85 – Corrugation, minor rutting and base course exposure

SLK 15.10 – Rutting, corrugation and potholes near farm crossover

SLK 15.80 – Rutting and potholes forming

Yarranup Road

SLK 8.60 – Minor ravelling and potholes forming

SLK 9.30 – Minor ravelling and corrugation along the wheel path along the bend

SLK 9.40 to SLK 9.60 – Drainage with large drop-off on the edge of carriageway (WB)

SLK 10.10 – Minor corrugation and rutting along the wheel path (EB)

SLK 10.40 – Evidence of water ponding along the eastbound table drain

SLK 10.50 – Effective road width narrowed due to table drains around the bend (~4.5m)

SLK 11.30 – Corrugation, rutting along wheel path

SLK 12.20 – Moderate corrugation, uneven road surface resulting in poor rideability

SLK 12.60 to SLK 12.80 – Moderate corrugation, rutting and ravelling with potholes forming

SLK 13.10 – Corrugations and uneven road surface resulted in poor rideability around bend

SLK 13.30 – Moderate corrugations

Document Title:	ROUTE STUDY

Transmittal No:	FRWF-VES-TRN-0000022	**Issue Date:**	19/07/2022

Supplier Doc No:	FRWF-RJA-TRNS-RPT-0001	**Revision:**	4

Job / Contract No:	12574907
Supplier Name:	Vestas Australian Wind Technology P/L
Supplier Address:	
Supplier Email:	

This document is property of Enel Green Power S.p.A. It is strictly forbidden to reproduce this document, in whole or in part, and to provide to others any related information without the previous written consent by Enel Green Power S.p.A.

REX J ANDREWS
ENGINEERED TRANSPORTATION

ROUTE STUDY: VESTAS

PROJECT: FLAT ROCKS WINDFARM

EX PORT OF BUNBURY

13/07/2022 REV 04

Rev.	Date	Change	Responsible	Checked
00	10/03/2022	Route Assessed	W Andrews	✓
00	12/04/2022	Report Compiled	J Stokes	✓
00	22/04/2022	Report Completed	W Andrews	✓
01	31/05/2022	Route updates	W Andrews	✓
02	30/06/2022	Route updates	W Andrews	✓
03	06/07/2022	Route and conclusion edits	W Andrews	✓
04	13/07/2022	Updated site plan	W Andrews	✓

Index:

1.0 INTRODUCTION 3
2.0 PROJECT DATA 5
3.0 TRANSPORT COMBINATIONS (EXAMPLES) 6
4.0 TRANSPORT DRAWINGS (POSSIBLE COMBINATIONS) 7
5.0 SITE LOCATION 12
6.0 TURBINE LAYOUT AND SITE ACCESS ROUTES 13
7.0 PORT OF IMPORT 14
8.0 ROUTE SUMMARIES 16
9.0 ROUTE 1A SURVEY: PORT OF BUNBURY TO FLAT ROCKS WINDFARM LOADS UNDER 5.2 METRES IN OVERALL HEIGHT 17
10.0 ROUTE 1B SURVEY: PORT OF BUNBURY TO FLAT ROCKS WINDFARM – LOADS OVER 5.2 METRES IN OVERALL HEIGHT 31
11.0 CONCLUSION 34
12.0 REFERENCES: 37

1.0 Introduction

This document describes observations and previous experience on route and explains the Transport of Wind turbine equipment from Bunbury Port to Flat Rocks Windfarm.

This Route survey took place on 10/03/2022.

Evaluation

1	No Cost
2	Some Work
3	Moderate Amount of Work
4	Extreme Amount of Work

(Mark below boxes with an X)

		1	2	3	4
A	Harbour		X		
B	Road Modification			X	
C	Road Furnishings			X	
D	Bridge Calculations			X	
E	Overhead Utilities			X	
F	Trees		X		
G	Site Entrance		X		
H	Traffic Control	X			

2.0 Project data

Date of latest Route Assessment: 10/03/2022
Survey undertaken by: (Rex J Andrews P/L)
Project name: Flat Rock Windfarm
Location: Bunbury Port (WA) to Broomehill (WA)
Turbine type:

18 x Vestas V150 4.2MW
125m Hub Height
5 Section Tower

3.0 Transport combinations (Examples)

Base Towers (12.7l x 5.0 x 4.7 x 85T)
Configuration. Prime Mover with 4x8 4x8 Bookend
Overall dimension: 41.0l x 5.1w x 5.6h x 150.0T

Section 2 Towers (19.6l x 4.7 x 4.5 x 85T)
Configuration. Prime Mover with 8x8 Low Platform
Overall dimension: 33.0l x 4.7w x 5.6h x 125T

Section 3 Towers (24.3l x 4.5 x 4.5 x 79T)
Configuration. Prime Mover with 4x8 4x8 Low Extending Platform
Overall dimension: 37.0l x 4.7w x 5.5h x 145T

Section 4 Towers (29.9l x 4.5 x 4.0 x 69T)
Configuration. Prime Mover with 4x8 4x8 Low Extending Platform
Overall dimension: 41.0l x 4.7w x 5.5h x 145T

Top Towers (36.0l x 4.0 x 3.3 x 65T)
Configuration. Prime Mover with 4x4 Dolly and 3x8 Jinker
Overall dimension: 47.0l x 4.3w x 4.9h x 106.5T

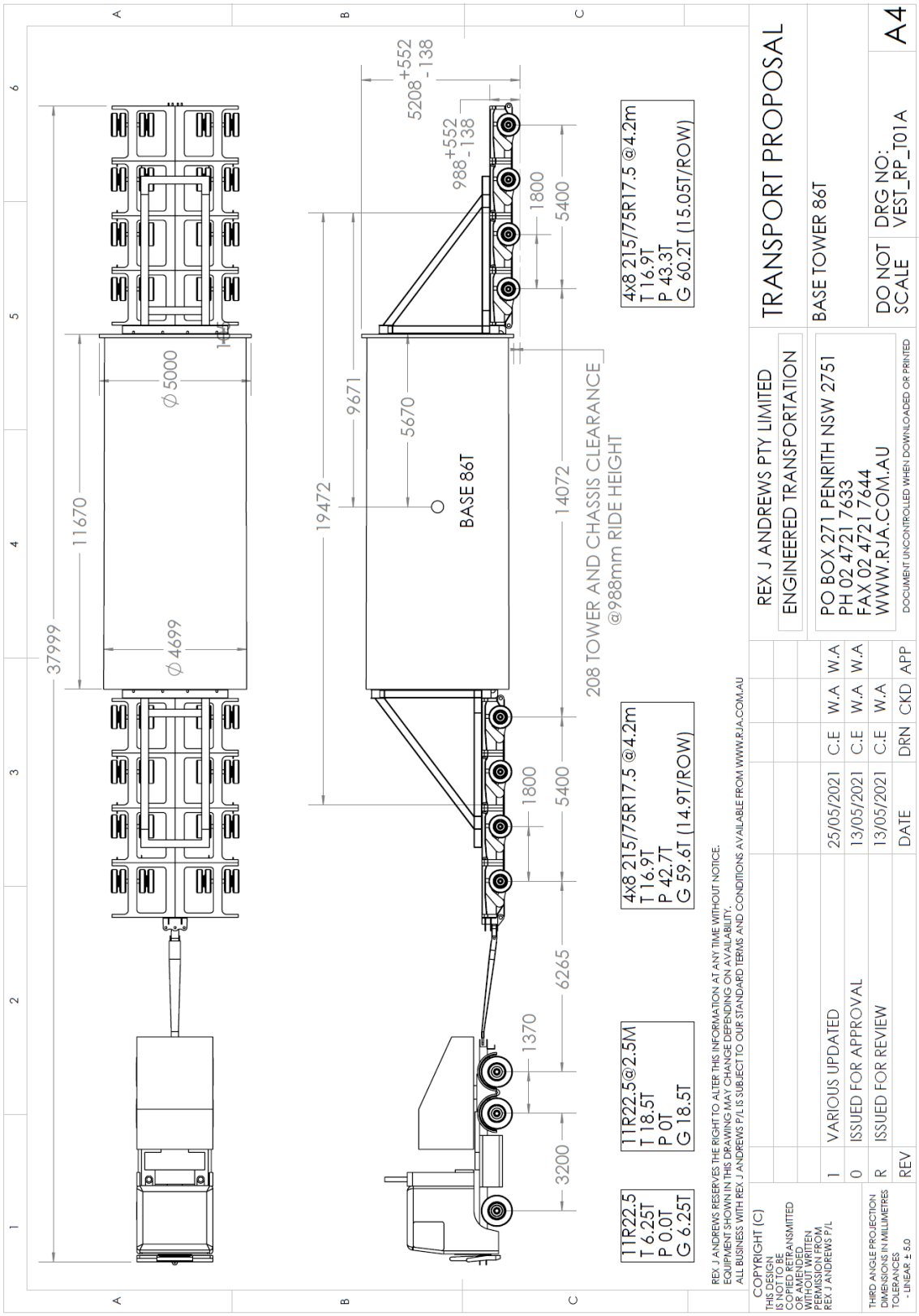
Nacelles (13.1l x 4.0w x 4.2h x 130.0T)
Configuration. Prime Mover with 12x8 Platform
Overall dimensions: 34.0l x 4.3w x 5.2h x 193T

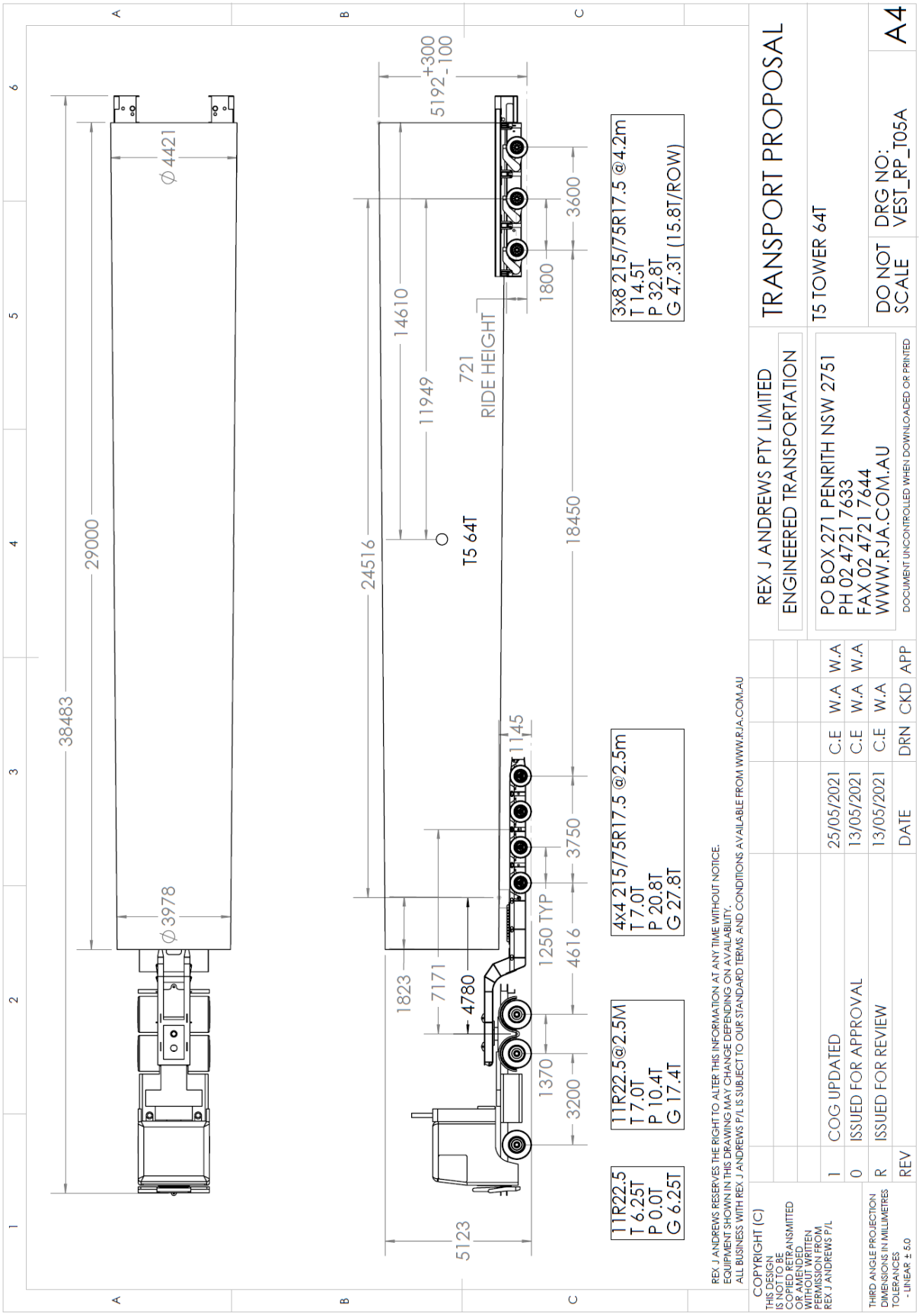
Hubs (5.5l x 3.8w x 3.9h x 36.0T)
Configuration. Prime Mover with 4x4 Low Loader
Overall dimension: 19.0l x 4.0w x 4.9h x 54.5T

Blades (73.5l x 4.5w x 3.5h x 26T)
Configuration. Prime Mover with 2x4 Dolly 3x4 Extendable Blade Trailers
Overall dimension: 85.0l x 4.6w x 5.0h x 60.0T

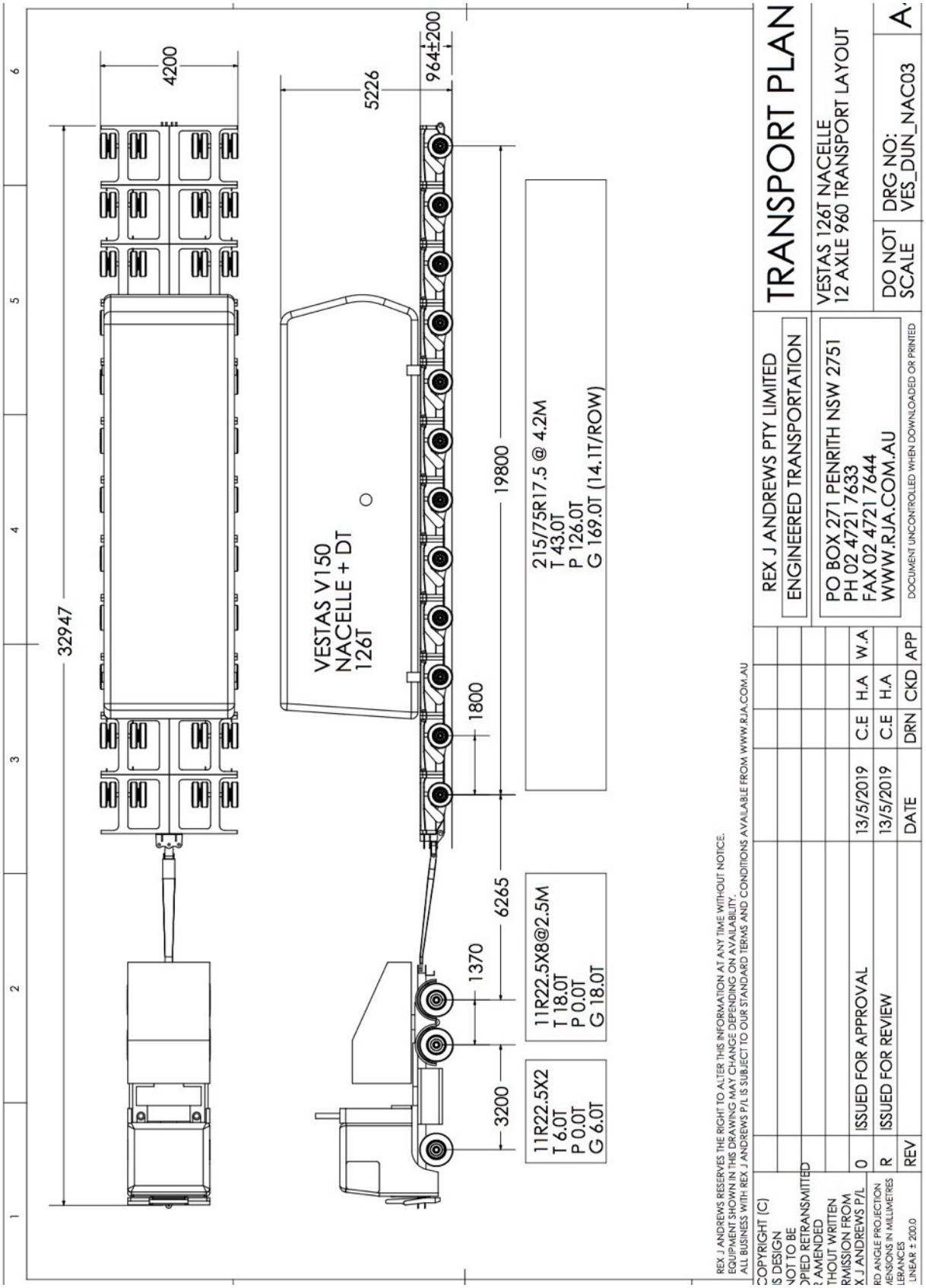
4.0 Transport drawings (Possible combinations)

Tower diagrams:

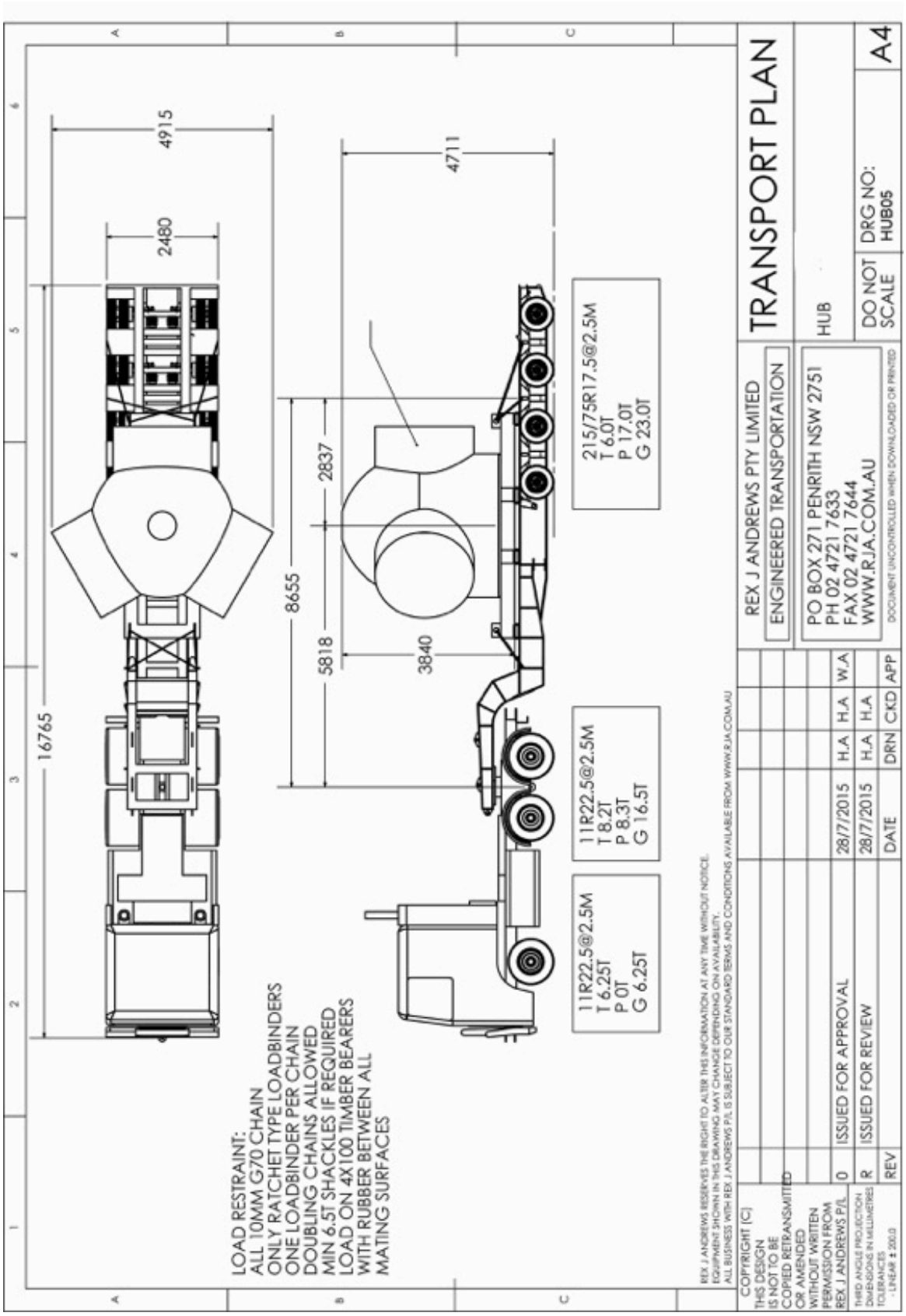



38483
29000
Ø4421
Ø3978
24516
14610
11949
721
RIDE HEIGHT
T5 64T
5192+300 -100
3600
1800
18450
1145
3750
1250 TYP
4616
1370
3200
1823
7171
4780
5123
11R22.5
T 6.25T
P 0.0T
G 6.25T
11R22.5@2.5M
T 7.0T
P 10.4T
G 17.4T
4x4 215/75R17.5 @2.5m
T 7.0T
P 20.8T
G 27.8T
3x8 215/75R17.5 @4.2m
T 14.5T
P 32.8T
G 47.3T (15.8T/ROW)
REX. J ANDREWS RESERVES THE RIGHT TO ALTER THIS INFORMATION AT ANY TIME WITHOUT NOTICE.
EQUIPMENT SHOWN IN THIS DRAWING MAY CHANGE DEPENDING ON AVAILABILITY.
ALL BUSINESS WITH REX J ANDREWS P/L IS SUBJECT TO OUR STANDARD TERMS AND CONDITIONS AVAILABLE FROM WWW.RJA.COM.AU
COPYRIGHT (C)
THIS DESIGN IS NOT TO BE COPIED OR TRANSMITTED OR AMENDED WITHOUT WRITTEN PERMISSION FROM REX J ANDREWS P/L
1 COG UPDATED 25/05/2021 C.E W.A W.A
0 ISSUED FOR APPROVAL 13/05/2021 C.E W.A W.A
R ISSUED FOR REVIEW 13/05/2021 C.E W.A
REV DATE DRN CKD APP
THIRD ANGLE PROJECTION
DIMENSIONS IN MILLIMETRES
TOLERANCES:
- LINEAR ± 5.0
REX J ANDREWS PTY LIMITED
ENGINEERED TRANSPORTATION
PO BOX 271 PENRITH NSW 2751
PH 02 4721 7633
FAX 02 4721 7644
WWW.RJA.COM.AU
DOCUMENT UNCONTROLLED WHEN DOWNLOADED OR PRINTED
TRANSPORT PROPOSAL
T5 TOWER 64T
DO NOT SCALE
DRG NO: VEST_RP_T05A
A4

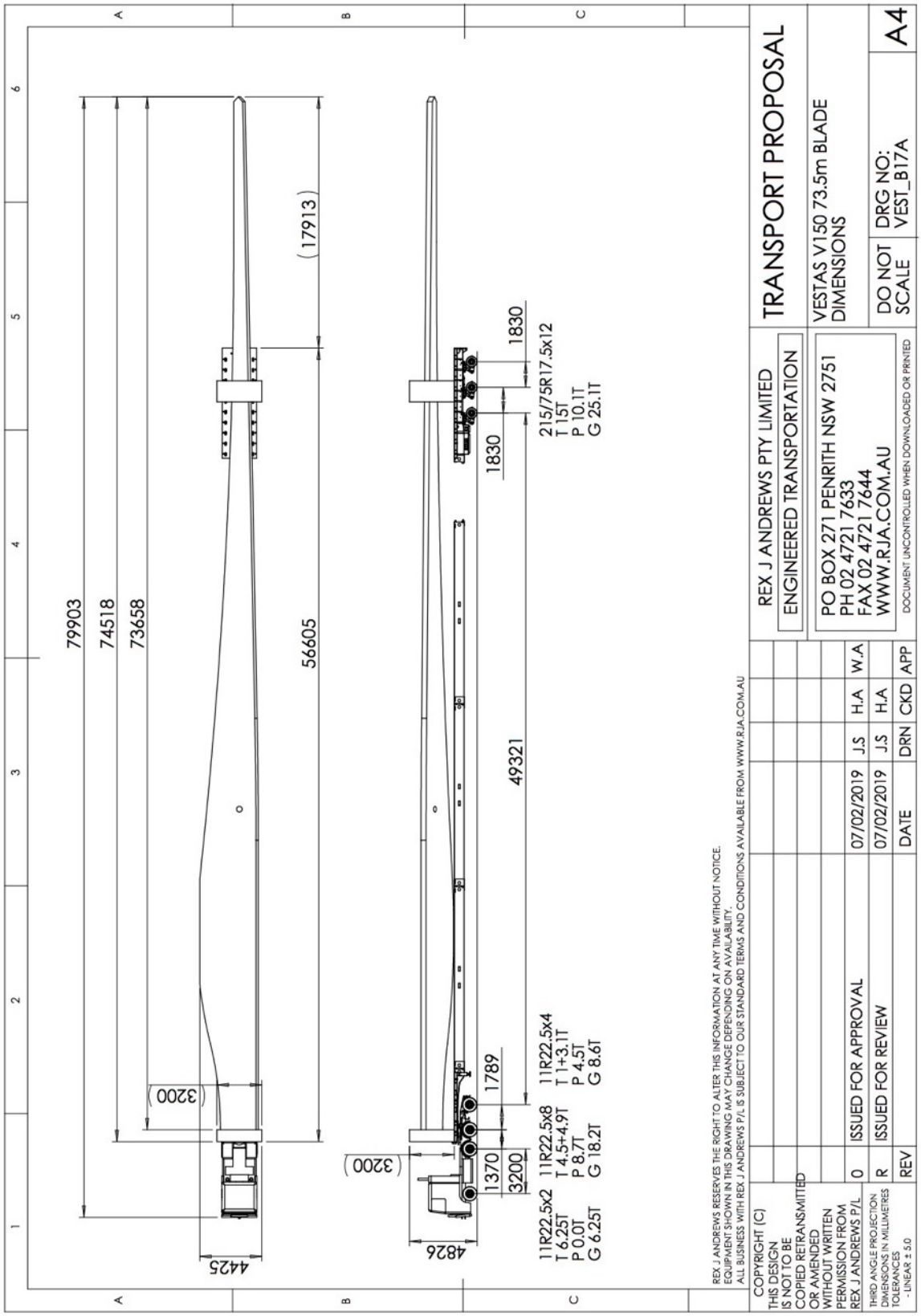
Nacelle diagram:



Hub diagram:

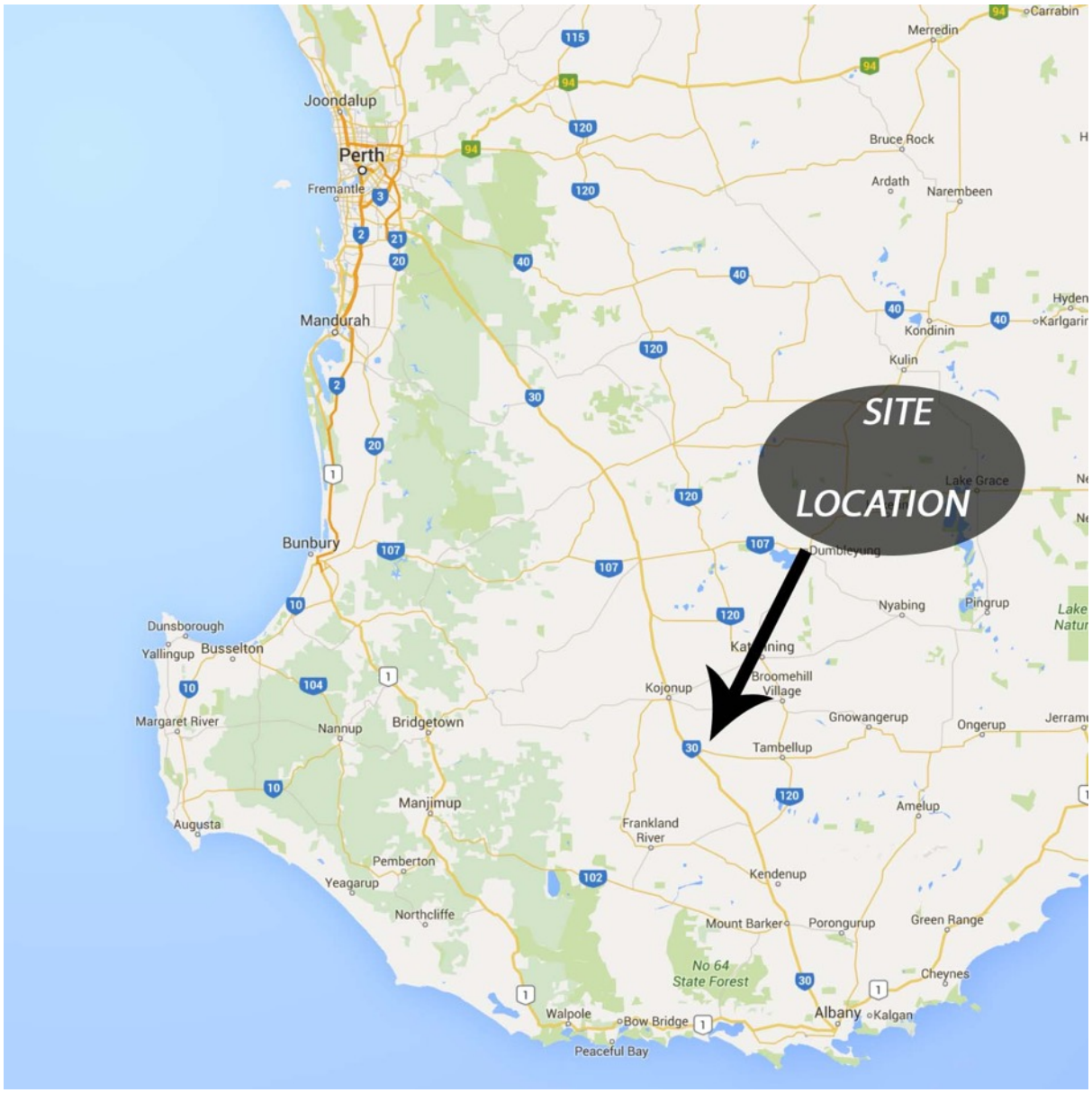

4915
2480
16765
4711
2837
8655
5818
3840
215/75R17.5@2.5M
T 6.0T
P 17.0T
G 23.0T
11R22.5@2.5M
T 8.2T
P 8.3T
G 16.5T
11R22.5@2.5M
T 6.25T
P 0T
G 6.25T
LOAD RESTRAINT:
ALL 10MM G70 CHAIN
ONLY RATCHET TYPE LOADBINDERS
ONE LOADBINDER PER CHAIN
DOUBLING CHAINS ALLOWED
MIN 6.5T SHACKLES IF REQUIRED
LOAD ON 4X100 TIMBER BEARERS
WITH RUBBER BETWEEN ALL
MATING SURFACES
REX J ANDREWS RESERVES THE RIGHT TO ALTER THIS INFORMATION AT ANY TIME WITHOUT NOTICE.
EQUIPMENT SHOWN IN THIS DRAWING MAY CHANGE DEPENDING ON AVAILABILITY.
ALL BUSINESS WITH REX J ANDREWS P/L IS SUBJECT TO OUR STANDARD TERMS AND CONDITIONS AVAILABLE FROM WWW.RJA.COM.AU
COPYRIGHT (C)
THIS DESIGN
IS NOT TO BE
COPIED RETRANSMITTED
OR AMENDED
WITHOUT WRITTEN
PERMISSION FROM
REX J ANDREWS P/L
THIRD ANGLE PROJECTION
DIMENSIONS IN MILLIMETRES
TOLERANCES
- LINEAR ± 200.0
REV
DATE
DRN
CKD
APP
0
ISSUED FOR APPROVAL
28/7/2015
H.A
H.A
W.A
R
ISSUED FOR REVIEW
28/7/2015
H.A
H.A
REX J ANDREWS PTY LIMITED
ENGINEERED TRANSPORTATION
PO BOX 271 PENRITH NSW 2751
PH 02 4721 7633
FAX 02 4721 7644
WWW.RJA.COM.AU
DOCUMENT UNCONTROLLED WHEN DOWNLOADED OR PRINTED
TRANSPORT PLAN
HUB
DO NOT SCALE
DRG NO:
HUB05
A4

Blade diagram: V150



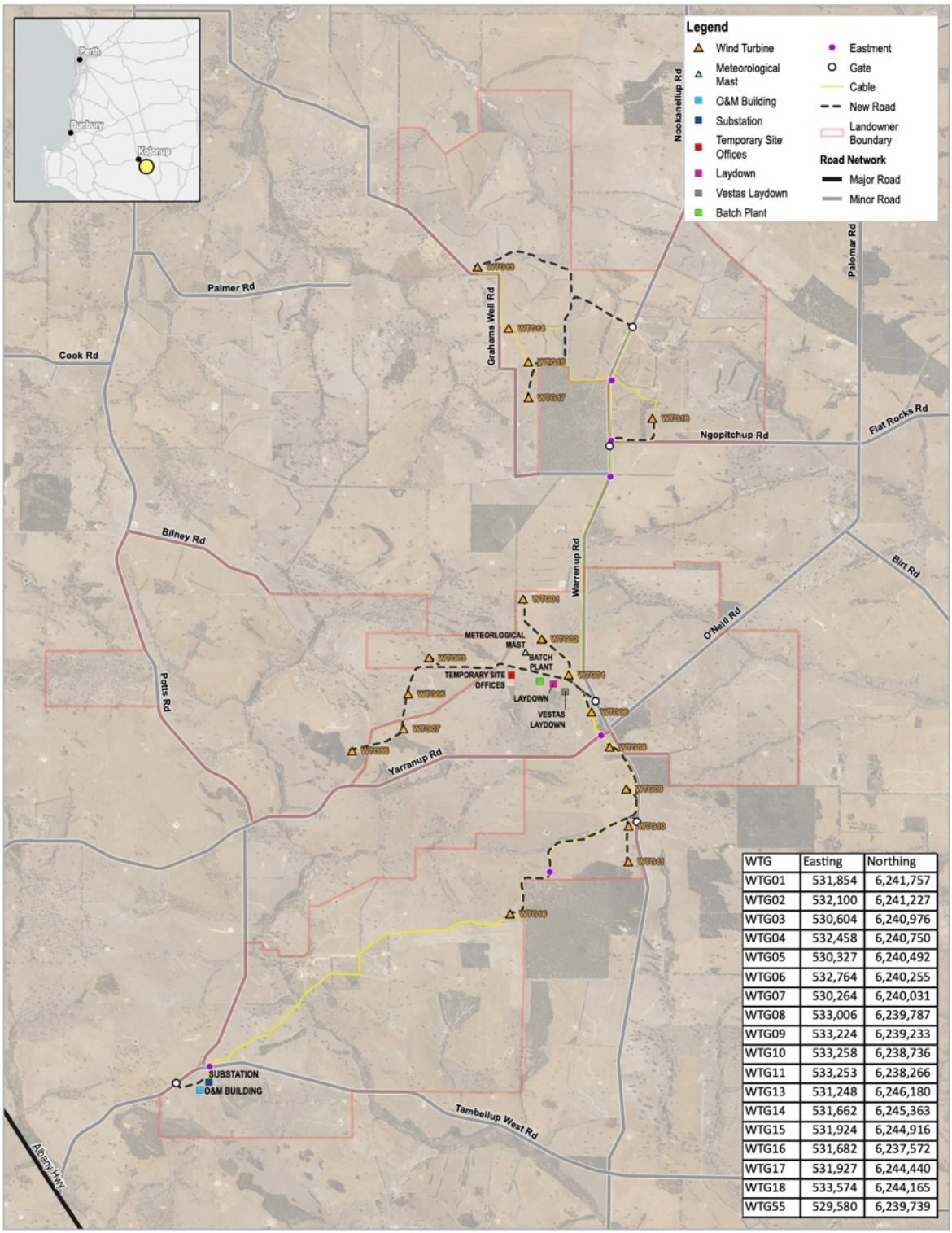
5.0 Site Location

The Flat Rock Windfarm is located approx. 25 Kilometers southeast of Kojonup, in the local council jurisdictions of Kojonup and Broomehill-Tambellup.



6.0 Turbine Layout and Site Access Routes

Flat Rock Windfarm turbine deliveries are accessed off Warrenup Road.



WTG	Easting	Northing
WTG01	531,854	6,241,757
WTG02	532,100	6,241,227
WTG03	530,604	6,240,976
WTG04	532,458	6,240,750
WTG05	530,327	6,240,492
WTG06	532,764	6,240,255
WTG07	530,264	6,240,031
WTG08	533,006	6,239,787
WTG09	533,224	6,239,233
WTG10	533,258	6,238,736
WTG11	533,253	6,238,266
WTG13	531,248	6,246,180
WTG14	531,662	6,245,363
WTG15	531,924	6,244,916
WTG16	531,682	6,237,572
WTG17	531,927	6,244,440
WTG18	533,574	6,244,165
WTG55	529,580	6,239,739

7.0 Port of Import

The wind turbine equipment will be imported from various countries and will arrive on ships into the Port of Bunbury.

The ideal berth for these shipments is berth # 5. This facility has a hardstand storage area of roughly 40,000 s/q meters, adjacent to the berth.

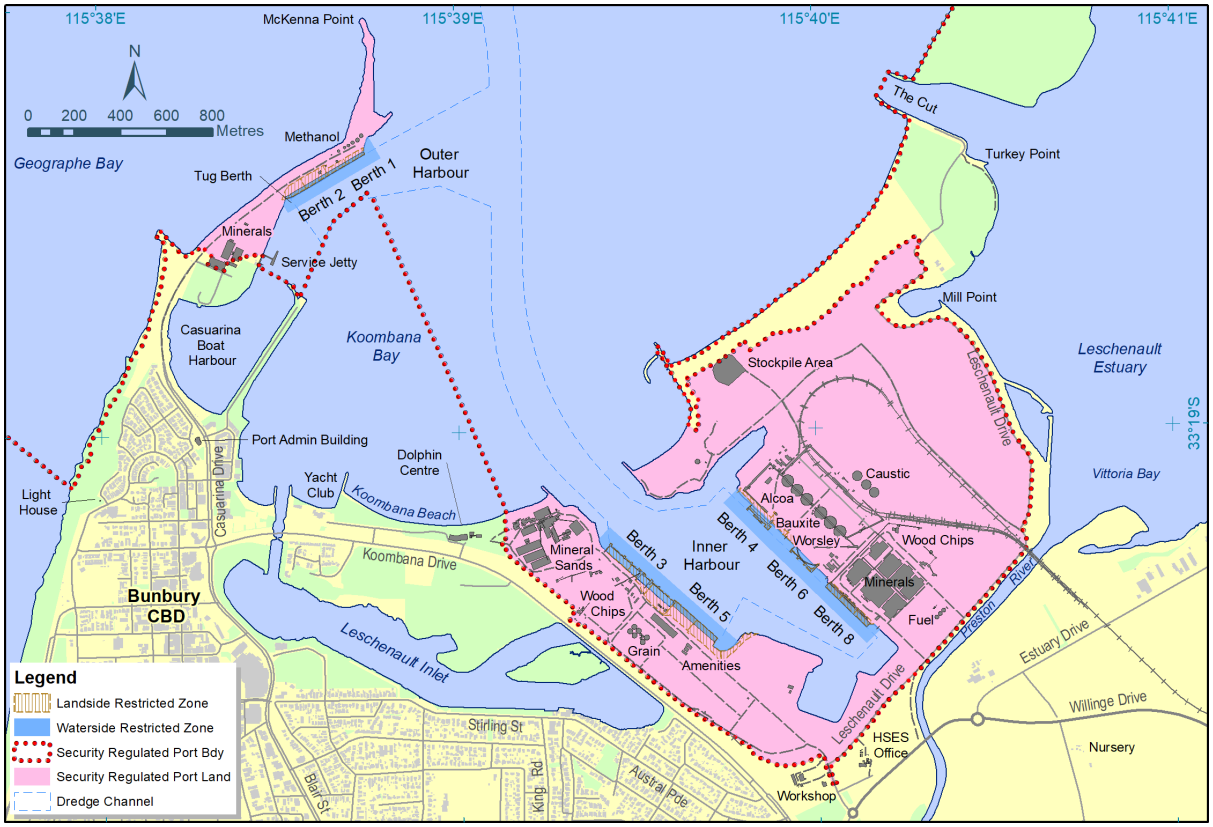


Image 1: Exiting Berth # 5, into the storage area and back onto the port access Road.

GPS LINK FOR SECTION OF ROAD: https://goo.gl/maps/BAP8NNpj8HRk5zu99

PROCEDURE: Blades can either reverse or drive forward off the berth and into the storage area. Once the components are ready to be delivered to site, then there is direct unrestricted access to Port Access Road.

COMMENTS: The areas showing the blade swept path must be cleared while shipment has been discharged.

ROAD MODIFICATIONS: A moderate amount of work is required.

8.0 Route Summaries

We have based this study on the turbine components and towers entering Australia via the Port of Bunbury. The study will show the likely route for these components, and the restraints that they may encounter on the route.

The transport routes may differ for some components.

ROUTE 1a: Port of Bunbury to Flat Rocks Windfarm

COMPONENTS: Blades and loads under 5.2 metres in overall height

DISTANCE: 257 kilometres

GPS LINK: https://goo.gl/maps/tzhrbHFVKLTounLf6

This route took us via This route took us via Leschenault Dr, Estuary Dr, Koombana Dr, Robertson Dr, S Western Hwy, Coalfields Hwy, Albany Hwy, Warrenup Road.

ROUTE 1b: Port of Bunbury to Flat Rocks Windfarm – High Load route

COMPONENTS: Loads over 5.2 metres in overall height

DISTANCE: 257 kilometres

GPS LINK: https://goo.gl/maps/JkBcLqGnCtwoiuVv8

This route took us via This route took us via Leschenault Dr, Estuary Dr, Koombana Dr, Forrest Hwy, Raymond Road, S Western Hwy, Coalfields Hwy, Albany Hwy, Warrenup Road.

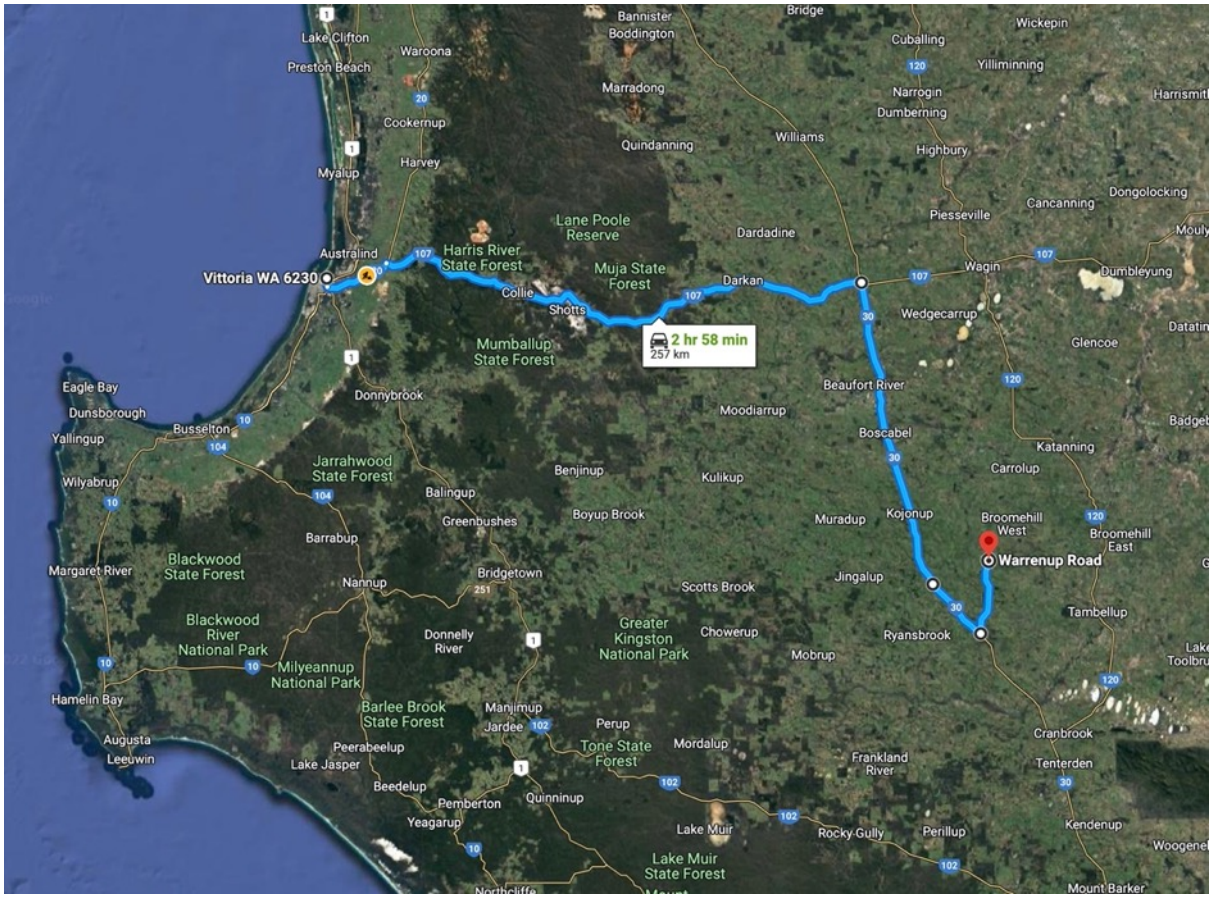
9.0 Route 1a Survey: Port of Bunbury to Flat Rocks Windfarm Loads under 5.2 Metres in overall height

COMPONENTS: Blades and loads under 5.2 metres in overall height

DISTANCE: 257 kilometres

GPS LINK: https://goo.gl/maps/tzhrbHFVKLTounLf6

ROUTE: Leschenault Dr, Estuary Dr, Koombana Dr, Robertson Dr, S Western Hwy, Coalfields Hwy, Albany Hwy, Warrenup Road.



KEY	
PINCHPOINT	
CAUTION	
EMERGENCY PARKING	

KM index	Location	Section of road	Critical Measurement	Procedure	Notes
0.0	Bunbury	Port access Road onto Leschenault Drive while traveling over rail crossing. https://goo.gl/maps/RE8iv5nKm8QKFJFGA	Length: 80 Metres Width: 8 Metres	Travel directly ahead from the Port Access Road onto Leschenault Drive.	Travel over the rail crossing and onto Leschenault Drive. Port Access Road is 8.0 Metres wide at the narrowest point. Some hardstand required.
0.2	Bunbury	Port Access Road over rail line https://goo.gl/maps/RE8iv5nKm8QKFJFGA	Width: 8 Metres	Travel directly ahead	Rail crossing is likely to be cross with caution.
0.2	Bunbury	Leschenault Drive onto Estuary Drive https://goo.gl/maps/fY3dHn9HiuRT5Bo7A	Length: 90 Metres Width: 9 Metres	Right hand turn from the incorrect side of Leschenault Street back to the correct side of Estuary Drive.	Loads to cut through the inside of the roundabout. Spotter to watch the pole on the inside of the turn, and the blade overhang on the trees at the rear. No road modifications required.
0.5	Bunbury	Estuary Drive onto Koombana Drive https://goo.gl/maps/srn3FPgTaf8Bsex17	Length: 55 Metres Width: 8 Metres	Left hand turn from the correct side of Estuary Drive onto the incorrect side of Koombana Drive.	Hardstand is required on the inside of the corner, and a sign made removable. Truck is to cross over and return to the correct side by travelling over the centre median strip. The centre median strip looks okay in its current form.
0.8	Bunbury	Koombana Drive onto Robertson Drive https://goo.gl/maps/fczbdpz6r4AoWkMS9	Length: 100 Metres Width: 10 Metres	Travel directly ahead through the roundabout on the correct side. Taking the second exit.	Spotter to guide the load through the poles and signs. No road modifications required.
2.4	Bunbury	Robertson Drive onto S-Western Highway https://goo.gl/maps/BjMCk7U8Y1JbQM5n8	Length: 55 Metres Width: 8 Metres	Left hand turn from the correct side of Robertson Drive onto the incorrect side of the South Western Highway.	Signs will need to be relocated or made removable. Truck is to cross over and return to the correct side by travelling over the centre median strip. The centre median strip looks okay in its current form.
6.0	Picton	S-Western Highway over rail line https://goo.gl/maps/ck2rKuR5h7yCngoZ6	Width: 8 Metres	Travel directly ahead	Rail crossing is likely to be cross with caution.
12.7	Waterloo	S-Western Highway https://goo.gl/maps/4AUbZcEDJUNBYQz78	Length: 130 metres Width: 6 Metres	Merge to the left	Large parking bay, all loads.

KM index	Location	Section of road	Critical Measurement	Procedure	Notes
18.5	Roelands	South S-Western Highway onto Coalfields Highway https://goo.gl/maps/ZoDXKuSEcCvoZZwz7	Length: 45 Metres Width: 7 Metres	Right hand turn from the correct side of the South Western Highway onto the incorrect side of the Coalfields Highway.	Hardstand is required in the centre median strip and on the inside of the corner. A light pole will need to be relocated and some signs relocated or made removable.
18.6	Roelands	Coalfields Highway over rail line https://goo.gl/maps/BCU93NVFkqkK8UmSA	Width: 8 Metres	Travel directly ahead	Rail crossing is likely to be cross with caution.
48.0	Allanson	Coalfields Highway https://goo.gl/maps/exmY2eavRpMNKVrj7	Length: 130 metres Width: 11 Metres	Merge to the left	Large parking bay, all loads.
55.0	Collie	Coalfields Highway https://goo.gl/maps/yFgE2ew3rE6kWuWr5	Length: 100 metres Width: 6 Metres	Merge to the left	Large parking bay, all loads.
55.5	Collie	Coalfields Highway over rail line https://goo.gl/maps/X9T58io8SyCpRwAH8	Width: 8 Metres	Travel directly ahead	Rail crossing is likely to be cross with caution.
61.0	Shotts	Coalfields Highway over rail line https://goo.gl/maps/XPyhuteAWiJs2EdA9	Width: 8 Metres	Travel directly ahead	Rail crossing is likely to be cross with caution.
88.5	Bowelling	Coalfields Highway https://goo.gl/maps/k6jY3Ry4etiv7Rhm6	Length: 140 metres Width: 12 Metres	Merge to the left	Large parking bay, all loads.
146.0	Arthur River	Coalfields Highway onto Albany Highway https://goo.gl/maps/1dT7ApYv6e93bUyRA	Length: 90 Metres Width: 10 Metres	Right hand turn from the correct side of the Coalfields Highway across to the incorrect side of the Albany Highway.	Loads to travel across the inside of the corner on the incorrect side of the road. No road modifications required.
146.1	Arthur River	Albany Highway https://goo.gl/maps/PGexx4a78c8qxntK7	Length: 120 metres Width: 8 Metres	Merge to the left	Large parking bay, all loads.
176.0	Beaufort river	Albany Highway https://goo.gl/maps/anZmJWoJFWrMKZjA9	Length: 130 metres Width: 8 Metres	Merge to the left	Large parking bay, all loads.
238.0	Lumeah	Albany Highway onto Warrenup Road https://goo.gl/maps/8v1xfFPQzY7jv4KK6	Length 35 Metres Width 8 Metres	Left hand turn from the incorrect side to the incorrect side	Hardstand and tree clearing is required.
238.0 to 245.0	Lumeah to Borderdale	Warrenup Road Asphalt section https://goo.gl/maps/WVXFEGkzw2ucG36H8	Length 120 Metres Width 7 Metres	Travel directly ahead	Tree trimming along a 1.7-kilometre section of Warrenup road. https://goo.gl/maps/ckTFV3zw4DYx43M68 Remaining section of road appears suitable for the loads.
245.0 to 257.0	Borderdale to Broomhill West	Warrenup Road Gravel section https://goo.gl/maps/WVXFEGkzw2ucG36H8	Length 120 Metres Width 7 Metres	Travel directly ahead	Tree trimming along multiple sections along a 5.4-kilometre section of Warrenup road. https://goo.gl/maps/PKpfcNNKCZXovqE49
249.5	Borderdale	Warrenup Road into site entrance https://goo.gl/maps/gjJndjCimG6gobrAA	N/A	Left hand turn	Site entrance to be made suitable for the swept path of the largest load.

KM index	Location	Section of road	Critical Measurement	Procedure	Notes
250.0	Broomhill West	Warrenup Road into site entrance https://goo.gl/maps/oSgdPZdsoF8tPuTAA	N/A	Left hand turn	Site entrance to be made suitable for the swept path of the largest load.
250.5	Broomhill West	Warrenup Road into site entrance https://goo.gl/maps/FMX6RMXAbaFnrTBw8	N/A	Left hand turn	Site entrance to be made suitable for the swept path of the largest load.
251.0	Broomhill West	Warrenup Road into site entrance https://goo.gl/maps/9AuvMvRVG2rJz4uY6	N/A	Left hand turn	Site entrance to be made suitable for the swept path of the largest load.
255.0	Broomhill West	Warrenup Road into site entrance https://goo.gl/maps/Y9qbzkrB61DWJSRe6	N/A	Right hand turn	Site entrance to be made suitable for the swept path of the largest load.
257.0	Broomhill West	Warrenup Road into site entrance https://goo.gl/maps/ZfB5bBzzF1tCMqvz9	N/A	Left hand turn	Site entrance to be made suitable for the swept path of the largest load.

0.0 Km's: Port Access Road onto Leschenault Drive

GPS LINK FOR SECTION OF ROAD: https://goo.gl/maps/RE8iv5nKm8QKFJFGA

PROCEDURE: Travel around a left-hand bend while crossing over the Rail line and onto Leschenault Drive.

COMMENTS: Some hardstand required on the outside of the corner.

Spotter to guide the load through this section of road.

ROAD MODIFICATIONS: A small amount of work is required.

0.2 Km's: Leschenault Drive onto Estuary Drive

GPS LINK FOR SECTION OF ROAD: https://goo.gl/maps/fY3dHn9HiuRT5Bo7A
PROCEDURE: Right hand turn from the incorrect side to correct side of the road.
COMMENTS: Loads to cut through the inside of the roundabout.
Spotter to guide the load through this section of road.
ROAD MODIFICATIONS: No modifications required.

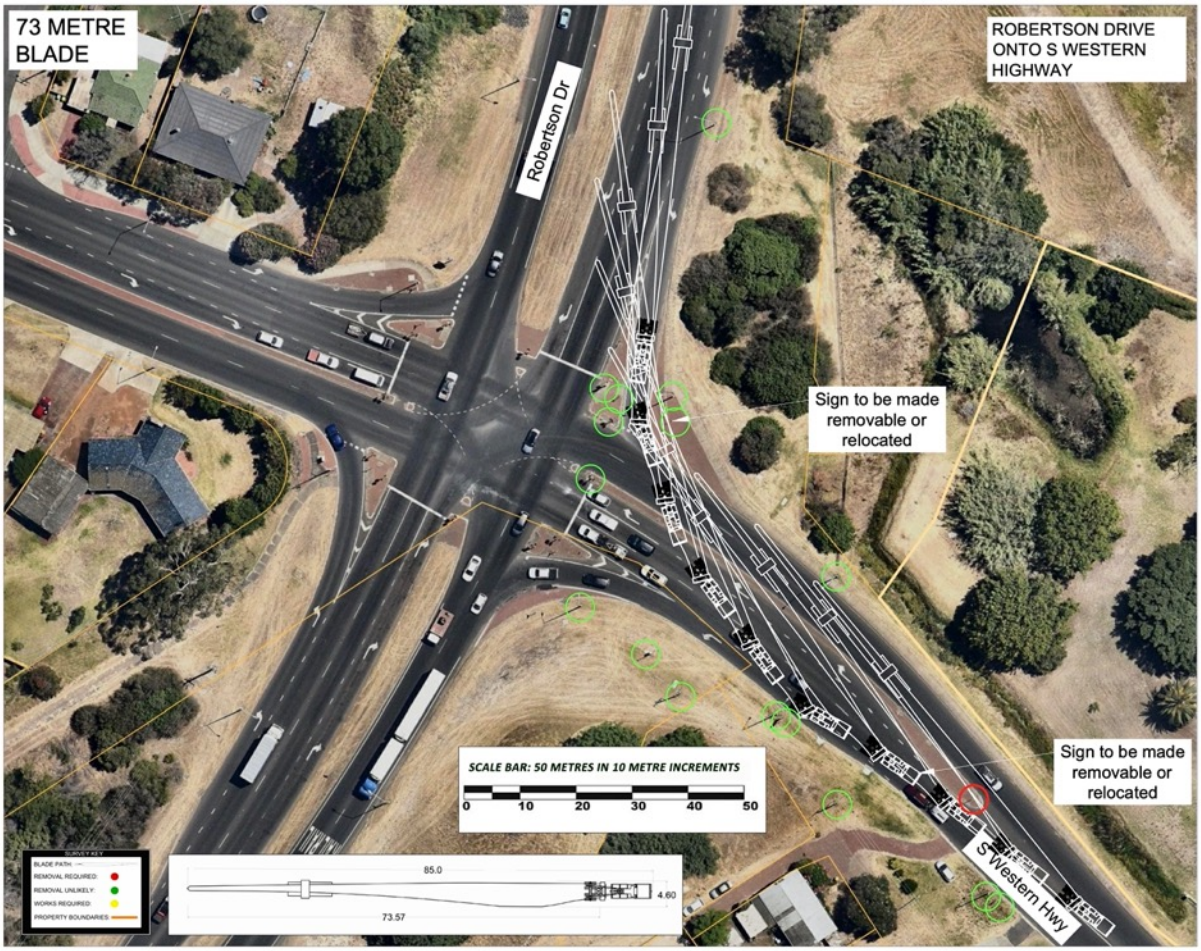
0.5 Km's: Estuary Drive onto Koombana Drive

GPS LINK FOR SECTION OF ROAD: https://goo.gl/maps/srn3FPgTaf8Bsex17
PROCEDURE: Left hand turn from correct side to wrong side of Koombana Drive.
COMMENTS: S sign will need to be relocated or made removable.
Spotter to guide the load through this section of road.
ROAD MODIFICATIONS: A small amount of work is required.

0.8 Km's: Koombana Drive onto Robertson Drive

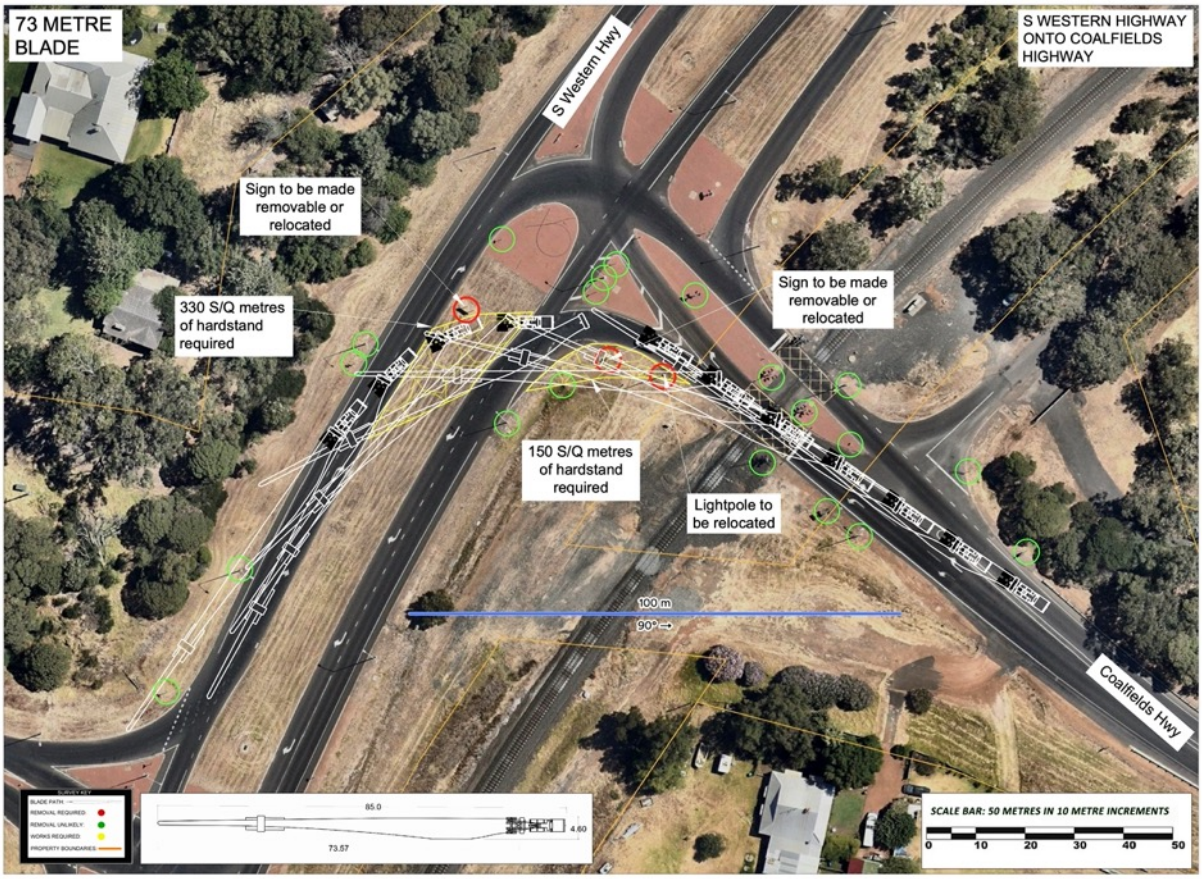
GPS LINK FOR SECTION OF ROAD: https://goo.gl/maps/fczbdpz6r4AoWkMS9
PROCEDURE: Travel directly ahead through the roundabout.
COMMENTS: Spotter to guide the load through this section of road.
ROAD MODIFICATIONS: No modifications required.

2.4 Km's: Robertson Drive onto S-Western Highway



GPS LINK FOR SECTION OF ROAD: https://goo.gl/maps/BjMCk7U8Y1JbQM5n8
PROCEDURE: Left hand turn from correct side to the incorrect side of the road.
COMMENTS: Some signs to be relocated or made removable.
Spotter to guide the load through this section of road.
ROAD MODIFICATIONS: A small amount of modifications are required.

18.5 Km's: S-Western Highway onto Coalfields Road



GPS LINK FOR SECTION OF ROAD: https://goo.gl/maps/ZoDXKuSEcCvoZZwz7

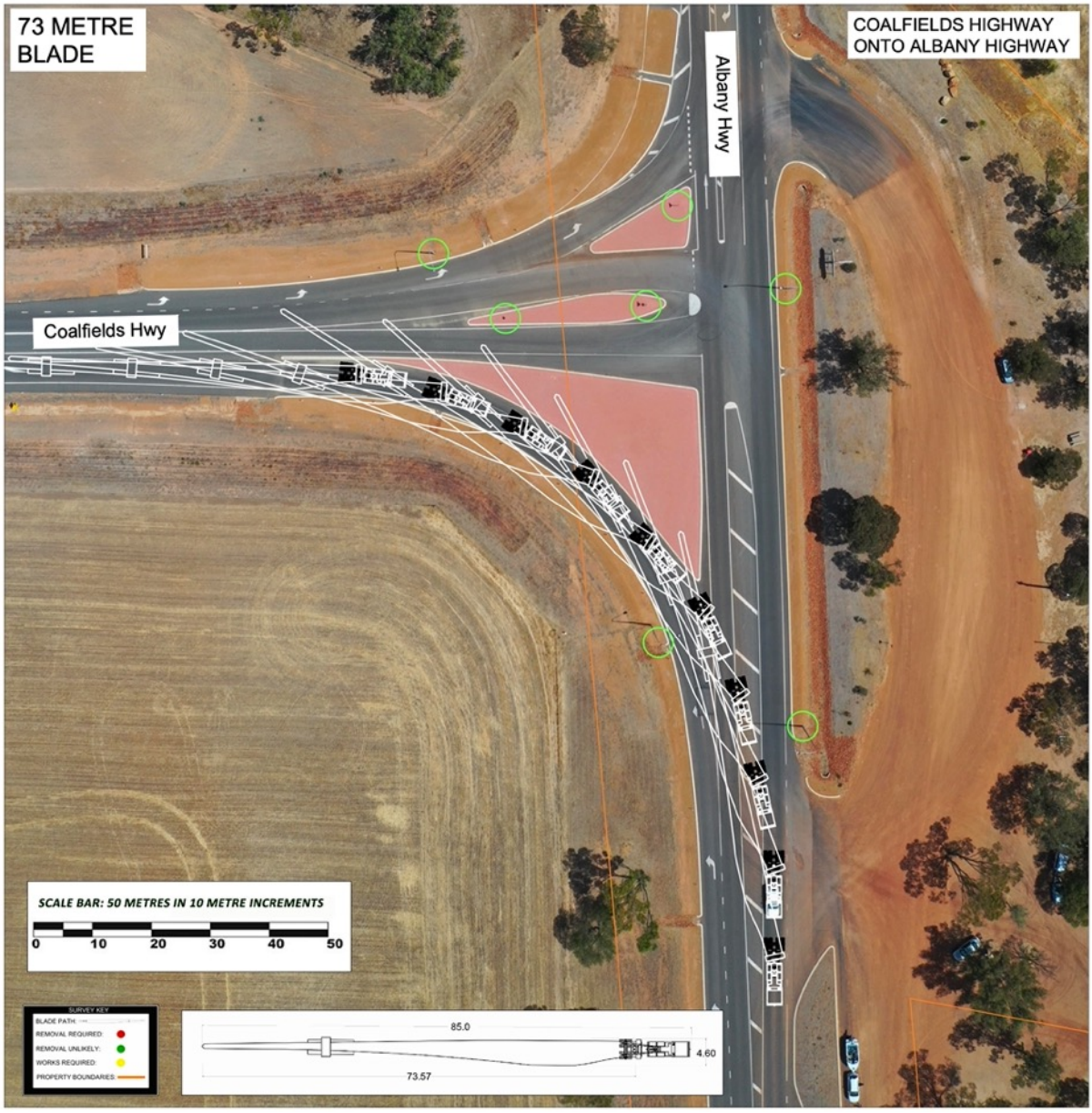
PROCEDURE: Right hand turn from correct side to the incorrect side of the road.

COMMENTS: Hardstand is required on 2 sections of the road. A light pole will need to be relocated and some signs to be relocated or made removable.

Spotter to guide the load through this section of road.

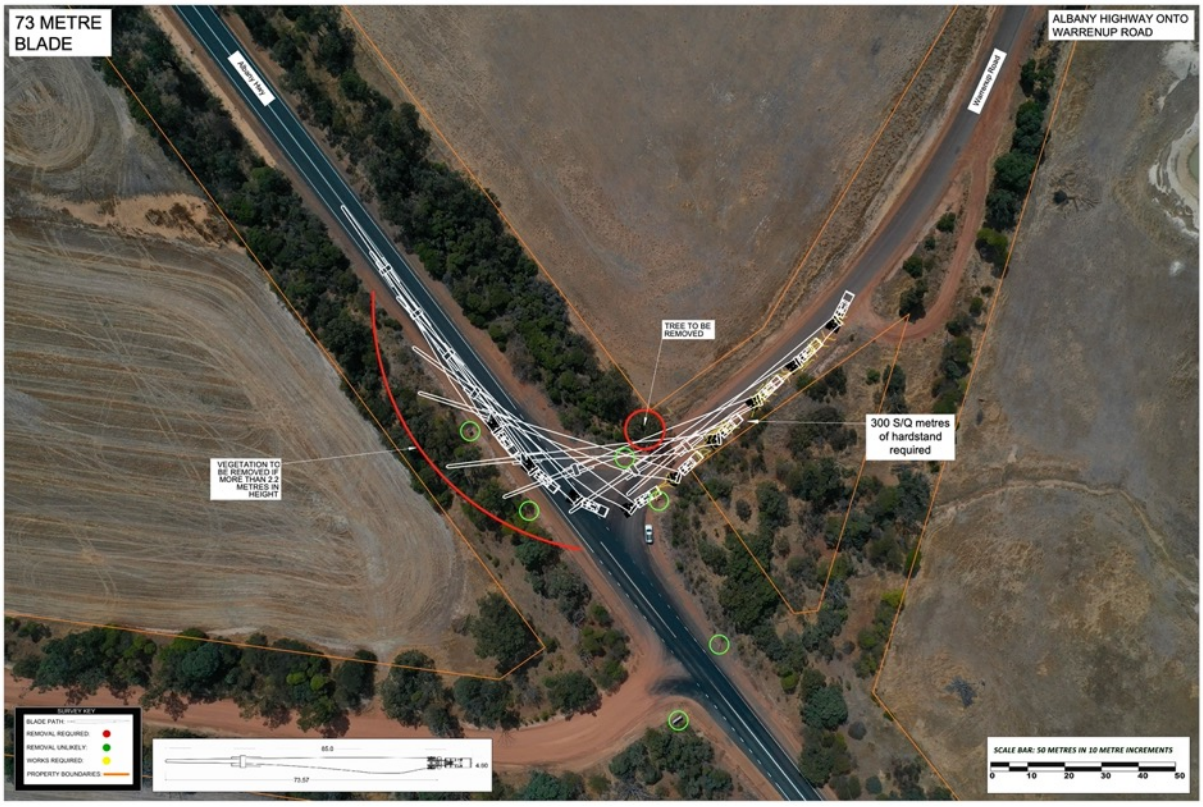
ROAD MODIFICATIONS: A large amount of modifications are required.

146.0 Km's: Coalfield Road onto Albany Highway



GPS LINK FOR SECTION OF ROAD: https://goo.gl/maps/1dT7ApYv6e93bUyRA
PROCEDURE: Right hand turn from correct side to the incorrect side of the road.
COMMENTS: Loads to cut through the inside of the corner on the incorrect side of the road. Spotter to guide the load through this section of road.
ROAD MODIFICATIONS: No modifications required.

238.0 Km's: Albany Highway onto Warrenup Road



GPS LINK FOR SECTION OF ROAD: https://goo.gl/maps/5NASCneW9CP2Va6N7

PROCEDURE: Left hand turn from the incorrect side to incorrect side of the road.

COMMENTS: Hardstand required on the outside of the corner and some vegetation will need to be removed.

Spotter to guide the load through this section of road.

ROAD MODIFICATIONS: Moderate amount of modifications are required.

238.0 to 245.0 Km's: Warrenup Road asphalt section

GPS LINK FOR SECTION OF ROAD: https://goo.gl/maps/WVXFEGkzw2ucG36H8

PROCEDURE: Travel directly ahead on the sealed section of Warrenup Road up until Tambellup W Road.

COMMENTS: Road has been recently sealed and appears to be in good condition.

ROAD MODIFICATIONS: No modifications are required.

245.0 to 257.0 Km's: Warrenup Road gravel section

GPS LINK FOR SECTION OF ROAD: https://goo.gl/maps/WVXFEGkzw2ucG36H8

PROCEDURE: Travel directly ahead on the unsealed section of Warrenup Road up until Tambellup W Road.

COMMENTS: Road is gravel and appears to be in okay condition. During wet weather the road may need maintenance.

This section of road will require some tree trimming. https://goo.gl/maps/PKpfcNNKCZXovqE49

ROAD MODIFICATIONS: A moderate amount of work is required.

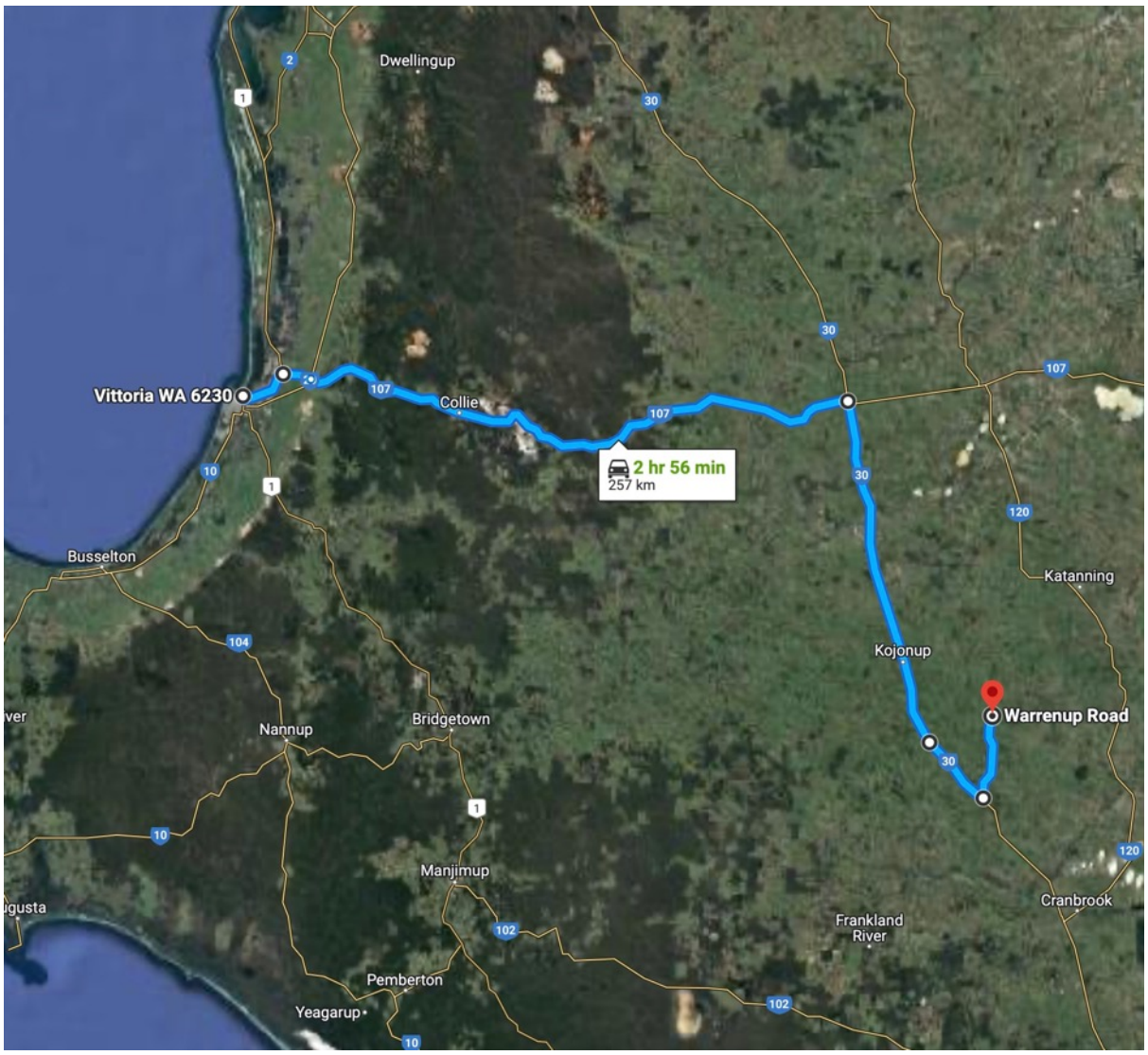
10.0 Route 1b Survey: Port of Bunbury to Flat Rocks Windfarm – Loads over 5.2 Metres in overall height

COMPONENTS: Loads over 5.2 metres in overall height

DISTANCE: 257 kilometres

GPS LINK: https://goo.gl/maps/JkBcLqGnCtwoiuVv8

This route took us via This route took us via Leschenault Dr, Estuary Dr, Koombana Dr, Forrest Hwy, Raymond Road, S Western Hwy, Coalfields Hwy, Albany Hwy, Warrenup Road.



KEY	
PINCHPOINT	
CAUTION	
EMERGENCY PARKING	

KM index	Location	Section of road	Critical Measurement	Procedure	Notes
0.0	Bunbury	Port access Road onto Leschenault Drive while traveling over rail crossing. https://goo.gl/maps/RE8iv5nKm8QKFJFGA	Length: 80 Metres Width: 8 Metres	Travel directly ahead from the Port Access Road onto Leschenault Drive.	Travel over the rail crossing and onto Leschenault Drive. Port Access Road is 8.0 Metres wide at the narrowest point.
0.2	Bunbury	Port Access Road over rail line https://goo.gl/maps/RE8iv5nKm8QKFJFGA	Width: 8 Metres	Travel directly ahead	Rail crossing is likely to be cross with caution.
0.2	Bunbury	Leschenault Drive onto Estuary Drive https://goo.gl/maps/fY3dHn9HiuRT5Bo7A	Length: 90 Metres Width: 9 Metres	Left hand turn	No problems with this section of road.
0.4	Bunbury	Estuary Drive onto Koombana Dr https://goo.gl/maps/ZuuPiGUkZ7WTUHPYA	Length: 55 Metres Width: 7 Metres	Left hand turn	No problems with this section of road.
0.5	Bunbury	Koombana Dr onto Forrest Hwy https://goo.gl/maps/gjKL53ZyyrE2HLAq7	Length: 70 Metres Width: 8 Metres	Left hand turn prior to the roundabout	No problems with this section of road.
0.8	Roelands	Forrest Hwy onto Raymond Road https://goo.gl/maps/gjKL53ZyyrE2HLAq7	Length: 50 Metres Width: 8 Metres	Right hand turn	No problems with this section of road.
13.5	Roelands	Raymond Road over the new Bunbury Bypass https://goo.gl/maps/6JMtyWWk1mvE2b7d7	Length: N/A Width: N/A	Travel directly ahead	The bridge over the new Bunbury bypass has not been constructed. The current timeframe for this new bridge is March 2023
18.4	Roelands	Raymond Road onto S Western Hwy https://goo.gl/maps/McbhNiDtjbpgihjGA	Length: 60 Metres Width: 8 Metres	Left hand turn	No problems with this section of road.
18.5	Roelands	S Western Hwy onto Coalfields Hwy https://goo.gl/maps/C5yq2YkKdEUExoJNA	Length: 55 Metres Width: 8 Metres	Right hand turn	No problems with this section of road.
18.6	Roelands	Coalfields Highway over rail line https://goo.gl/maps/BCU93NVFkqkK8UmSA	Width: 8 Metres	Travel directly ahead	Rail crossing is likely to be cross with caution.
48.0	Allanson	Coalfields Highway https://goo.gl/maps/exmY2eavRpMNKVrj7	Length: 130 metres Width: 11 Metres	Merge to the left	Large parking bay, all loads.
55.0	Collie	Coalfields Highway https://goo.gl/maps/yFgE2ew3rE6kWuWr5	Length: 100 metres Width: 6 Metres	Merge to the left	Large parking bay, all loads.
55.5	Collie	Coalfields Highway over rail line https://goo.gl/maps/X9T58io8SyCpRwAH8	Width: 8 Metres	Travel directly ahead	Rail crossing is likely to be cross with caution.
61.0	Shotts	Coalfields Highway over rail line https://goo.gl/maps/XPyhuteAWiJs2EdA9	Width: 8 Metres	Travel directly ahead	Rail crossing is likely to be cross with caution.

KM index	Location	Section of road	Critical Measurement	Procedure	Notes
88.5	Bowelling	Coalfields Highway https://goo.gl/maps/k6jY3Ry4etiv7Rhm6	Length: 140 metres Width: 12 Metres	Merge to the left	Large parking bay, all loads.
146.0	Arthur River	Coalfields Highway onto Albany Highway https://goo.gl/maps/1dT7ApYv6e93bUyRA	Length: 90 Metres Width: 10 Metres	Right hand turn	No problems with this section of road.
146.1	Arthur River	Albany Highway https://goo.gl/maps/PGexx4a78c8qxntK7	Length: 120 metres Width: 8 Metres	Merge to the left	Large parking bay, all loads.
176.0	Beaufort river	Albany Highway https://goo.gl/maps/anZmJWoJFWrMKZjA9	Length: 130 metres Width: 8 Metres	Merge to the left	Large parking bay, all loads.
238.0	Lumeah	Albany Highway onto Warrenup Road https://goo.gl/maps/8v1xfFPQzY7jv4KK6	Length 35 Metres Width 8 Metres	Left hand turn	No problems with this section of road.
238.0 to 245.0	Lumeah to Borderdale	Warrenup Road Asphalt section https://goo.gl/maps/WVXFEGkzw2ucG36H8	Length 120 Metres Width 7 Metres	Travel directly ahead	Tree trimming along a 1.7-kilometre section of Warrenup road. https://goo.gl/maps/ckTFV3zw4DYx43M68 Remaining section of road appears suitable for the loads.
245.0 to 257.0	Borderdale to Broomhill West	Warrenup Road Gravel section https://goo.gl/maps/WVXFEGkzw2ucG36H8	Length 120 Metres Width 7 Metres	Travel directly ahead	Tree trimming along multiple sections along a 5.4-kilometre section of Warrenup road. https://goo.gl/maps/PKpfcNNKCZXovgE49
249.5	Borderdale	Warrenup Road into site entrance https://goo.gl/maps/gjJndjCimG6gobrAA	N/A	Left hand turn	Site entrance to be made suitable for the swept path of the largest load.
250.0	Broomhill West	Warrenup Road into site entrance https://goo.gl/maps/oSgdPZdsoF8tPuTAA	N/A	Left hand turn	Site entrance to be made suitable for the swept path of the largest load.
250.5	Broomhill West	Warrenup Road into site entrance https://goo.gl/maps/FMX6RMXAbaFnrTBw8	N/A	Left hand turn	Site entrance to be made suitable for the swept path of the largest load.
251.0	Broomhill West	Warrenup Road into site entrance https://goo.gl/maps/9AuvMvRVG2rJz4uY6	N/A	Left hand turn	Site entrance to be made suitable for the swept path of the largest load.
255.0	Broomhill West	Warrenup Road into site entrance https://goo.gl/maps/Y9qbzkrB61DWJSRe6	N/A	Right hand turn	Site entrance to be made suitable for the swept path of the largest load.
257.0	Broomhill West	Warrenup Road into site entrance https://goo.gl/maps/ZfB5bBzzF1tCMgvz9	N/A	Left hand turn	Site entrance to be made suitable for the swept path of the largest load.

11.0 Conclusion

After studying all options and undertaking a route survey, we believe the loads could be transported on this route with a moderate number of upgrades.

The following are the key points that need to be taken into consideration for the development of this route.

PORT OF BUNBURY:

- The port has in excess of 50,000 S/Q metres of suitable storage.
- The port has adequate access from the berth through to the storage area, then onto the road network.

BUNBURY:

- One Intersection requires a large amount of works, including the relocating of a light pole.
- Two Corners will require moderate amount of works.
- The Bunbury outer ring road project is currently under construction. Both route 1a and route 1b will pass through this project. It is recommended that the windfarm maintains communication with the project during the pre-works and during the deliveries. If the ring road project does have delays than there is a possibility that there may be a conflict with the turbine deliveries.

LUMEAH (TURN OFF ALBANY HIGHWAY)

- The intersection of the Albany Highway and Warrenup Road will require some works, including hardstand and tree removal.

WARRENUP ROAD (UP TO TAMBELLUP W ROAD)

- This section of road is suitable for all loads. A small amount of tree pruning is required on the first 1 kilometre of road.

WARRENUP ROAD (AFTER TAMBELLUP W ROAD)

- This section of road is gravel and will likely require maintenance during the deliveries. In wet weather this road may become impassable.
- A moderate amount of tree pruning is required on the majority of the road.

BRIDGES:

- Main Roads WA will need to assess several structures on route. These are likely to be okay for the components listed.

OVERHEAD STRUCTURES:

- There are no structures on this route.

OVERHEAD UTILITIES:

- Western Power have scoped both routes. The outcome is that neither route will require an outage, but both routes require wire lifting.
- Western Power are reassessing these routes and are looking at permanently lifting assets above 5.2 metres on route 1a. Western Power are in the process to see if route 1b can be lifted to 5.7 metres for the majority of the route than the township of Kojonup which will require wire lifters.

RAIL ASSETS:

- There are 4 rail crossings on route that will require approval from authorities before loads can access the routes.

VEGETATION:

- The route up until Warrenup Road is clear of vegetation removal. The Corner of the Albany Highway and Warrenup Road will require vegetation removal. The gravel section of Warrenup Road will require tree trimming along 2 sections of road. These sections of road are along the following GPS links below.
- https://goo.gl/maps/ckTFV3zw4DYx43M68
- https://goo.gl/maps/PKpfcNNKCZXovqE49

PAVEMENT:

- The Pavement up to Warrenup Road is of suitable highway grade.
- Warrenup Road to the south of Tambellup Road is asphalt and will be suitable for the blades and lighter loads.
- Warrenup Road to the north of Tambellup Road is gravel and will need some maintenance during the deliveries. This section of road may be impassable for the heavy loads if wet.

ROADWORKS:

- The project will need to start discussions with government authorities at least 6 months prior to turbine transport to understand if the project would conflict with any upcoming roadworks. Once a TMP has been approved for the transport of the turbines, then the exact movement dates need to be communicated with Mina Roads WA to make all road stakeholders aware of the movements.

APPROVALS:

At a minimum, the following are required for approval to access these routes.

- NHVR
- Main Roads WA
- WA Traffic Escort Division
- Local Councils
- Western Power
- Telstra

12.0 References:

Rex Andrews P/L Route Survey # 341 REV02
Google Earth/Maps
Nearmaps
NHVAS Maintenance Management (NHVAS21193)
NHVAS Basic Fatigue Management (NHVAS21193)
Main Roads Western Australia
WA Heavy Vehicle accreditation

Disclaimer: This route study is a guide only; government approvals would be required before these routes could be deemed suitable for transporting the components over the listed routes.

This study was undertaken using data supplied by Rex J Andrews P/L. Equipment and swept paths might vary if using transport methodology other than the data supplied by Rex J Andrews.