

Navarre Green Power Hub

Preliminary Traffic Assessment

Neoen Pty. Ltd.

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Contents

- Executive summary** 1
- 1 Introduction**..... 2
 - 1.1 Purpose 2
 - 1.2 Assumptions and limitations 2
- 2 Project overview** 2
 - 2.1 Project location 2
 - 2.2 Project description 6
 - 2.3 Construction phase..... 9
 - 2.3.1 Vehicle types 9
 - 2.3.2 Site access and routes 9
 - 2.4 Operation and maintenance phase 11
 - 2.5 Decommissioning phase 11
- 3 Existing conditions** 11
 - 3.1 Transport network..... 11
 - 3.1.1 Road network 11
 - 3.2 Public transport..... 14
 - 3.3 Active transport..... 14
 - 3.4 Traffic volumes 14
 - 3.5 Crash history 15
- 4 Traffic assessment**..... 17
 - 4.1 Construction phase..... 17
 - 4.1.1 Traffic generation..... 17
 - 4.1.2 Traffic distribution 18
 - 4.1.3 Traffic summary 20
 - 4.1.4 Preliminary OSOM delivery vehicle route assessment 22
 - 4.2 Operations and maintenance phase 29
 - 4.3 Decommissioning phase 29
- 5 Conclusions** 29

Figures

- Figure 1 Project area
- Figure 2 Project land zoning map
- Figure 3 Proposed project layout
- Figure 4 Site access points and internal access track layout
- Figure 5 Road network
- Figure 6 Crash history
- Figure 7 Construction worker distribution
- Figure 8 Port of Geelong to Navarre preliminary OSOM route
- Figure 9 Port of Portland to Navarre preliminary OSOM route

Tables

Table 1 Infrastructure associated with Wind Farm Area - Eastern Layout

Table 2 Infrastructure associated with Wind Farm Area - Western Layout

Table 3 Road network existing conditions

Table 4 Existing traffic volumes

Table 5 Crash history (Data source: Victoria DoT Open Data Hub)

Table 6 Total traffic generation

Table 7 Construction worker distribution

Table 8 Construction vehicle distribution

Table 9 Construction traffic movements (peak vehicle volume per road)

Table 10 Port of Geelong to Navarre preliminary OSOM route - OSOM Class 1 road approval

Table 11 Port of Portland to Navarre preliminary OSOM route OSOM Class 1 road approvals

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Executive summary

Neoen Pty. Ltd. (Neoen) is proposing to build and operate a wind farm and battery hub near the township of Navarre in north-western Victoria, known as the Navarre Green Power Hub or the Project. The Project will have a nominal capacity of around 600 MW and will incorporate a total of 102 wind turbines, split across two areas and will also include a 220 kV transmission line between the Western and Eastern Layouts and a 220kV transmission line between the Western Layout and Bulgana Terminal Station.

Aurecon was commissioned by Neoen to undertake a Preliminary Traffic Assessment to inform the development of the Project.

A desktop review was completed of publicly available information in relation to the traffic conditions in and around the Project Area. Information collated during this review has been used to prepare this Preliminary Traffic Assessment. The assessment has found that:

- Internal access and circulation for large construction and delivery vehicles during the construction phase would be required to accommodate the staging and unloading of Oversize and/or Overmass (OSOM) vehicles. This requirement will be confirmed during the detailed design phase.
- Any required traffic management treatments and internal and external mitigation works are to be identified and addressed by way of an approved Construction Traffic Management Plan (CTMP) or Traffic Management Plan (TMP) prepared by the construction contractor (as engaged by the Proponent) to the satisfaction of the relevant authority. This would be prepared in consultation with the relevant authorities and the Proponent.
- The risk of vehicle volume impact is considered low for Escort Street (up to 242 vehicles per day), Stawell-Avoca Road (up to 365 vehicles per day) and Ararat-St Arnaud Road (up to 365 vehicles per day) due to them being C-Class arterial roads.
- Sections of the Council roads are currently unsealed and/or narrow allowing one-way traffic at a single time only. Suitable road improvements and upgrades will be investigated and implemented to support the traffic volumes and heavy vehicles expected. Project Area road upgrades are expected and will be investigated, potential road upgrades (and intersection upgrades) may occur for local roads such as:
 - Barkly – Navarre Road
 - Herd Road
 - High Street
 - Winjallok Road
 - Callawadda – Navarre Road
 - Bolangum Inn Road

This may include treatments such as road widening, sealing, passing areas and maintaining roads during construction.

- The largest typical transport vehicle for the wind farm construction is the blade transport truck. The length of the blade transport truck has not yet been confirmed; however, it is expected to be up to 100 m long.
- Preliminary OSOM delivery vehicle routes (for carrying wind turbine components) have been identified from the Port of Geelong and Port of Portland. A route assessment is to be undertaken to determine and refine routes for OSOM and/or OD vehicle deliveries, most appropriate port for the Project and where intersections along the preliminary proposed route may require modifications.
- Exceptional super-loads (two sub-station) deliveries is to be assessed as part of a separate application and/or CTMP.
- The generated traffic impacts during operations and maintenance phase and decommissioning phase is expected to be an impact less than the construction phase.

1 Introduction

Neoen Pty. Ltd. (Neoen) is proposing to build and operate a wind farm and battery hub near the township of Navarre in north-western Victoria, known as the Navarre Green Power Hub or the Project. Aurecon was commissioned by Neoen to undertake a Preliminary Traffic Assessment to inform the development of the Project.

1.1 Purpose

This report specifically sets out a preliminary desktop assessment of the anticipated traffic and transport impacts of the proposed Project, including consideration of the following:

- Existing conditions of the subject site and transport network (desktop review)
- Traffic movement estimates generated by the proposed wind farm primarily during the construction phase and their distribution (as operation phase traffic movements are expected to be low)
- Preliminary review of the delivery route of the largest components between Port of Geelong and the site (over size over mass (OSOM) route).

While preparing this assessment, a desktop review of the Project Area and its environs has been completed, development plans reviewed, and all relevant traffic data collected and analysed.

Relevant standards and guidelines relied upon are noted and referenced as necessary throughout this report.

1.2 Assumptions and limitations

The assumptions and limitations of this report are as follows:

- The nominated description of the Project, its components and layout have been provided by Neoen on 14 March 2023 and have been used as the basis for this assessment and the conclusions developed.
- No site assessment has been undertaken. This assessment has been completed using desktop information only.
- No traffic surveys or stakeholder engagement has been undertaken.

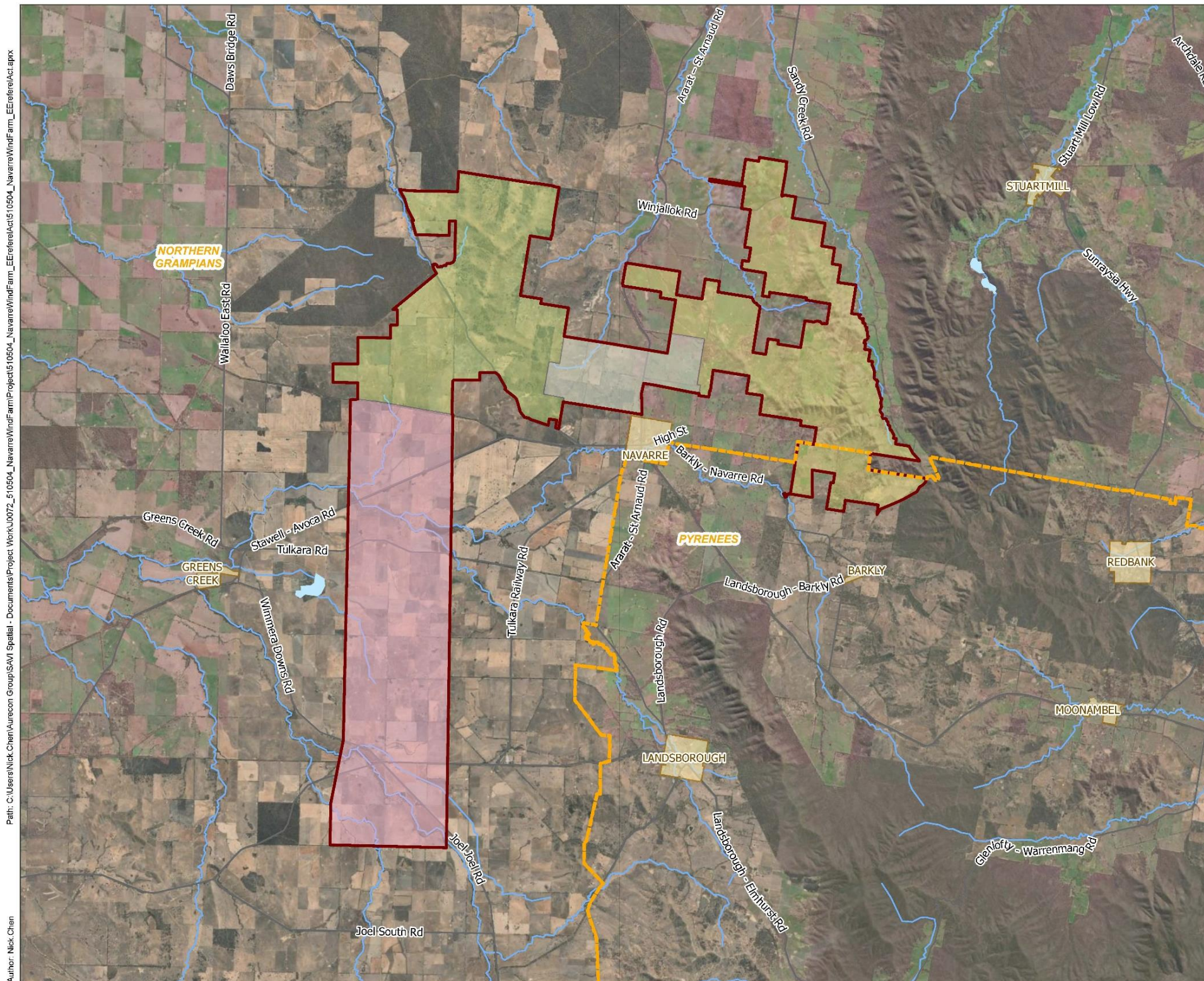
2 Project overview

2.1 Project location

The Project comprises approximately 18,404 hectares (ha) of predominantly private land immediately north of Navarre in north-western Victoria (Project Area). The Project Area consists of four (4) main sub-areas:

- Wind Farm Project Area – Eastern Layout: Approximately 5,266 ha located to the east of Ararat Street-Arnaud Road and west of Kara Kara National Park.
- Wind Farm Project Area – Western Layout: Approximately 4,873 ha located to the west of Ararat Street-Arnaud Road and east of Morri Morri Nature Conservation Reserve.
- Transmission Line Project Area – Eastern and Western Layout Link: Approximately 1,272 ha investigation corridor located between the Eastern Layout and Western Layout.
- Transmission Line Project Area – Bulgana Terminal Station Connection: Approximately 6,993 ha investigation corridor located between the Eastern Layout and Bulgana Terminal Station.

The location of the Project and the Project Area is shown in Figure 1.



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Author: Nick Chen

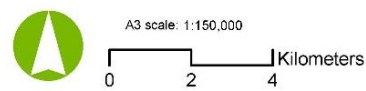


Legend

- Local Government Area
- Town
- Railway
- Road
- Watercourse
- Waterbody
- Project Area
- Wind Farm Project Area**
 - Eastern Development
 - Western Development
- Transmission Line Project Area**
 - Eastern and Western Layout Connection
 - Bulgana Terminal Station Connection

Source:
Esri, Vicmap (2023), Aurecon (2023)

Date: 9/05/2023 Version: 1



Job No: 510504
Coordinate System: GDA 1994 MGA Zone 54

**Navarre Green Power Hub
Project Area**

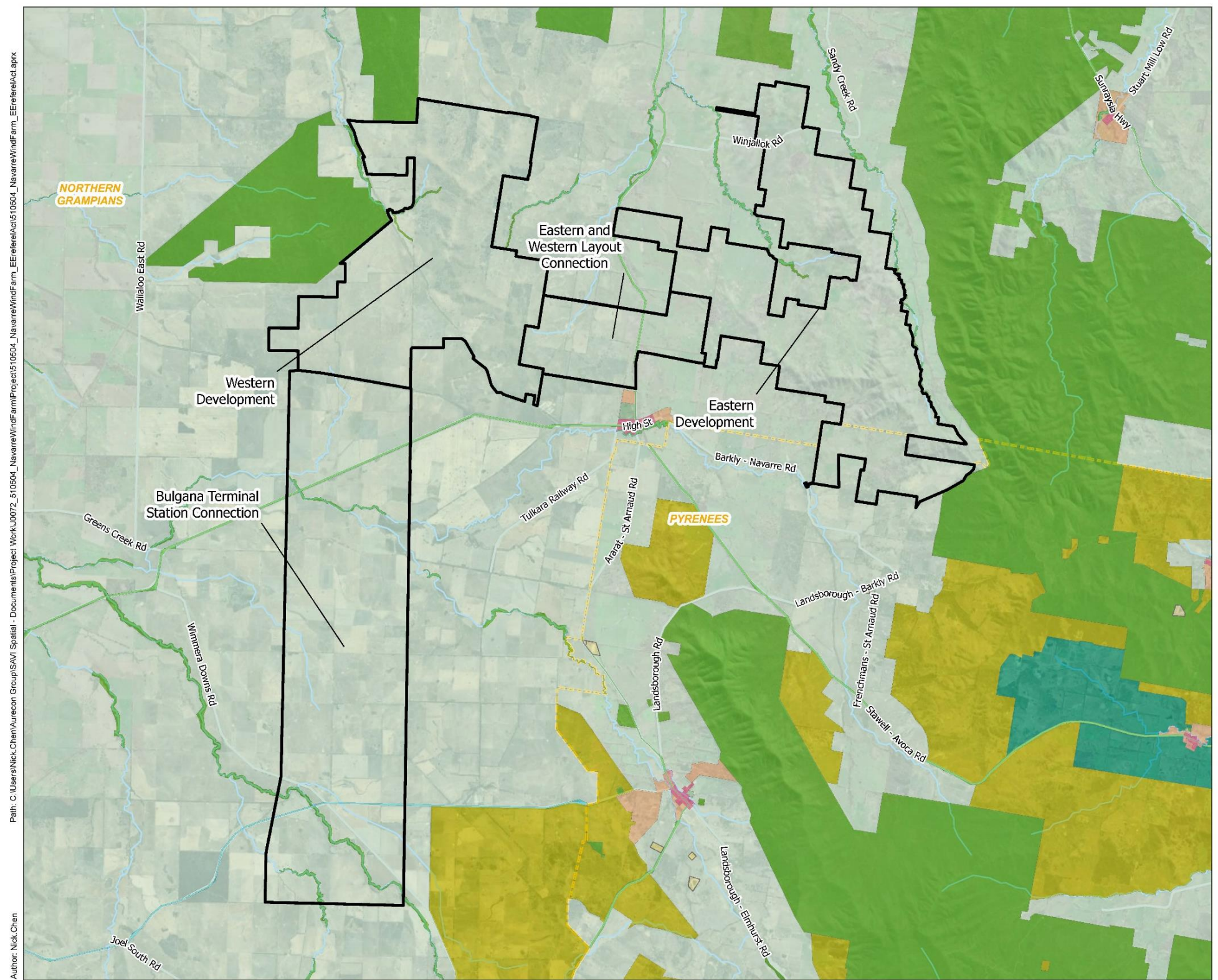
Figure 1 Project area

Under the Northern Grampians and the Pyrenees Planning Schemes, the Project is located within a Farming Zone (FZ) and parts of Public Conservation and Resource Zones (PCRZ) and Transport Road Zone 2 (TRZ2), noting two PCRZ surround it on the east and west borders of the Project Area.

There is also a small area of Rural Living Zone 2 (RLZ2) on the southern border of the Project Area. Other surrounding zones include:

- Township Zone (TZ) to the south in Navarre
- Rural Conservation Zone (RCZ) to the south-east
- Additional PCRZs to the north of the Project Area.

Planning zones within and surrounding the Project Area are presented in Figure 2.



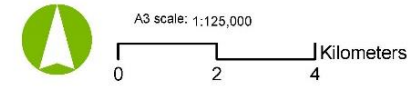
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 Author: Nick Chen



- Legend**
- Project Area
 - Local Government Area
 - Watercourse
 - Road
- Planning zones**
- FZ - Farming Zone
 - LDRZ - Low Density Residential Zone
 - PCRZ - Public Conservation and Resource Zone
 - PPRZ - Public Park and Recreation Zone
 - PUZ1 - Public Use Zone-Service and Utility
 - PUZ5 - Public Use Zone-Cemetery/Crematorium
 - PUZ6 - Public Use Zone-Local Government
 - RAZ - Rural Activity Zone
 - RCZ - Rural Conservation Zone
 - RLZ - Rural Living Zone
 - TRZ2 - Transport Zone 2-Principal Road Network
 - TRZ3 - Transport Zone 3-Significant Municipal Road
 - TZ - Township Zone

Source:
Esri, Vicmap (2023), Aurecon (2023)

Date: 9/05/2023 Version: 1



Job No: 510504
Coordinate System: GDA 1994 MGA Zone 54

**Navarre Green Power Hub
Planning Zones**

Figure 2 Project land zoning map



2.2 Project description

The Project would have a nominal capacity of around 600 MW and would incorporate a total of 102 wind turbines, split across two areas:

- The Wind Farm Project Area – Eastern Layout, which would consist of 50 wind turbines across approximately 5,266 ha of land.
- Wind Farm Project Area – Western Layout, which would consist of 52 wind turbines across approximately 4,873 ha of land.

The Project would include a 220 kV transmission line between the Western and Eastern Layouts and a 220kV transmission line between the western development and Bulgana Terminal Station.

In addition to the turbines and transmission lines, the Project would also include the permanent and temporary infrastructure listed in Table 1 and Table 2 below.

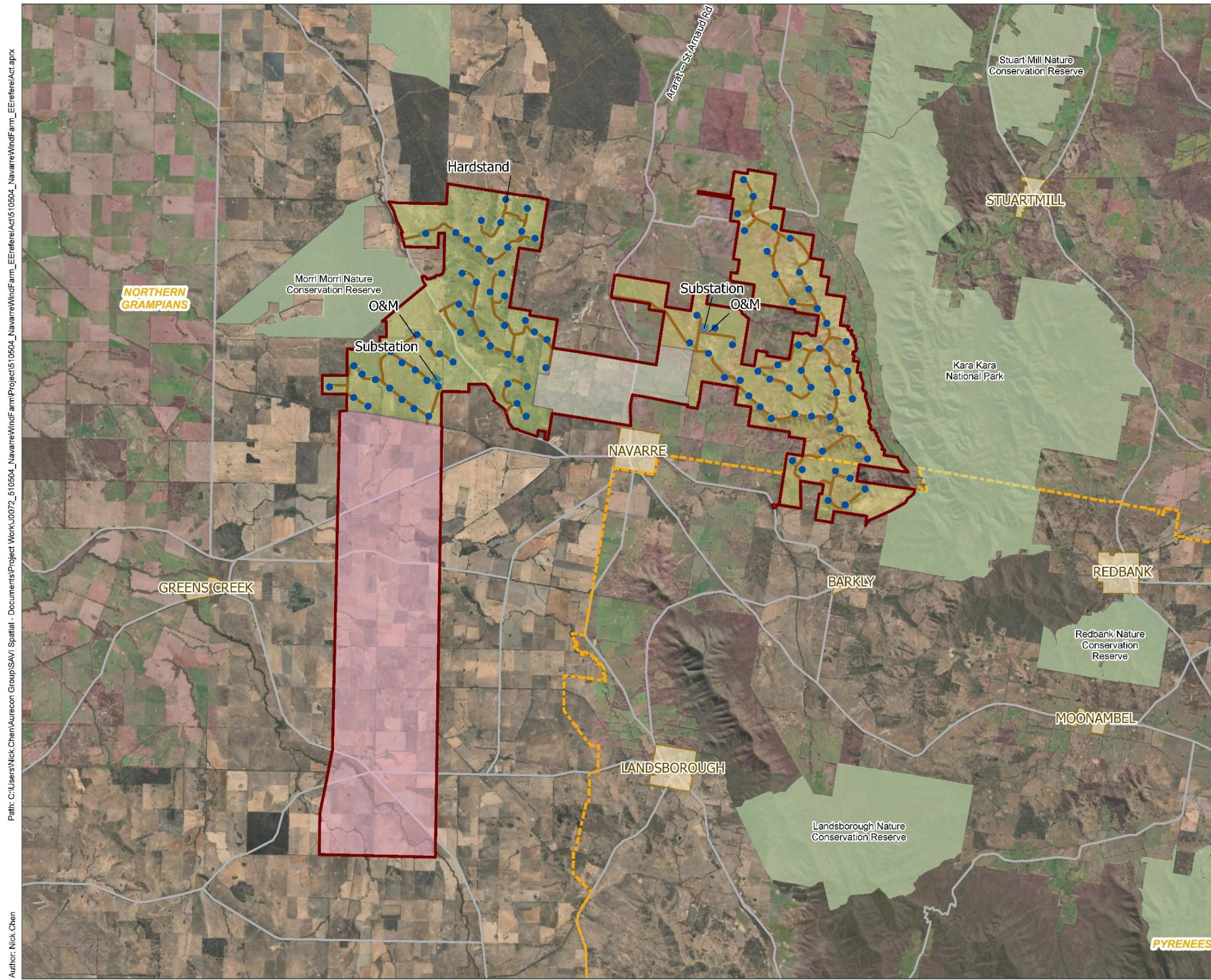
Table 1 Infrastructure associated with Wind Farm Area - Eastern Layout

The Wind Farm Project Area – Eastern Layout	
Permanent	Temporary
<ul style="list-style-type: none"> ■ A substation (up to 10ha) ■ Hardstand and laydown areas surrounding each turbine ■ Access tracks and site access points. It is expected the site access points would be at one location on Barkly-Navarre Road, one location on Ararat-St Arnaud Road and one location on Winjallock Road. ■ Operations and maintenance building and laydown ■ A Battery Energy Storage System with a capacity of 600MW / 1200MWh ■ Road upgrades to the local roads ■ Meteorological monitoring masts ■ Internal power collection stations ■ Internal underground cabling ■ A quarry to source raw material required for construction and maintenance during operations. 	<ul style="list-style-type: none"> ■ A construction office and compounds. This would include site offices, car parking, storage and amenities. ■ A concrete batching plant.

Table 2 Infrastructure associated with Wind Farm Area - Western Layout

The Wind Farm Project Area – Western Layout	
Permanent	Temporary
<ul style="list-style-type: none"> ■ A substation (up to 10ha) ■ Hardstand and laydown areas surrounding each turbine. ■ Access tracks and site access points. It is expected the site access points would be at one location on Callawadda-Navarre Road and three locations on Bolangum Inn Road. ■ Operations and maintenance building and laydown. ■ Road upgrades to the local roads. ■ Meteorological monitoring masts. ■ Internal power collection stations. ■ Internal underground cabling. ■ A quarry to source raw material required for construction and maintenance during operations. 	<ul style="list-style-type: none"> ■ A construction office and compounds. This would include site offices, car parking, storage and amenities. ■ A concrete batching plant.

The proposed layout of the Project is shown in Figure 3.



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Author: Nick.Chen

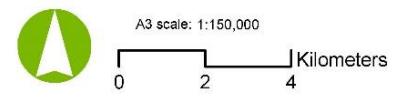


Legend

- National/Regional Park
- Local Government Area
- Town
- Railway
- Road
- Project**
- Project Area
- Proposed Roads and Access Routes
- Proposed Turbine Locations
- Wind Farm Project Area**
- Eastern Development
- Western Development
- Transmission Line Project Area**
- Eastern and Western Layout Connection
- Bulgana Terminal Station Connection

Source:
Esri, Vicmap (2023), Aurecon (2023)

Date: 10/05/2023 Version: 1



Job No: 510504
Coordinate System: GDA 1994 MGA Zone 54

**Navarre Green Power Hub
Proposed Project Layout**

Figure 3 Proposed project layout

2.3 Construction phase

The construction phase is discussed below. It is noted that the Proponent has not provided a schedule for the Project, rather an indicative construction timeframe of 24 months consisting of civil works, mechanical and structural, electrical works, and testing and commissioning has been assumed.

For the purposes of this assessment, it is anticipated that construction for both Eastern and Western layouts would occur concurrently. The highest traffic impact is expected to occur during civil construction works and Wind Turbine Generator (WTG) component delivery and erection.

2.3.1 Vehicle types

During the construction phase, vehicle movements are expected to consist of:

- Light vehicles for construction worker movements to and from the site
- OSOM and/or OD (over dimension) vehicles for WTG component delivery
- Other heavy vehicles for component and delivery movements, such as aggregate and cement deliveries, other materials and equipment (e.g. rigid trucks, truck and trailer combinations, etc.).

Construction vehicle types will be confirmed following appointment of a construction contractor. Prior to construction commencing, appropriate traffic management measures would be identified for each vehicle type as necessary and detailed in an appropriate Construction Traffic Management Plan (CTMP) or Traffic Management Plan (TMP). This is especially the case for OD / OSOM vehicles.

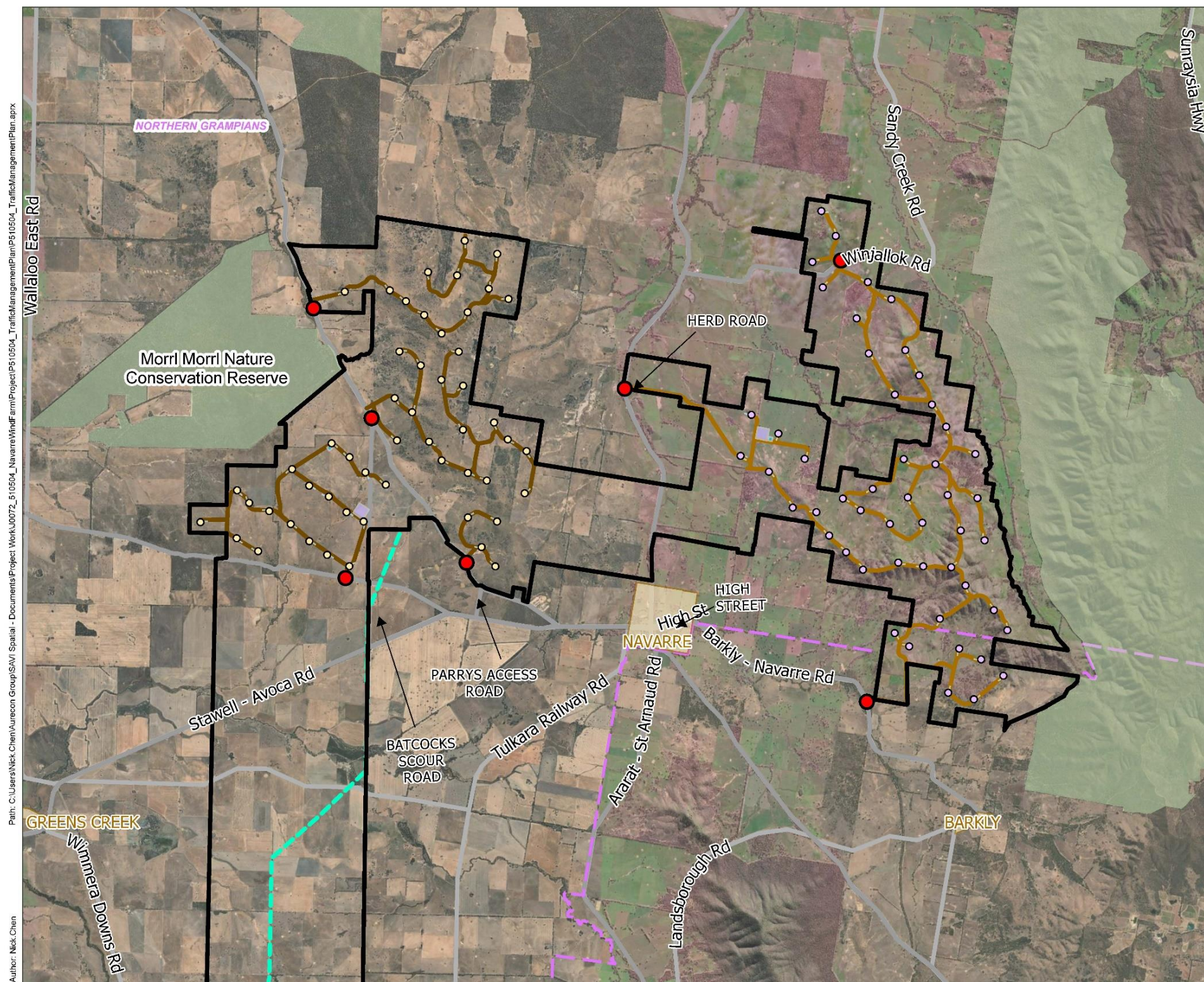
2.3.2 Site access and routes

As part of the Project, permanent access points and internal access tracks would be constructed. The internal access tracks to the turbine locations (shown in brown) and the site access points (shown in red) are illustrated in Figure 4 on the following page.

There are currently expected to be seven (7) access points which will be used during construction. These are located on:

- Barkly – Navarre Road
- Ararat – St Arnaud Road (via Herd Road)
- Winjallock Road
- Callawadda – Navarre Road
- Bolangum Inn Road (three access points).

The construction site access routes, road or lane closures or other traffic management treatments, have not been defined by the Proponent at this stage.



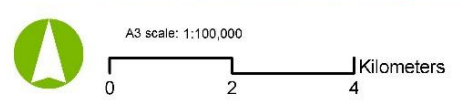
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 Author: Nick.Chen



- Legend**
- Project Area
 - Township
 - Local Government Area
 - Bulgana Transmission Line
 - Road
 - Access points
- Turbine Locations**
- Eastern Turbine
 - Western Turbine
- Proposed roads and access routes**
- Western Access Tracks
 - Eastern Access Tracks
- Ancillary Structures**
- O&M buildings
 - Substation
 - Hardstand Construction
 - National/Regional Park

Source:
Esri, Vicmap (2023), Aurecon (2023)

Date: 9/05/2023 Version: 2



Job No: 510504
Coordinate System: GDA 1994 MGA Zone 54

Navarre Green Power Hub
Site Access Points and Internal Access Track Layout

Figure 4 Site access points and internal access track layout

2.4 Operation and maintenance phase

The operational life is expected to be between 15 to 20 years. Operation and maintenance phase activities are expected to consist of the following:

- Use of operations and maintenance building
- Routine servicing and maintenance of the wind turbines, battery energy storage system (BESS), substations and transmission network
- Maintenance of internal access tracks
- Environmental monitoring.

The access points and internal access tracks are as described in Section 2.3.2 and illustrated in Figure 4.

Though major works are not routine, there is expectation that infrequent major works may need to occur that would require the use of an OSOM vehicle.

2.5 Decommissioning phase

Following the operational stage of the Project, it will be decommissioned and the land will be rehabilitated. This will include the removal of all above ground non-operational equipment and rehabilitation of construction areas and access tracks.

3 Existing conditions

3.1 Transport network

3.1.1 Road network

The characteristics of the existing road network are summarised in Table 3 and shown in Figure 5.

Most of the roads have a posted speed limit of 100 km/h, noting reduced limits in the Navarre town centre. There are no provisions for bicycles or pedestrians on the roads assessed.

Some of the roads are VicRoads' B-Double, OSOM, or higher mass limit (HML) approved routes. None of the roads are OD approved routes.

Table 3 Road network existing conditions

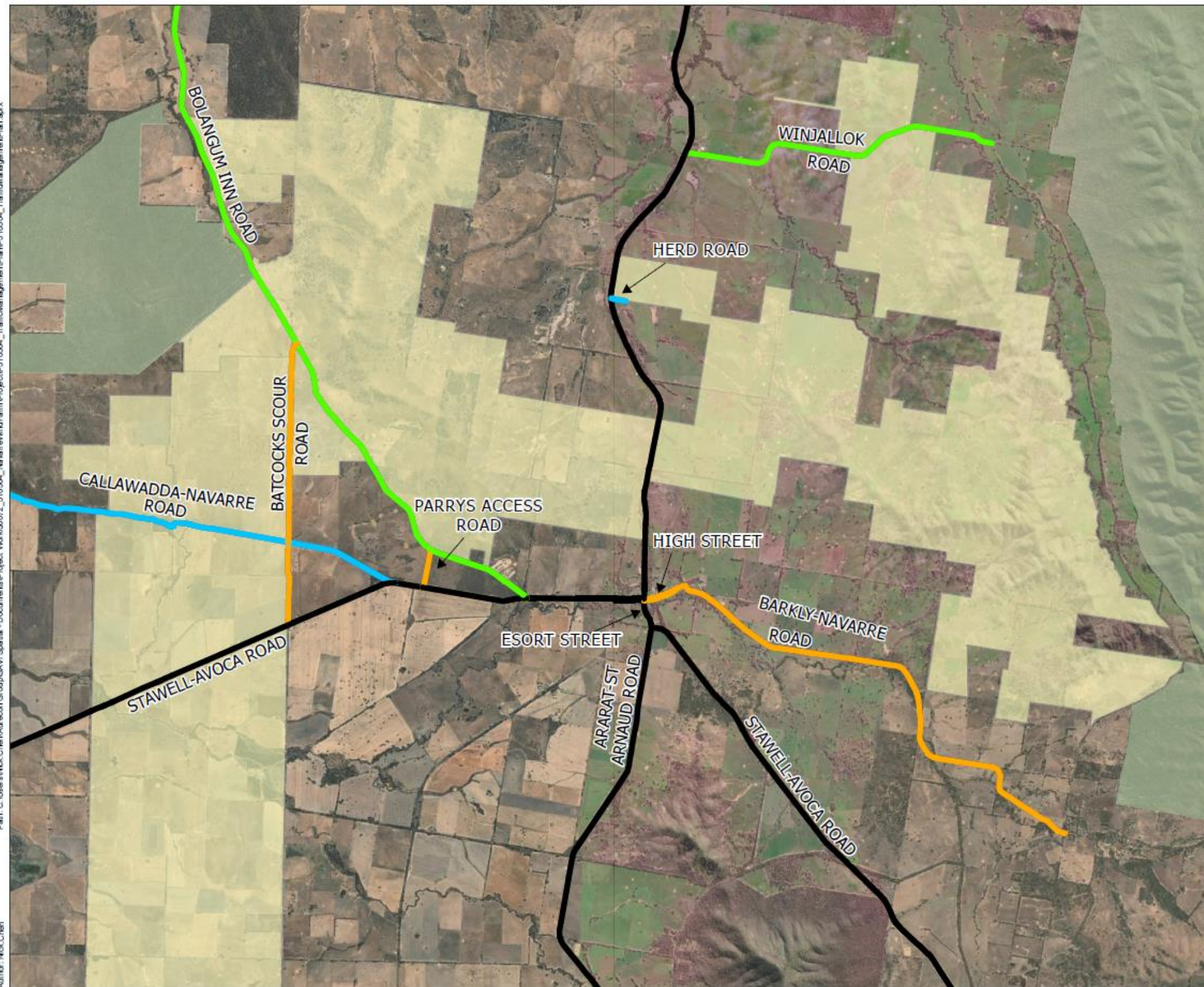
Road name / segment		Road authority	Hierarchy	Posted speed limit (km/hr)	Wearing course	Number of lanes (two-way total)	Approx. lane width (m)	Approx. shoulder width (m)	Shoulder type	Carriageway width (m)	B-Double approved	OSOM approved	HML approved	
Stawell-Avoca Road	West of Tulkara Railway Road to Tulkara Railway Road	DTP	Arterial	100	Sealed	Two	2.8	1.5	Gravel	8.6	Y	C	Y	
	Tulkara Railway Road to Escort Street		Arterial	60	Sealed	Two	2.8	1.5	Gravel	8.6	Y	C	Y	
	Escort Street to Jacks Lane		Arterial	80	Sealed	Two	2.7	1.0	Gravel	7.4	Y	C	Y	
	Jacks Lane to east of Jacks Lane		Arterial	100	Sealed	Two	2.7	1.0	Gravel	7.4	Y	C	Y	
Ararat-St. Arnaud Road	North of Stawell-Avoca Road		Arterial	100	Sealed	Two	2.9	1.2	Gravel	8.2	Y	Y	Y	
	South of Stawell-Avoca Road		Arterial	100	Sealed	Two	2.6	0.5	Gravel	6.2	Y	Y	Y	
Escort Road			Arterial	70	Sealed	Two	2.7	-	-	-	5.4	Y	Y	Y
Herd Road			Northern Grampians Shire	Track	100	Unsealed	One	3.1	0.8	Gravel	4.7	-	-	-
Bolangum Inn Road		Collector		100	Unsealed	Two	3.0	-	-	-	6.0	-	-	-
Callawadda-Navarre Road		Track		100	Unsealed	Two	3.3	-	-	-	6.6	-	-	-
Winjallock Road		Collector		100	Partially sealed	Two	3.0	-	-	-	6.0	-	-	-
High Street		Access		60	Sealed	Two	2.5	-	-	-	5	-	-	-
Parrys Access Road		Access		100	Unsealed	Two	2.9	-	-	-	5.8	-	-	-
Batcocks Scour Road		Access		100	Unsealed	One	4.3	-	-	-	4.3	-	-	-
Barkly-Navarre Road		Northern Grampians Shire / Pyrenees Shire		Access	100	Unsealed	One	3.5	1.2	Gravel	5.9	-	-	-

Note: DTP = Department of Transport and Planning. Y = Yes. C = Conditionally Approved. Road widths measured from Vicmap API Aerial Imagery. Carriageway width = lane + shoulder.



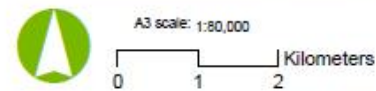
Legend

- Project Area
- National/Regional Park
- Road**
- Arterial Roads
- Collector
- Tracks
- Access



Source:
Esri, Delwp (2023), Aurecon (2023)

Date: 16/05/2023 Version: 1



Job No: 510504
Coordinate System: GDA 1994 MGA Zone 54

Navarre Green Power Hub
Road Network

Figure 5 Road network

3.2 Public transport

The only public transport service within the vicinity of the Project Area is the PTV *St Arnaud - Stawell via Ararat* bus route that travels along Ararat – St Arnaud Road, stopping on the corner of Ararat – St Arnaud Road and Stawell – Avoca Road at the following times:

- To Stawell: Tuesday, 9:00 am to 10:55 am
- To St Arnaud: Tuesday, 1:15 pm to 3:05 pm.

There is an identified school bus route operating within the vicinity of the Project Area; the Landsborough-Navarre bus route. This is privately operated by the Marian College Ararat for their students¹.

It appears to only operate in the afternoon from 3:50 pm departing from Stawell stopping at Landsborough and Navarre, before returning to Stawell.

3.3 Active transport

There are currently no formal pedestrian or cyclist paths within the general vicinity of the Project Area.

3.4 Traffic volumes

There are currently no recorded traffic volumes for Council roads. Given the adjacent rural land uses and lack of residential development, traffic volumes on these roads are expected to be low.

Existing available traffic data has been collated from DoT open data traffic volumes for arterial roads and is summarised in Table 4. The roads with traffic volume data available show that they currently have low daily traffic and that there is capacity available.

Table 4 Existing traffic volumes

Location		Direction	Peak hour [1]		Daily	Heavy vehicles
			AM Peak	PM Peak		
Stawell-Avoca Road (North)		South-west	20	20	195	19%
		North-east	19	19	192	17%
		<u>Two-way total</u>	<u>39</u>	<u>39</u>	<u>387</u>	<u>18%</u>
Ararat-St Arnauds Road	Wimmera Highway to Stawell - Avoca Road (North of Escort Street)	South	15	15	153	16%
		North	15	15	151	17%
		<u>Two-way total</u>	<u>30</u>	<u>30</u>	<u>304</u>	<u>17%</u>
	Escort Street	South	15	15	146	14%
		North	15	15	149	14%
		<u>Two-way total</u>	<u>30</u>	<u>30</u>	<u>295</u>	<u>13%</u>
	Stawell – Avoca Road (South of Escort Street) to Pyrenees Highway	South	8	8	79	24%
		North	8	8	82	20%
		<u>Two-way total</u>	<u>16</u>	<u>16</u>	<u>161</u>	<u>25%</u>

[1] vehicles per hour assumed 10% daily traffic volume, AADT (daily volume) from Victoria DoT Open Data Hub

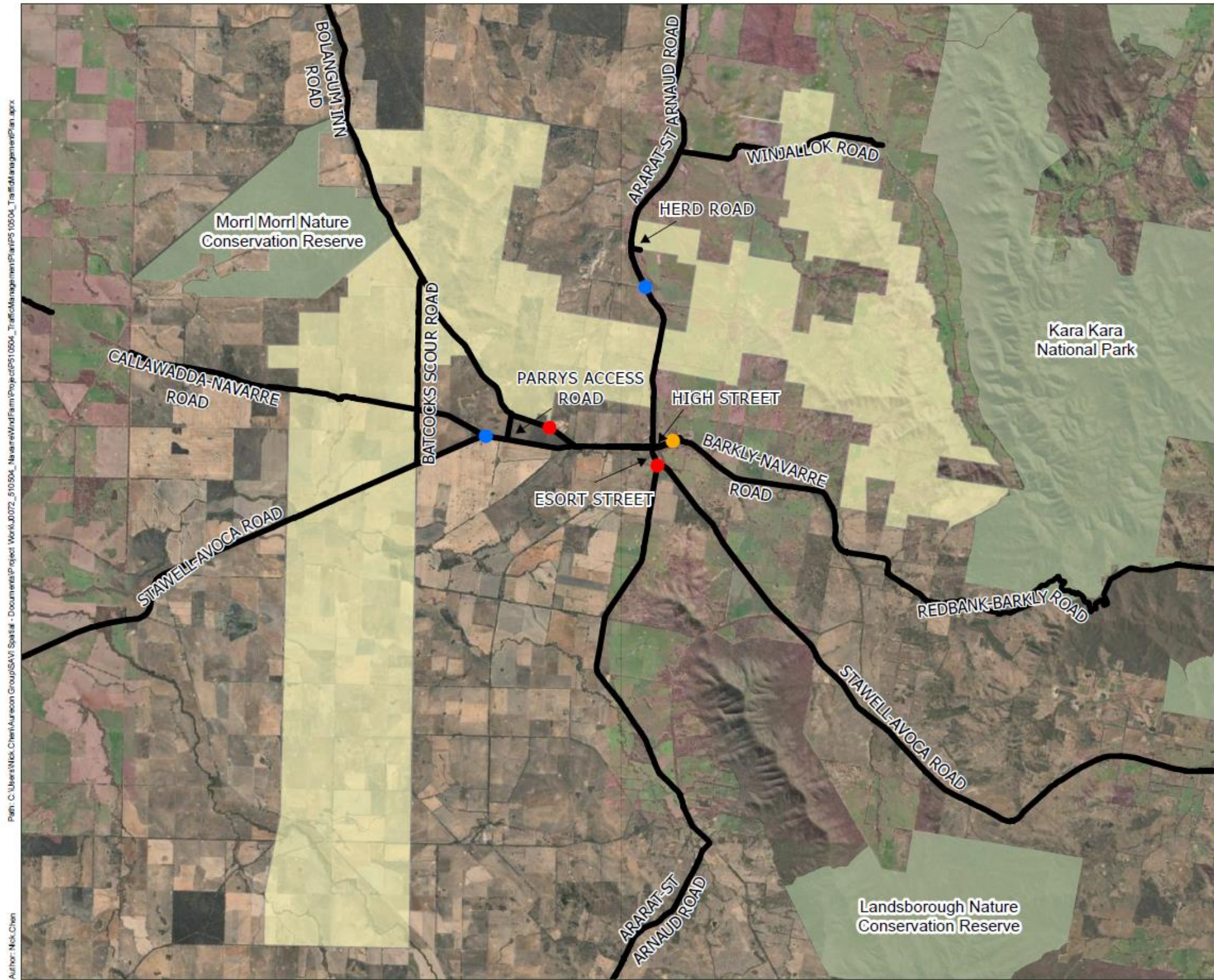
¹ <https://www.mcararat.catholic.edu.au/enrolment/transportation>

3.5 Crash history

Information from 2016 to 2020 shows that there have been five crashes within the immediate vicinity of the Project Area (Figure 6). Of these crashes, one resulted in a serious injury and two resulted in fatalities. Details of the serious and fatal crashes are summarised in Table 5 and locations are shown in Figure 6. Regarding the two minor crashes, both were single vehicle collisions with an object/parked car. None were alcohol related.

Table 5 Crash history (Data source: Victoria DoT Open Data Hub)

No.	Location	Date	Severity	Crash type	Details
1	Bolangum Inn Road	May 2016	Fatality	Fell in/from vehicle	Farming incident unrelated to traffic, daytime
2	Ararat-St Arnaud Road	February 2017	Other	Left off carriageway into object/parked vehicle	Collision with a fixed object, single vehicle, daytime
3	Escort Street / Stawell - Avoca Road intersection (South of Escort Street)	May 2018	Fatality	Left off carriageway into object/parked vehicle	Vehicle failed to yield at stop sign, resulting in four fatalities and one injury, dark lighting
4	High Street	June 2019	Serious injury	Off right bend into object/parked vehicle	Drunk driver with two passengers collided with a fixed object, dark lighting
5	Stawell-Avoca Road	July 2018	Other	Off left bend into object/parked vehicle	Collision with a parked car, single vehicle, daytime



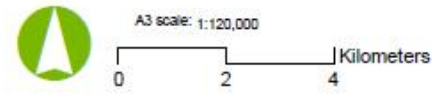
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 Author: Mick Chen



- Legend**
- Project Area
 - National/Regional Park
 - Road
- Traffic incident**
- Fatal accident
 - Serious injury accident
 - Other injury accident

Source:
Esri, Delwp (2023), Aurecon (2023)

Date: 16/05/2023 Version: 1



Job No: 510504
Coordinate System: GDA 1994 MGA Zone 54

Navarre Green Power Hub
Crash History

Figure 6 Crash history



4 Traffic assessment

4.1 Construction phase

4.1.1 Traffic generation

Workers

Construction is anticipated to occur seven days a week, with the proposed hours of 7:00 am – 6:00 pm. The number of full-time workers expected on site is approximately 240 per day during peak construction, as provided by the Proponent.

To determine the worst-case peak hour traffic volumes generated by the Project it is conservatively assumed that workers will individually travel by vehicles and travel to site would occur between 6:00 am – 7:00 am and travel from site would occur between 6:00 pm – 7:00 pm (representing the worker AM and PM peak hours).

On the above basis, the peak traffic generation for light vehicles is up to 240 vehicles to site in the AM and PM peak hours (equating to up to 480 light vehicle movements per day).

Construction vehicles

During working hours there would be light and heavy vehicles travelling to and from the various parts of the Project Area to deliver materials and equipment and conduct construction operations (amongst other tasks).

The average daily heavy vehicles have been conservatively estimated, based on previous projects, as 120 vehicles one-way for deliveries and other tasks (noting a construction program and schedule is not currently available and this assumes a confluence of parallel construction activities which needs to be confirmed when the Project is further developed). Notwithstanding, the peak volumes are anticipated to occur during civil construction works and/or WTG component delivery and construction.

Given the site work hours are 7:00 am – 6:00 pm it is assumed that deliveries and equipment will be travelling to and from site between approximately 8:00 am – 5:00 pm (over 9 hours). No deliveries are assumed to occur in the first hour (workers undertaking pre-starts and setting up) and the last hour (workers preparing to leave site).

The average daily and hourly construction traffic volumes are 240 daily heavy vehicles trips two-way and 27 heavy vehicle trips two-way in a single hour which will be noted hereafter as the midday peak hour.

Total traffic generation

The total traffic generation for the peak construction day and peak hours are summarised in Table 6.

Table 6 Total traffic generation

Type	No. vehicles per day	Vehicle Movements			
		AM Peak (one-way)	PM Peak (one-way)	Midday Peak (two-way)	Daily
Workers	240	240	240	-	480
Construction heavy vehicles	120	-	-	27	240
Total	360	240	240	27	720

4.1.2 Traffic distribution

Workers

Based on information provided by the Proponent, it is assumed workers will originate from the following areas:

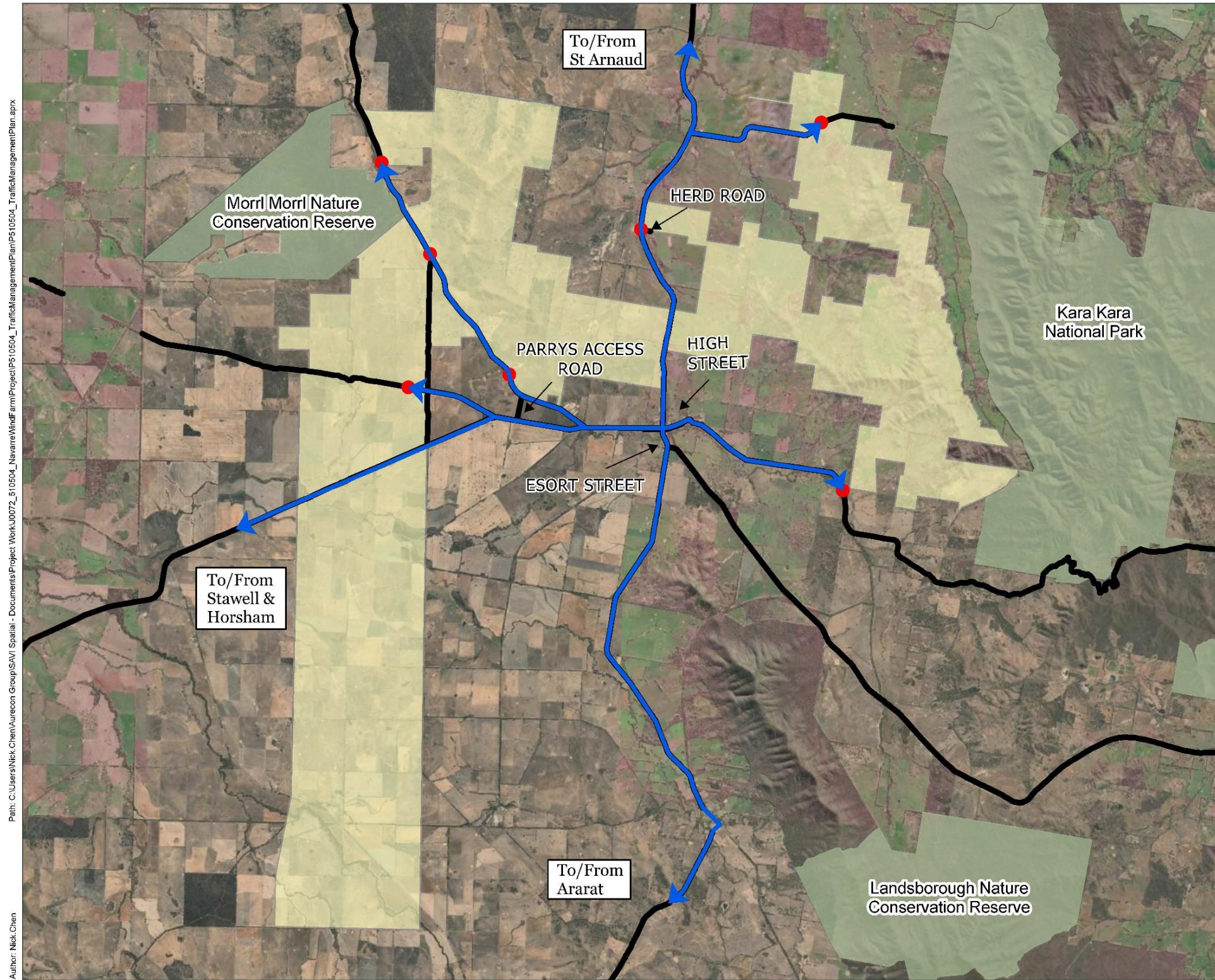
- 33% from St Arnaud
- 33% from Stawell
- 17% from Horsham
- 17% from Ararat.

No main site access has been identified however it is assumed that half the workers will travel to the Eastern Layout and half to the Western Layout. For the purpose of this assessment the most direct route via arterial roads to each access point was chosen with the exception of local roads Batcocks Sour Road and Parrys Access Road. These roads have been avoided as there are alternatives in better condition and it reduces the need for potential road upgrades.

The distribution for workers trips is summarised in Table 7 with a map illustrating these routes in Figure 7 on the following page.

Table 7 Construction worker distribution

Origin	Primary access road	Distribution to/from access point(s)				
		Western development		Eastern development		
		Callawadda-Navarre Road	Bolangum Inn Road	Herd Road	Winjallok Road	Barkly – Navarre Road
St Arnaud	Ararat-St Arnaud Road (N)	Stawell-Avoca Road (W), Callawadda-Navarre Road	Stawell-Avoca Road (W), Bolangum Inn Road	Herd Road	Winjallok Road	High Street, Barkly – Navarre Road
Ararat	Ararat-St Arnaud Road (S), Escort Street	Stawell-Avoca Road (W), Callawadda-Navarre Road	Stawell-Avoca Road (W), Bolangum Inn Road	Ararat-St Arnaud Road (N), Herd Road	Ararat-St Arnaud Road (N), Winjallok Road	High Street, Barkly – Navarre Road
Stawell and Horsham	Stawell-Avoca Road (W)	Callawadda-Navarre Road	Bolangum Inn Road	Ararat-St Arnaud Road (N), Herd Road	Ararat-St Arnaud Road (N), Winjallok Road	Ararat-St Arnaud Road, High Street, Barkly – Navarre Road

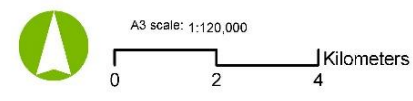


- Legend**
- Project Area
 - National/Regional Park
 - Road
 - Construction Worker Distribution
 - Access points

Source:
Esri, DeLwp (2023), Aurecon (2023)

Date: 9/05/2023 Version: 1

Path: C:\Users\Nick.Chen\Aurecon Group\SAVI Spatial - Documents\Project Work\0072_510504_NavarreWindFarm\Project\PS10504_TrafficManagementPlan.aprx
Author: Nick.Chen



Job No: 510504
Coordinate System: GDA 1994 MGA Zone 54

Navarre Green Power Hub
Construction Worker Distribution

Figure 7 Construction worker distribution

Construction vehicles

The Proponent has not provided construction vehicle origins or routes at this stage of the Project, only that wind turbine components are to arrive from either the Port of Geelong or the Port of Portland.

The following assumptions have been made for distribution of construction vehicles:

- The wind turbines, substation components, BESS are to come from Stawell-Avoca Road (south)
- Deliveries of materials are to come from quarries in the area in which are closest to the south of the Project Area
- An even split of the heavy vehicle volumes originating between the three arterial roads ((via Stawell-Avoca Road (West and South), Ararat-Arnaud Road).
- Similar to the worker distribution, it is assumed that half the construction vehicles will travel to the Eastern Layout and half to the Western Layout.

The estimated traffic distribution for the construction vehicles is summarised in Table 8.

Table 8 Construction vehicle distribution

Primary road	Distribution to/from access point(s)				
	Western development			Eastern development	
	Callawadda-Navarre Road	Bolangum Inn Road	Herd Road	Winjallok Road	Barkly – Navarre Road
Stawell-Avoca Road (West)	Callawadda-Navarre Road	Bolangum Inn Road	Ararat-St Arnaud Road (North), Herd Road	Ararat-St Arnaud Road (North), Winjallok Road	High Street, Barkly – Navarre Road
Ararat-St Arnaud Road (South)	Escort Street, Stawell-Avoca Road (West), Callawadda-Navarre Road	Escort Street, Stawell-Avoca Road (West), Bolangum Inn Road	Escort Street, Ararat-St Arnaud Road (North), Herd Road	Escort Street, Ararat-St Arnaud Road (North), Winjallok Road	Escort Street, High Street, Barkly – Navarre Road
Stawell-Avoca Road (South)	Escort Street, Stawell-Avoca Road (West), Callawadda-Navarre Road	Escort Street, Stawell-Avoca Road (West), Bolangum Inn Road	Escort Street, Ararat-St Arnaud Road (North), Herd Road	Escort Street, Ararat-St Arnaud Road (North), Winjallok Road	Escort Street, High Street, Barkly – Navarre Road

4.1.3 Traffic summary

The above-described traffic generation and distribution have been applied at a high-level to the Project Area as the maximum volume per road during construction as per Table 9. It is anticipated that the highest traffic volume produced during the construction period will be up to 365 vehicle per day on primary Project roads at various time periods. The peak volume per road will not occur at the same time as this will be dependent on the construction schedule, staging and access points.

Table 9 Construction traffic movements (peak vehicle volume per road)

Road	Daily			Hourly								
	LV	HV	Total	AM Peak			Midday Peak			PM Peak		
				LV	HV	Total	LV	HV	Total	LV	HV	Total
Ararat-St Arnaud Road (North)	240	125	365	120	-	120	-	14	14	120	-	120
Ararat-St Arnaud Road (South)	82	90	172	41	-	41	-	10	10	41	-	41
Stawell-Avoca Road (West)	240	125	365	120	-	120	-	14	14	120	-	120
Stawell-Avoca Road (South)	-	90	90	-	-	-	-	10	10	-	-	-
Escort Street	82	180	262	41	-	41	-	20	20	41	-	41
Callawadda-Navarre Road	240	125	365	120	-	120	-	14	14	120	-	120
Bolangum Inn Road	240	125	365	120	-	120	-	14	14	120	-	120
Herd Road	240	125	365	120	-	120	-	14	14	120	-	120
Winjallock Road	240	125	365	120	-	120	-	14	14	120	-	120
High Street	240	125	365	120	-	120	-	14	14	120	-	120
Barkly – Navarre Road	240	125	365	120	-	120	-	14	14	120	-	120

Traffic assessment - risks and mitigation

High level risks and mitigations have been identified for the anticipated increase in traffic volumes due to the Project. These are as follows:

- Sections of Council roads are currently unsealed and/or narrow allowing one-way traffic at a single time only. Suitable road improvements and upgrades are recommended to be investigated and implemented to support the Project's anticipated construction traffic volumes as part of the TMP. Notwithstanding, Project area road upgrades (and intersection upgrades) are expected to be required on the following local Council roads:
 - Barkly – Navarre Road
 - Herd Road
 - High Street
 - Winjallok Road
 - Callawadda – Navarre Road
 - Bolangum Inn Road

This may include treatments such as road widening, sealing, passing areas and maintaining roads during construction.

- TMPs are recommended to be implemented to communicate and manage the routes in which workers and heavy vehicles utilise during construction. This would reduce any impact on sections of roads which are not suitable for use.
- The impact is expected to be low for Escort Street, Stawell-Avoca Road and Ararat-St Arnaud Road due to them being C-Class arterial roads. Although the increase in volume is large, the overall volumes are still low.

4.1.4 Preliminary OSOM delivery vehicle route assessment

The largest typical transport vehicle for wind farm construction is the blade transport truck. The length of the blade transport truck for this Project has not yet been confirmed; however, it is expected to be in the order of up to 100 m long.

Two preliminary OSOM delivery routes have been identified (for largest OSOM vehicles carrying wind turbine components) one from the Port of Geelong and one from the Port of Portland.

Based on preliminary findings, a route from the Port of Geelong is more direct and faster than that of the Port of Portland's and is therefore recommended. Port of Portland also has multiple bridges/structures along its route which have load limits and conditional approvals.

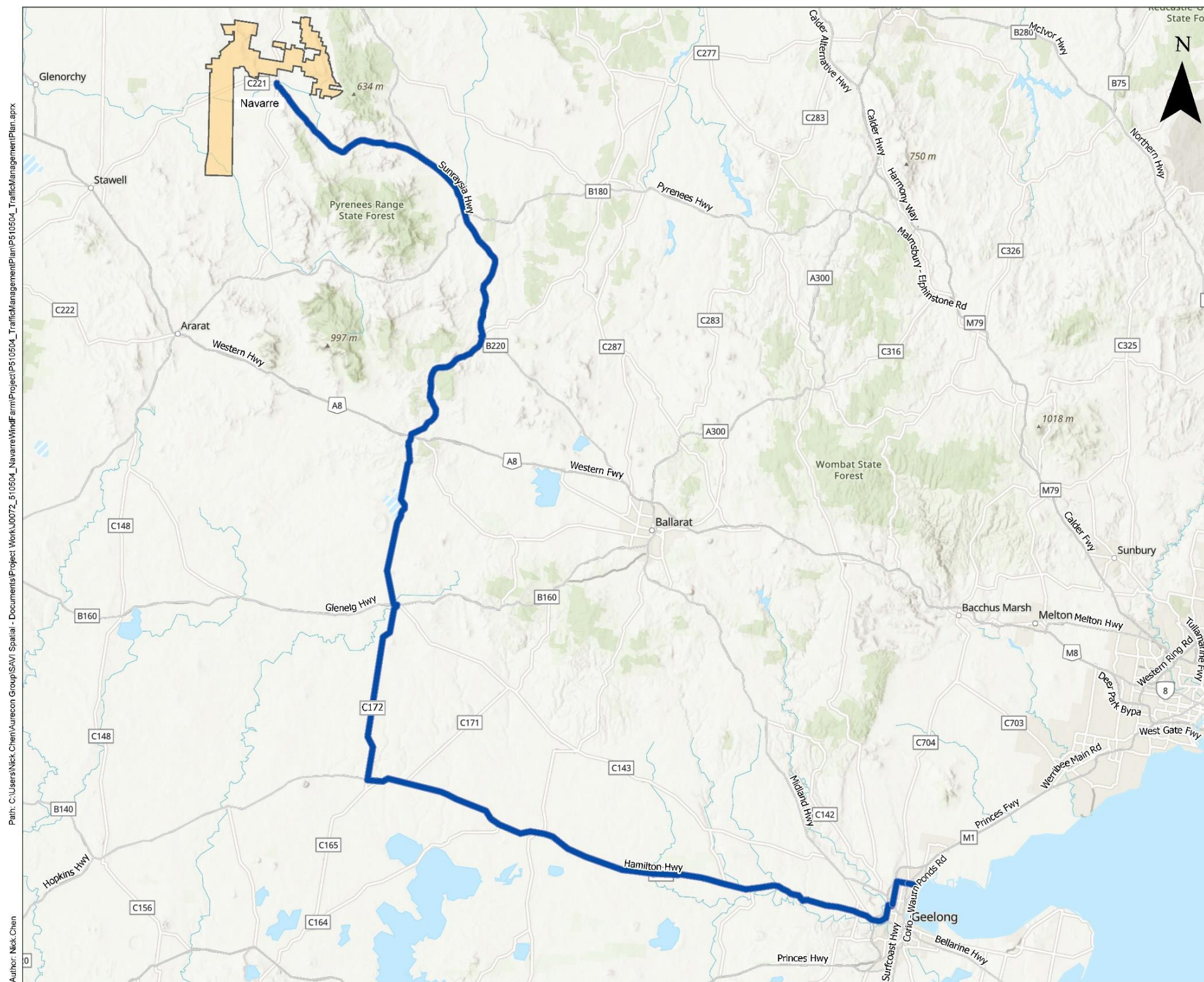
It is noted however that a detailed route assessment from the adopted port of origin (unconfirmed at this stage) to site will be required once the port of origin and custom OSOM delivery vehicles are confirmed.

Port of Geelong

The preliminary route from the Port of Geelong is summarised below and shown in Figure 8.

- Madden Avenue, right turn onto Seabeach Parade
- Left turn onto St Georges Road
- Straight onto Cox Road
- Left onto Anakie Road
- Right onto Midland Highway
- Take the left slip lane onto Geelong Ring Road (M1)

- Take left slip lane onto Hamilton Highway (B140)
- Turn right onto Lismore-Skipton Road (C172)
- Left onto Montgomery Street
- Turn right onto Beaufort Rd / Skipton Road (C172)
- Continue straight onto Lawrence Street / Albert Street / Beaufort-Lexton Road (C172)
- Left onto Sunraysia Highway (B220)
- Turn left onto Stawell-Avoca Rd (C221)
- Turn right onto Ararat-St Arnaud Rd (C241)
- Arrive at Navarre, corner of Ararat-St Arnaud Rd (C241) and Stawell-Avoca Rd (C221).



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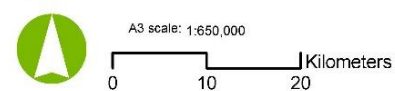
Legend

- Project Area
- Route
- Road

Source:
 Esri, DeLWP (2023), Aurecon (2023)

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Job No: 510504
 Coordinate System: GDA 1994 MGA Zone 54

Navarre Green Power Hub
 Port of Geelong to Navarre OSOM route

Figure 8 Port of Geelong to Navarre preliminary OSOM route

Table 10 shows OSOM Class 1 road approval status of each of the roads along the preliminary route from the Port of Geelong.

Table 10 Port of Geelong to Navarre preliminary OSOM route - OSOM Class 1 road approval

Road	OSOM Class 1 approval status
Madden Rd	Approved
Seabeach Pde	Uncategorised
St Georges Rd	Uncategorised
Rail level crossing	Conditionally approved
Cox Rd	Approved
Anakie Rd	Uncategorised
Rail level crossing	Uncategorised
Midland Hwy (A300)	Approved
Geelong Ring Road (M1)	Approved
Hamilton Highway (B140)	Approved
Rail level crossing	Conditionally approved
Rail level crossing	Conditionally approved
Rail level crossing	Conditionally approved
Lismore-Skipton Road (C172)	Uncategorised
Montgomery Street	Approved
Beaufort Rd / Skipton Road (C172)	Approved (with below conditions)
Beaufort-Lexton Road (C172)	
Rail level crossing	Conditionally approved
Sunraysia Hwy (B220)	Approved (with below conditions)
Rail level crossing (High Street)	Conditionally approved
Restricted bridge structure 49.5 tonne mass limit	Conditionally approved
Stawell-Avoca Rd (C221)	Approved
Ararat-St Arnaud Rd (C241)	Approved
Escort St	Approved

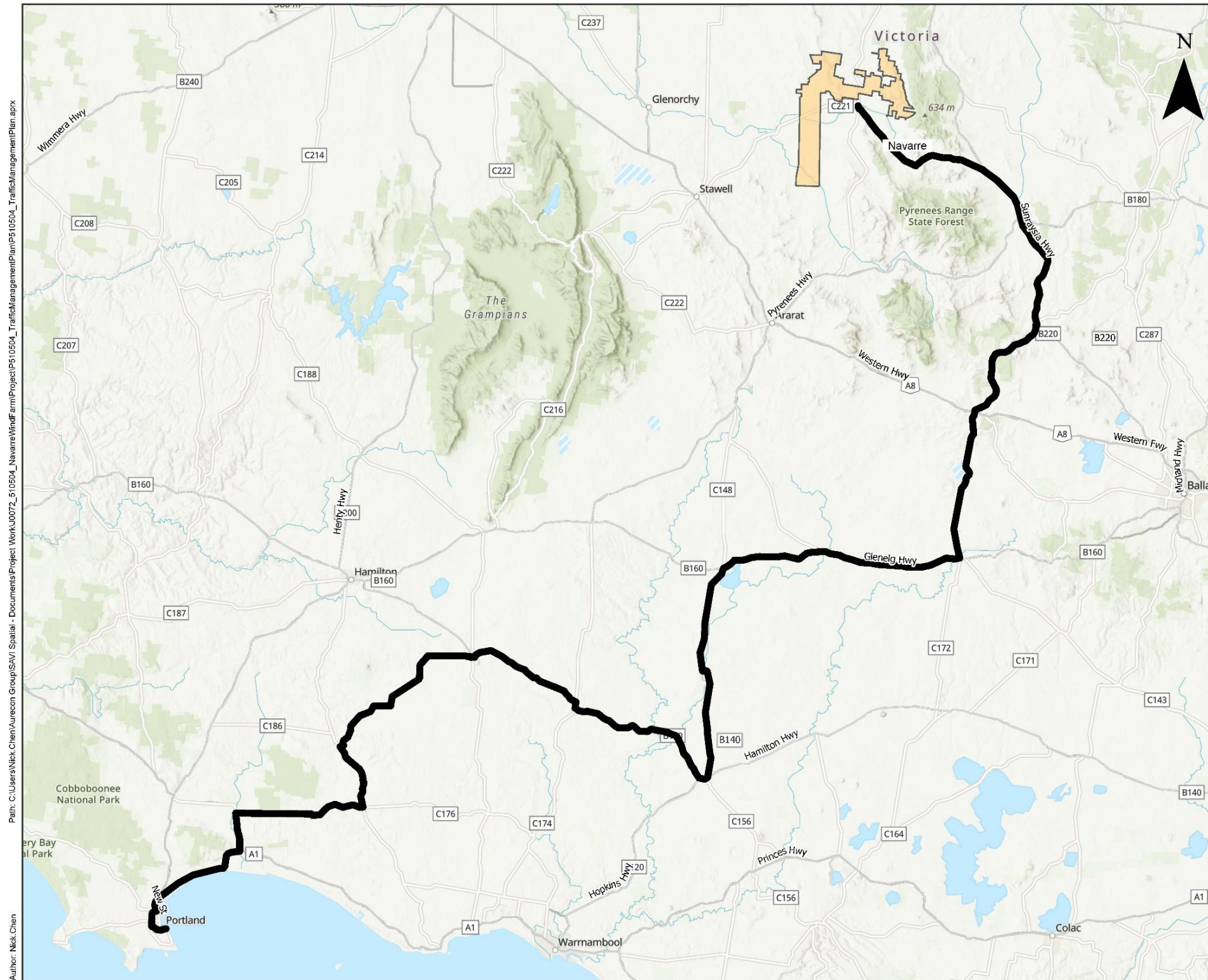
Port of Portland

Though the townships of Ararat and Horsham have approved routes that are more direct, they contain turns that are in built-up areas and potentially too constrained for blade transport vehicles. There is also a restricted level crossing at Dunkeld that prohibits the crossing of OSOM vehicles. The preliminary route avoids these however does have multiple Restricted structures with 49.5 tonne mass limits.

The preliminary route from the Port of Portland is summarised below and shown in Figure 9.

- Exit No.2 Quay Rd, turning right onto Madeira Packet Rd (C194)
- Continue straight onto Henty Hwy (A200)
- Bear left, keeping on Henty Hwy (A200)
- Turn right onto Princes Hwy (A1)
- Turn left onto Tyrendarra-Ettick Rd (C191)
- Turn right onto Woolsthorpe-Heywood Rd (C176)
- Turn left onto Hamilton-Port Fairy Rd (C184)

- Turn right onto Heckfield St (C185)
- Bear left onto MacArthur-Penshurst Rd (C185)
- At the roundabout, go straight onto Hamilton Hwy (C178), taking the second exit
- Continue straight onto Hamilton Hwy (B140)
- Turn left onto Mortlake-Ararat Rd (C148)
- Turn right onto Glenelg Hwy (B160)
- Turn left onto Skipton Rd (C172)
- Continue straight onto Beufort-Lexton Rd (C172)
- Turn left onto Sunraysia Hwy (B220)
- Continue straight onto High St (B220)
- Continue straight onto Sunraysia Hwy (B220)
- Turn left onto Stawell-Avoca Rd (C221)
- Turn right onto Ararat-St Arnaud Rd (C241)
- Arrive at Navarre, corner of Ararat-St Arnaud Rd (C241) and Stawell-Avoca Rd (C221).



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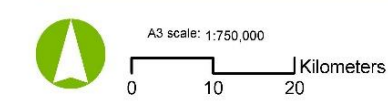


Legend

- Project Area
- Route
- Road

Source:
Esri, DeLop (2023), Aurecon (2023)

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Navarre Green Power Hub
Port of Portland to Navarre OSOM route

Figure 9 Port of Portland to Navarre preliminary OSOM route

Table 11 shows OSOM Class 1 road approval status of each of the roads along the preliminary route from the Port of Portland.

Table 11 Port of Portland to Navarre preliminary OSOM route OSOM Class 1 road approvals

Road	OSOM Class 1 approval status
No2 Quay Rd	Approved
Madeira Packet Rd (C194)	Approved
Henty Hwy (A200)	Approved
Princes Hwy (A1)	Approved
Tyrendarra-Ettick Rd (C191)	Approved
Woolsthorpe-Heywood Rd (C176)	Approved
Hamilton-Port Fairy Rd (C184)	Approved
Heckfield St (C185)	Approved
MacArthur-Penshurst Rd (C185)	Approved
Hamilton Hwy (C178)	Approved
Hamilton Hwy (B140)	Approved
Mortlake-Ararat Rd (C148)	Approved
Glenelg Hwy (B160)	Approved (with below conditions)
Level crossing	Conditionally approved
Restricted structure 49.5 tonne mass limit	Conditionally approved
Restricted structure 49.5 tonne mass limit	Conditionally approved
Skipton Rd (C172)	Approved
Beaufort-Lexton Rd (C172)	Approved (with below conditions)
Level crossing	Conditionally approved
Sunraysia Hwy (B220)	Approved (with below conditions)
Level crossing	Conditionally approved
Restricted structure 49.5 tonne mass limit	Conditionally approved
Stawell-Avoca Rd (C221)	Approved
Ararat-St Arnaud Rd (C241)	Approved
Escort St	Approved

OSOM route - risks and mitigation

High level risks and mitigations have been identified for heavy vehicle use for the Project. These are as follows:

- Undertake a route assessment to determine and refine routes for OSOM and/or OD vehicle deliveries, most appropriate port for the Project and where intersections along the preliminary proposed route may require modifications, noting that no detailed assessment including swept paths, vertical clearances or road condition has been undertaken at this stage. Modifications to intersection may include but are not limited to:
 - removal / relocation of signs / roadside furniture
 - removal of vegetation
 - infill hardstands at turns.
- Sections of the Council roads are currently unsealed and/or narrow allowing one-way traffic at a single time only. Suitable improvements and upgrades are recommended to be investigated to support construction and delivery vehicle access (including OSOM vehicles)

- TMPs are recommended to be prepared by the construction contractor during later stages of the Project. These would:
 - communicate and manage the routes in which heavy vehicles utilise during construction including OSOM vehicles
 - specific access routes and internal circulation that would be adopted.
- Exceptional super-load (two sub-stations) delivery is to be assessed as part of a separate application and/or TMP.

4.2 Operations and maintenance phase

The Proponent advises that there are to be approximately 14 workers expected on-site during the operation and maintenance phase of the Project. They will work 7 days a week from 7:00 am to 6:00 pm and will individually commute using light vehicles (cars, vans, utes, etc.). This is significantly less than the construction phase traffic and is expected to have a negligible impact on traffic volumes on the surrounding road network and site access points.

4.3 Decommissioning phase

The Project lifespan is expected to be between 15 to 20 years. No information is currently available about the decommissioning phase's traffic impacts; however, it is expected to be significantly less than that of the construction phase. The decommissioning phase is over 10 years from the Project completion and therefore it will be subject to a separate future TIA.

5 Conclusions

This assessment has been undertaken to identify any key traffic and transport risks that may be relevant to the ongoing design or implementation of the Project. The assessment has found that:

- Construction access crossovers would be located on:
 - Barkly – Navarre Road
 - Ararat – St Arnaud Road (via Herd Road)
 - Winjallok Road
 - Callawadda – Navarre Road
 - Bolangum Inn Road (three access points)
- Internal access and circulation for large construction and delivery vehicles during the construction phase would be required to accommodate the staging and unloading of OSOM vehicles. This requirement will be confirmed during the detailed design phase.
- Any required traffic management treatments and internal and external mitigation works are to be identified and addressed by way of an approved Construction Traffic Management Plan (CTMP) or Traffic Management Plan (TMP) prepared by the construction contractor (as engaged by the Proponent) to the satisfaction of the relevant authority. This would be prepared in consultation with the relevant authorities and the Proponent.
- The risk of vehicle volume impact is considered low for Escort Street (up to 242 vehicles per day), Stawell-Avoca Road (up to 365 vehicles per day) and Ararat-St Arnaud Road (up to 365 vehicles per day) due to them being C-Class arterial roads.
- Sections of the Council roads are currently unsealed and/or narrow allowing one-way traffic at a single time only. Suitable road improvements and upgrades will be investigated and implemented to support the traffic volumes and heavy vehicles expected. Project Area road upgrades are expected and will be investigated, potential road upgrades (and intersection upgrades) may occur for local roads such as:

- Barkly – Navarre Road
- Herd Road
- High Street
- Winjallok Road
- Callawadda – Navarre Road
- Bolangum Inn Road

This may include treatments such as road widening, sealing, passing areas and maintaining roads during construction.

- The largest typical transport vehicle for the wind farm construction is the blade transport truck. The length of the blade transport truck has not yet been confirmed; however, it is expected to be up to 100 m long.
- Preliminary OSOM delivery vehicle routes (for carrying wind turbine components) have been identified from the Port of Geelong and Port of Portland. A route assessment is to be undertaken to determine and refine routes for OSOM and/or OD vehicle deliveries, most appropriate port for the Project and where intersections along the preliminary proposed route may require modifications.
- Exceptional super-loads (two sub-station) deliveries is to be assessed as part of a separate application and/or CTMP.
- The operations and maintenance phase traffic is expected to be an impact less than the construction phase due to lower traffic movements generated and the lesser need for heavy vehicles.
- The traffic impact of the decommissioning phase is also expected to be less than that of construction due to lower volumes. The decommissioning phase is over 10 years from the Project completion and therefore it will be subject to a separate future TIA.

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