Traffic Impact Assessment

Wombelano Wind Farm

V200680

Prepared for
Wind Projects Australia

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Cardno

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Executive Summary

Cardno has been engaged by Wind Projects Australia Project 1 Pty Ltd to undertake a review of the traffic generation and access impacts associated with the development and operation of the proposed Wombelano Wind Farm.

The Wind Farm site is located approximately 65 kilometres south-west of Horsham. Goroke-Harrow Road extends north-south adjacent to the Wind Farm site and will act as the primary access route to the Wind Farm. Goroke-Harrow Road connects to Nhill-Harrow Road in the south and the Wimmera Highway in the north which are proposed as the primary routes linking to the broader arterial road network.

In assessing the traffic impacts and associated mitigation measures, consideration has been given to:

- The suitability of roads within the Wind Farm area to accommodate traffic generated by the Wind Farm project;
- The suitability of Goroke-Harrow Road from Nhill-Harrow Road as the key access route to the Wind Farm from the arterial road network; and
- Over dimensional (OD) and over-size, over-mass (OSOM) haulage route options between the Port of Portland and Port of Geelong and the Wind Farm site for WTG components and other major imported componentry.

Wind Farm traffic generation scenarios assessed include:

- External traffic associated with materials haulage (bulk construction materials and WTG/major components) and staff vehicles during the Wind Farm construction;
- Operational traffic generated across the life of the Wind Farm; and
- Post operation traffic generated during the Wind Farm decommissioning.

As the most intense period of site activity, specific consideration has been given to traffic impacts and mitigation measures required during the Wind Farm construction period. During times of peak construction activity, based on the advised project scope, the Wind Farm is expected to generate up to 83 vehicle movements per day to Goroke-Harrow Road. This is considered to be low in traffic engineering terms and is likely to have a negligible impact.

The assessment of the preferred OD / OSOM vehicle route option from Port of Portland to the Wind Farm site for the transport for WTG and other imported major components demonstrates, subject to some roadside works and the implementation of traffic management during haulage, that the proposed routes are suitable for the largest blades and haulage design vehicles.

Traffic generation scenarios assessed within this report assume the current Wind Farm project scope and construction timeframes as advised by Wind Projects Australia Project 1 Pty Ltd. The OD / OSOM haulage route assessment conservatively assumes the largest likely WTG blade length of 85 metres and that WTG components will be delivered through the Port of Portland.

Having consideration of base traffic levels, traffic generated by the Wind Farm during the construction and operation of the Wind Farm, it is expected that the traffic will be reasonably accommodated by the public roads with negligible impact. It is anticipated that specific plans will be produced over time to cover the delivery to the subject site of plant and equipment.

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1 Introduction

Cardno has been engaged by Wind Projects Australia Project 1 Pty Ltd to undertake a review of the traffic and access implications of the development and operation of the proposed Wombelano Wind Farm.

This traffic impact assessment considers the Wombelano Wind Farm to consist of seven (7) Wind Turbine Generators (WTG) that are anticipated to be one of the following types:

- Siemens-Gamesa 6MW SG170 (w. 170m rotor)
- GE Cypress Platform; or
- Vestas V162 (w. 5.6MW generator on a 149m tower).

On advice from Wind Projects Australia, this assessment also assumes that the Port of Portland as the preferred port of entry for all WTG and other major imported componentry. We understand that, subject to a range of factors, the use of alternate or multiple ports may be considered.

It is important to note that some assumptions regarding traffic generated by the site has been adapted from previous work performed at a similar wind farm at Rifle Butts. Both timeline and wind farm capacity have been used as scaling factors where necessary.

In the course of undertaking this assessment, the subject site which has planning approval, its surroundings and key road links relevant to the movement of materials, plans of the wind farm and site access, and relevant traffic data have all been inspected and/or analysed accordingly. Consideration was also given to current VicRoads policy relevant to wind farm projects and requirements for over dimensional (OD) and over-size / over-mass (OSOM) transport and associated traffic management.

Documents reviewed and considered as part of this assessment include:

- VicRoads Heavy Vehicle Network Maps (www.vicroads.vic.gov.au/business-and-industry/heavy-vehicle-industry/heavy-vehicle-map-networks-in-victoria);
- Guidelines and Framework for Assessing Wind Farm Energy Projects and Associated Traffic Management Plans (Draft), Version 4 (VicRoads, 17 October 2012);
- West Wimmera Shire Council Road Management Plan 2017-2021 (West Wimmera Shire Council, 15 November 2017); and
- West Wimmera Shire Council Road Register n.d.

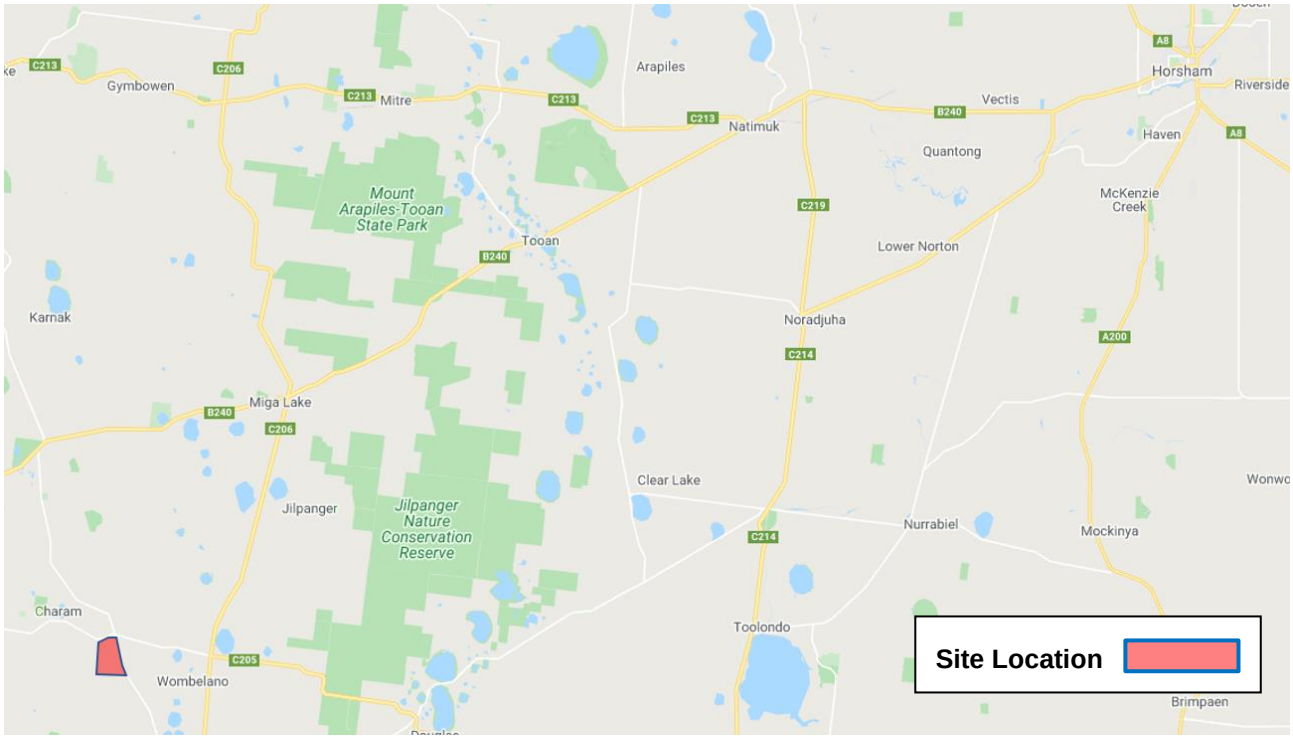
2 Wombelano Wind Farm

2.1 Location

The Wombelano Wind Farm site is located approximately 65 kilometres south-west of Horsham and 300 kilometres north-west of Melbourne. The wind farm site itself extends across approximately 250 hectares of land across a single holding which is predominately used for broad acre cropping and sheep grazing.

The location of the site in the context of the broader region is shown in Figure 2-1.

Figure 2-1 Site Locality



2.2 Site Context

As described above, land across the wind farm site is currently used for broad acre cropping and sheep grazing and is relatively flat with significant vegetation generally limited to locations around homesteads, low points or outcrops and road reserves. The road network across the wind farm site consists of a loose grid of sealed and unsealed roads, with the rural construction standard of sealed roads reflecting their function and use.

Goroke-Harrow Road is the significant road within the wind farm site and extends to Nhill-Harrow Road in the south and the Wimmera Highway in the north.

Identified as a Link road within the West Wimmera Shire Council Road Register, Goroke-Harrow Road has predominately been constructed with a central seal of approximately 4.0 metres within a wider road formation that allows for two vehicles to pass using unsealed shoulders.

Goroke-Harrow Road is used by local farmers and carries large vehicles used to transport grain and equipment to and from the surrounding farmland. The road may also be utilised by the local school bus for morning pick-up and afternoon drop-off, however this cannot be confirmed.

Figure 2-2 to Figure 2-4 show views of the various sections of Goroke-Harrow Road and Charam-Wombelano Road in the vicinity of the Wind Farm site.

Figure 2-2 Charam-Wombelano Road looking west from Goroke-Harrow Road

Figure 2-3 Charam-Wombelano Road looking east from north-western corner of site boundary

Figure 2-4 Goroke-Harrow Road looking north from the south-eastern corner of site boundary

Charam-Wombelano Road is also a link road within the wind farm area that extends west to the Wimmera Highway from Goroke-Harrow Road. An emergency entrance / exit will be located on the north of the site providing direct access to this road.

Marshs Road is a local access road within the wind farm area that extends north from Charam-Wombelano Road to Goroke-Harrow Road. It doesn't directly border the site area, and is currently unsealed.

The classification and standard of roads within the Wind Farm site, as per the published by the West Wimmera Shire Council (WWSC) road registers, is shown in Table 2-1.

Table 2-1 Wind Farm Site Local Road Classification and Status

Road	Section	Classification	Sealed/Unsealed
Goroke-Harrow Road	Wimmera Hwy to Nhill-Harrow Road	Link Roads	Sealed
Charam-Wombelano Road	Wimmera Hwy to Nhill-Harrow Road	Link Roads	Sealed
Marshs Road	Charam-Wombelano Road to Goroke-Harrow Road	Access Road	Unsealed

Link Roads within the WWSC are identified by providing a link between major roads, locations or places of significance.

2.3 Planning and Policy Context

2.3.1 Planning Context

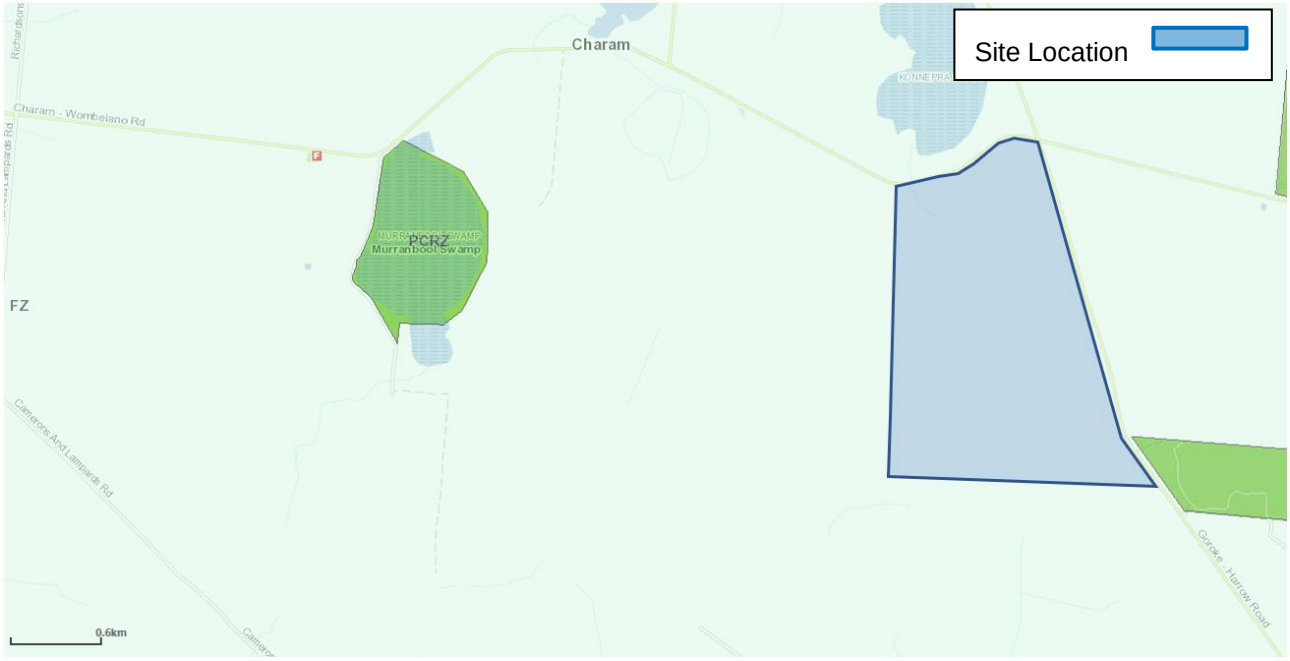
The site is located within the West Wimmera local government area (LGA).

The site is located at Crown Allotment 48A, Parish of Wombelano.

All land within the Wind Farm area is zoned as Farming Zone, with no applicable overlays.

Zoning and overlays that apply to the site and surrounds are shown in Figure 2-5.

Figure 2-5 Planning Zones and Overlays



2.3.2 Planning Framework

2.3.2.1 Clause 52.32 – Wind Energy Facilities

Clause 52.32 of the Victorian Planning Provisions outlines the relevant requirements associated with the development of Wind Energy Facilities. Sub-clause 52.32-4 relates to traffic and access matters and requires a site and context analysis for the surrounding area that looks at access to infrastructure.

2.3.2.2 Clause 35.07 – Farming Zone

A Wind Energy Facility is defined as a Section 2 use permitted within a Farming Zone and so is also subject to the requirements of Clause 35.07. As such, in considering an application for use and buildings and works an application must include how the use and development makes use of existing infrastructure and services.

2.4 Wind Farm Description

The proposed Wind Farm layout is shown in Figure 2-6.

The project will consist of a wind energy facility comprising up to seven (7) wind turbine generators (WTGs). Turbines will be three bladed and have an expected capacity of approximately 25 MW. The maximum height to the tip of the rotor at its highest extent will not exceed 250 metres. The turbines will consist of five (5) tubular steel tower sections, which could be up to 30 metres (based on the longest section of a 110m tower), with a mounted nacelle containing the generator, gear box and electrical equipment. Each turbine will require a transformer and switchgear which will be housed inside the tower base, or externally, immediately adjacent to the base. Hardstand crane pads of approximately 100 metres by 40 metres will be located at the base of each turbine tower.

As stated in the Introduction, it is anticipated that the turbines will be one of the following:

- Siemens-Gamesa 6MW SG170 (w. 170m rotor)
- GE Cypress Platform; or
- Vestas V162 (w. 5.6MW generator on a 149m tower).

WTG sites will be accessed via a network of new access tracks and sections within the Wind Farm site. New access tracks will be approximately 6 m wide to allow access for construction and for ongoing maintenance throughout the life of the Wind Farm. Some sections will be temporarily upgraded to 12 metres wide to allow for ease of relocating cranes. A track around the perimeter of the Wind Farm site (approx. 5.5km) will act as the main internal route whereby small tracks will extend out to allow access to each of the seven (7) turbines.

The Wind Farm will also include a control room, a batching plant, and a new overhead transmission line to connect the farm to the Charam Zone substation located on the south-eastern corner of the intersection between Goroke-Harrow Road and Charam-Wombelano Road.

It is intended that a small spares/maintenance compound with a WC and break-room/change shed with power connectivity to enable welding will be located to the north of the site entrance where there is currently an existing shearing shed and infrastructure. There will be no manned O&M facility on-site.

The Charam Zone Substation enables connection to the nearby existing 66kV and 22kV power lines, however a new overhead line will be constructed to it from the Control Room. Internally, electricity will be distributed from each wind turbine to the terminal station via a network of medium voltage underground cables. These 140 sq mm cables will be laid with a 12-strand ADSS fibre optic line with approximately 900mm cover.

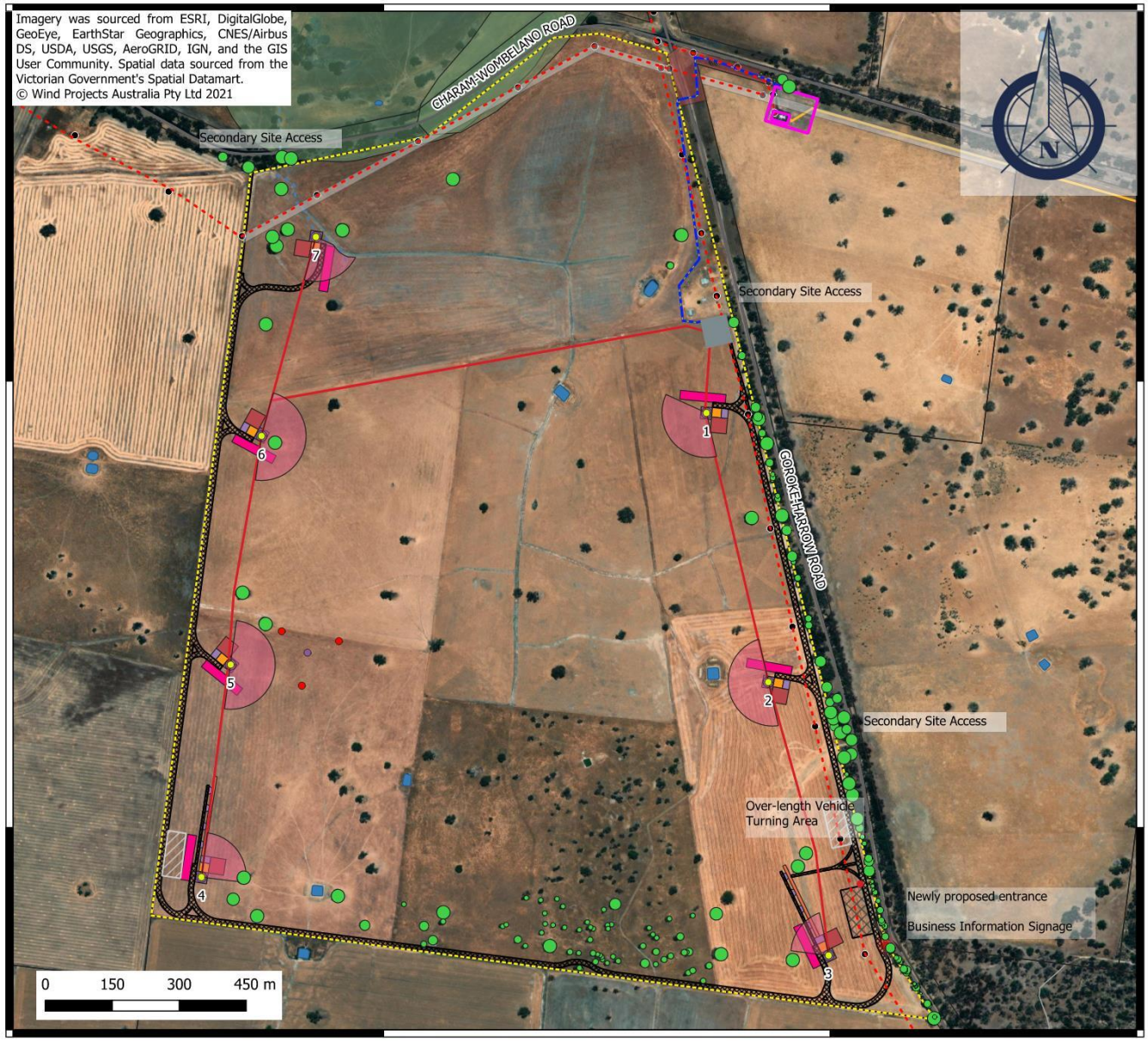
In addition, other temporary infrastructure associated with the construction of the wind farm will include a main site construction compound located near the site entrance from Goroke-Harrow Road that will comprise:

- A temporary site office;
- Laydown area;
- Storage, workshops; and
- Utility shed for breaks and power connectivity for welding;

All temporary infrastructure will be removed at the end of the construction period and the sites rehabilitated if required.

The Wind Farm will have an expected operating life of 25 years.

Figure 2-6 Wind Farm Site Infrastructure Layout



2.5 Wind Farm Project Construction

During construction, the Wind Farm will include a main construction compound that will incorporate a range of facilities including a shed with power connectivity to allow for welding. It has conservatively been assumed that all materials required will be sourced externally (aggregate, binder and water).

Drawing on experience from similar past projects, it has been assumed that there will be in the order of up to 40 staff required on-site during times of peak construction activity. In addition, we have assumed that the construction and delivery of the Wombelano Wind Farm would occur across a 10-month period (approximately) and include the following key work phases and indicative included tasks:

- Site Establishment – includes establishment of the temporary concrete batching plant, delivery of key plant and construction vehicles and the construction of initial internal access tracks required for the delivery of materials and goods for further construction;
- Civil Construction Works – includes the construction of the balance of internal access roads, WTG site hardstand areas, WTG footings, terminal station construction and internal power infrastructure;
- Temporary Site Office and Lay Down Area;
- Permanent Site Office
- WTG Component Delivery;
- WTG Erection; and
- Substation Construction.

Some overlap between each work phase is expected, with site preparation, WTG component delivery and erection to be undertaken on a rolling basis.

2.6 Construction Vehicle Access

2.6.1 External Construction Materials Delivery

Externally sourced materials required for construction will access the Wind Farm site via the entrance at Goroke-Harrow Road. All external construction material deliveries are expected to be to the main construction site compound in the first instance.

A source for these external materials has yet to be identified.

2.6.2 WTG/Substation Components

Wind Projects Australia has advised that the Port of Portland is currently the preferred port of entry for WTG and other major imported componentry. On this basis, an over-dimensional (OD) vehicle haulage route has been identified between the Port of Portland and the Wind Farm site based on the largest expected WTG component being an 85-metre turbine blade.

The blade truck route follows approved or conditionally approved Over Size and Over Mass (OSOM) declared main roads through to the Wind Farm site. Specifically, the route from Port of Portland heads north through the Portland urban area via the Henty Highway to the Princes Freeway. The route then progresses northwest along Glenelg Highway before turning north at Coleraine-Edenhope Road. From here, the route continues north along Nhill-Harrow Road, before turning onto Goroke-Harrow Road and then into the Wind Farm site.

This route, identified as the primary route in Figure 2-7, seeks to keep to OSOM declared main roads where possible and avoids known “pinch points” along other routes along the Henty Highway and other alternate routes. It has the fewest obstacles that would prevent access from long blade carrying vehicles.

The suitability of the route has been confirmed by way of inspection and swept path analysis as discussed in Section 4.1 of this report.

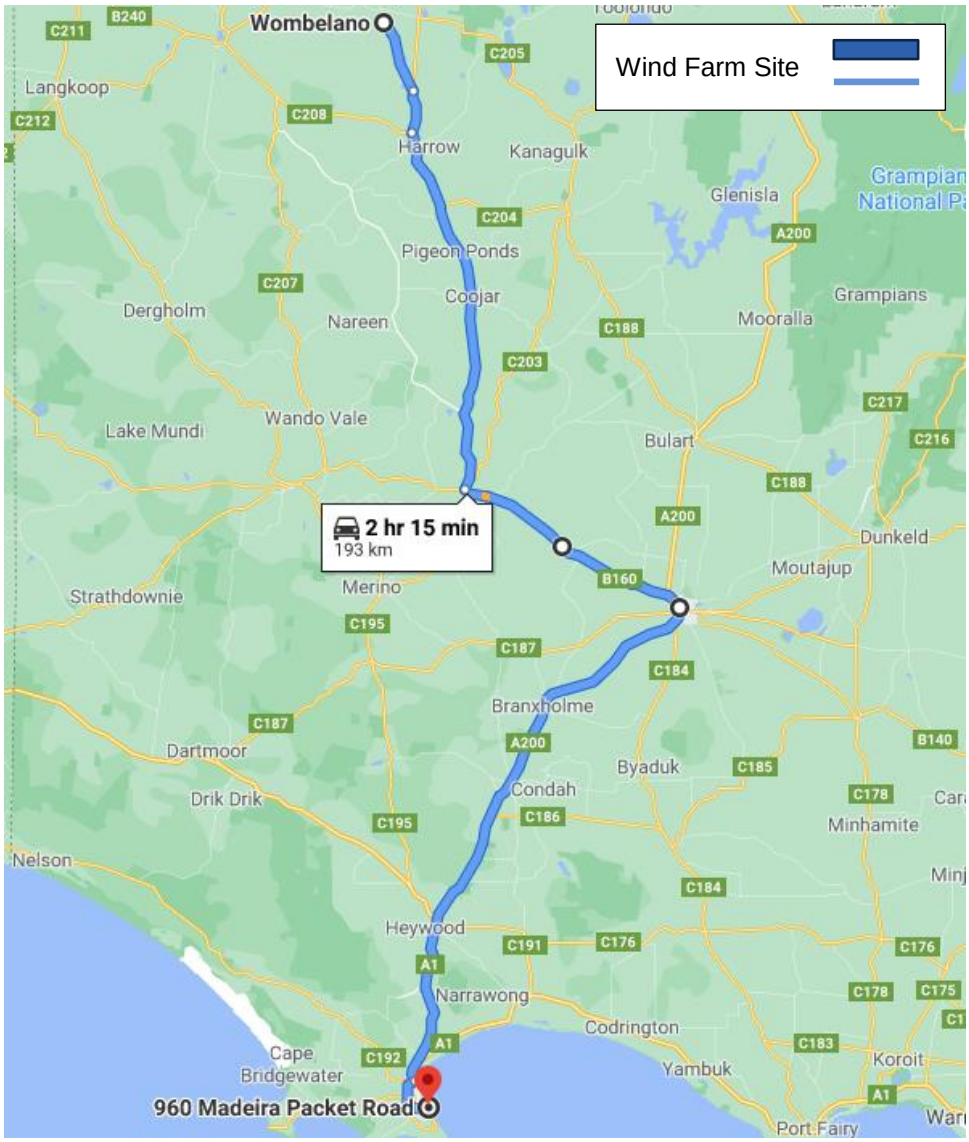
The remaining components will take a more direct route via the Henty Highway, Princes Highway and Portland-Casterton Road through to Merino, and then via Coleraine-Merino Road to Coleraine. From Coleraine, the route will be identical to that of the turbines, with access to the site again via Goroke-Harrow Road. This route has fewer obstacles and overhead utilities than the other routes, and bridge structures that have been used in the past have proven suitable and capable of carrying the weight of trucks carrying wind farm components.

It is noted that some WTG components may be delivered directly to WTG sites rather than to the main construction compound.

2.6.3 Construction Staff

Construction staff will likely be accommodated in Horsham during the delivery stages. It is anticipated that staff accommodated at Horsham will travel to the Wind Farm site via the Wimmera Highway, before turning south onto Nhill-Harrow Road. The route then continues west on Charam-Wombelano Road before again continuing south on Goroke-Harrow Road to enter the site via the main entrance. This traffic has been estimated at approximately 10 vehicles per hour, and is considered to have a negligible impact on existing conditions.

Figure 2-7 WTG Component Haulage Routes



2.6.4 Local and Internal Access

During construction all other vehicle movements, including water cartage and the haulage of materials, will use the new internal Wind Farm access tracks.

The key internal Wind Farm access routes between the main construction compound area and WTG site are shown in Figure 2-6.

The proposed network of internal access tracks deliberately seeks to limit internal construction traffic (such as access track/hardstand materials haulage, concrete trucks and internal staff vehicles) to internal access roads which would be maintained by Wind Projects Australia during construction.

2.7 Wind Farm Operation Vehicle Access

During operation, vehicles accessing the Wind Farm site will typically use Goroke-Harrow Road from Charam-Wombelano Road / Nhill-Harrow Road to the permanent site office area and then make use of the internal road network.

3 Traffic Impact Review

As previously noted, the proposed Wind Farm access road network seeks to limit internal construction traffic to internal access roads.

As such, the following review of traffic impacts considers traffic that will be externally generated, with this traffic largely consisting of:

- General traffic generated by staff travelling to / from the site (i.e. utes, vans and private cars);
- OD vehicles used for the delivery of large WTG components
- Water trucks; and
- Other heavy vehicles (HV) which are used for the delivery of the smaller WTG components and importing construction materials such as aggregate and cement.

3.1 Adopted Wind Farm Delivery Timeframes

It is anticipated that work phases will generally overlap and will be undertaken in tandem, with WTG component delivery and WTG erection to commence reasonably soon after the completion of the initial site footing and access works. Based on our experience with similar sized wind farm projects, the following are indicative timeframes for each work phase as identified in Section 2.5.

- Site Establishment — Weeks 1 – 4
- Civil Construction Works — Weeks 4 – 20
- WTG Component Delivery — Weeks 19 - 20
- Electrical — Weeks 17 - 33
- WTG Erection — Weeks 29 – 41
- Commissioning — Weeks 31 - 43

3.2 Materials Assumptions

3.2.1 Access Roads and Hardstand Areas

Unsealed internal access roads, hardstand areas and the upkeep of local external roads used for Wind Farm construction traffic will be constructed from externally sourced material from the local region.

It has been assumed that access road and hardstand area works will (subject to final design) comprise of:

- Approximately 5.5 kilometres of internal access roads with typical pavement widths of 6 metres and depth of 0.35 metres;
- Seven (7) WTG site hardstands at 100 metres by 40 metres and with a pavement depth of 0.4 metres with two layers;

It is assumed that all materials for access roads and hardstands will be imported to the site from a local (external) quarry.

3.2.2 WTG Footings

Concrete for WTG footings will be produced internally within the on-site concrete batching plant(s) from externally sourced aggregate, cement and reinforcement.

Each WTG footing will require approximately 540 cubic metres of concrete and include 53 tonnes of reinforcing steel. It is assumed that cement required for concrete will be sourced from nearby townships, most likely Horsham. Concrete aggregate will likely be sourced from an external quarry.

3.2.3 WTG Components

Each of the seven (7) WTG's will comprise the following components:

- 3 blades (up to 85 metres);
- A hub and nacelle;

- An internal or external transformer; and
- WTG tower sections.

3.2.4 Other

Other materials delivery required for the construction of the Wind Farm will include:

- Electrical cabling and other materials/equipment for the internal distribution network:
- The substation transformer;
- Construction equipment and plant;
- Meteorological masts; and
- Plant fuel and other miscellaneous items.

3.3 External Wind Farm Construction Traffic Generation

External traffic generated by the site is will be split across three broad categories:

- General traffic generated by staff travelling to / from the site (i.e. utes, vans and private cars);
- Over Dimensional (OD) used for the delivery of large WTG components; and
- Other heavy vehicles (HV) which are used for the delivery of the smaller WTG components and externally sourced construction materials such as aggregate and cement for the concrete.

Based on estimated project timeframes, expected external material requirements and typical vehicle types to be used across the project, estimated external daily vehicle movements across the various stages of the Wind Farm delivery are summarised in Table 3-1, whilst Figure 3-1 shows the total one-way movements expected to be generated by the subject site over the whole construction period.

Table 3-1 External Daily Vehicle Movements – Wombelano Wind Farm Site

Phase	Staff	Heavy Vehicles	OD Vehicles	Total
Weeks 1- 4	20	3	0	23
Weeks 4 -17	20	23	0	43
Weeks 17 - 19	20	25	0	45
Weeks 19 - 20	20	28	36	83
Weeks 20 - 29	20	10	0	30
Weeks 29 - 31	20	11	0	31
Weeks 31 - 33	20	11	0	31
Weeks 33 - 36	20	9	0	29
Weeks 36 - 41	20	1	0	21
Weeks 41 - 43	20	0	0	20

Figure 3-1 Wombelano Wind Farm Estimated Total Traffic Generation During Construction

Operation	Purpose	tonnes / load	total tonnage	Delivery Vehicle	One Way Deliveries	Comments
General						
Construction	Water delivery	15	na	Truck Tanker	1,018	Assumes 9 per day when sourced externally 2 per day when on-site
Operations	Fuel delivery	15	na	Truck Tanker	14	Assumes 1 per week
	Skip Delivery	3	na	SM Flat Bed	na	
	Portaloo Delivery	12	na	L Low Loader	na	
Wind Farm Construction						Number of turbines = 7
Site Set-Up	Miscelaneous Establishment Deliveries	5	na	L Low Loader	4	Large scale construction compound (includes containers)
	Skip delivery	3	na	SM Flat Bed	22	1 - 2 / week
	Portaloo Deliveries	12	na	L Low Loader	36	2-3 / week
	Earthworks equipment delivery	30	na	H Low Loader	4	
Road & Hard standings	Imported material for site roads capping (200mm)	30	21,368	Truck and Dog	712	all hardstand material from Quarry
	Imported material for crane hardstands (200mm)	30	10,438	Truck and Dog	348	all hardstand material from Quarry
	Imported material for construction compounds (200mm)	30	0	Truck and Dog	0	all hardstand material from Quarry
	Imported material for batch hardstand	30	0	Truck and Dog	0	all hardstand material from Quarry
	Lime / Cement Stabilisation	17	954	Cement Delivery	56	all hardstand material from Quarry
	Subgrade improvement material / fill	30	10,438	Truck and Dog	348	all hardstand material from Quarry
Foundation	Heavy equipment delivery	30	na	H Low Loader	3	Excavator, project concrete pump et al
Construction	Misc works	5	na	SM Flat Bed	5	Concrete curing materials, minor equipment etc
	Aggregate delivery to batching plant	30	7,258	Truck and Dog	242	80% agg and sand by mass - (sand not available on-site)
	Cement delivery to batching plant	16	1,270	Cement Delivery	79	14% cement delivery by mass
	Water delivery to batching plant	15	544	Truck Tanker	36	6% water by mass - more likely to come from local water
	Reinforcing steel delivery	60	371	HT Flat bed	6	53 tonnes steel for 540m3 footing
	Foundation bolts or steel insert delivery	12	na	L Low Loader	7	Bolts or insert depending on turbine supplier
Turbine Components	Tool container delivery	15	na	L Low Loader	2	Various equipment for turbine install crew HV
	Top section delivery	50	na	Low loader - Towers	42	5 Section tower assumed
	Middle Top Section	50	na	Low loader - Towers	42	5 Section tower assumed
	Middle Section	50	na	Low loader - Towers	42	5 Section tower assumed
	Middle Bottom Section	50	na	Low loader - Towers	42	5 Section tower assumed
	Bottom Section Delivery	50	na	Low loader - Towers	42	5 Section tower assumed
	Blades delivery - single blade transport	10	na	Low loader - Blade	126	3 blade turbine - assume non reticulated blades OD
	Nacelle	80	na	Low loader - Nacelle	35	
	Drive Train	80	na	Low loader - Drive Train	42	Drive Train delivered separately from nacelle
	Hubs + Spinner	15	na	L Low Loader	14	1 delivery per turbine OD
	Power module	24	na	H Low Loader	35	
Cable Installation	Cable delivery	15	na	L Low Loader	4	Wind farm collector underground cables for site
	Excavator delivery	30	na	H Low loader	4	Cable install support equipment
	Cable laying equipment	15	na	L Low loader	2	Specialised trenching equipment
	Cable Bedding Sand	30	3,231	Truck and Dog	108	Sand sourced externally - as advised
Internal Sub Station Construction						
Cranage	Terrain crane (50t)	50	na	Terrain Crane	2	Mobile crane
	Terrain crane (100t)	100	na	Terrain Crane	2	Mobile crane
	Terrain crane (250t)	250	na	Terrain Crane	1	Mobile crane
	Big Crane (650t)	30	na	H Low Loader	15	Crane ballast delivery
Misc Small Vehicles	**Workers and Visitors**	**na**	**na**	**Vans, cars**	**5,160**	Light vehicles no pavement damage / ESA contribution
	Misc small tools etc.	**na**	**na**	**Light goods van**	**90**	Light commercial vehicles
	Total estimated OD Traffic (one-way)				427	Total traffic generation will be x 2
	Total estimated HV Traffic (one-way)				3,079	Total traffic generation will be x 2
	Total estimated traffic for project (one way delivery)				8,756	Total traffic generation will be x 2

Adopted staff movements conservatively assume that all staff will access the Wind Farm site by private vehicle with an average occupancy of 1.0 persons per vehicle. It was also conservatively assumed that all 20 staff would be present at site during each phase of construction.

3.4 Wind Farm Construction Traffic Impact

As detailed above, the Wind Farm is expected to generate in the order of 83 additional traffic movements during the peak construction period (weeks 19 - 20), of which approximately 77% (64 movements) will be heavy vehicles / OSOM vehicles.

It is expected that all vehicles will travel along Goroke-Harrow Road to reach the site from the east during construction.

While this level of traffic may be significant in the context of the local road network, since traffic volumes on most sub-arterial rural roads sit around 100 vehicles per day, it will be comfortably accommodated by the effective capacity of the roads and the existing surface of Goroke-Harrow Road will be sufficient to accommodate the temporary increase during the construction period.

3.5 Wind Farm Operating Traffic Generation

For the majority of time, wind farms operate with limited staff and generate minimal traffic movements. Accordingly, apart from the initial construction phase, the proposal is anticipated to have a negligible impact upon traffic on the local road network. Details of likely traffic generation during operation are detailed as follows:

- Fortnightly minor maintenance to be carried out by a small team. This will involve a team of no more than 2 people attending the site, with up to 2 vehicles. This increase is insignificant;
- Occasional maintenance may occur when components of the development need to be replaced, such as replacing a blade or gearbox. This is expected to only occur very occasionally and will be subject to approval processes with the relevant authorities; and
- Visitors to the site such as office based staff and courier delivers etc.

In the context of Wind Farm construction traffic and background traffic on Goroke-Harrow Road, operating traffic will be negligible. By virtue of the minimal use of other local roads, Wind Farm operating traffic will have no material impact.

3.6 Wind Farm Decommissioning

The eventual decommissioning of the Wind Farm site will involve the removal of any structure above ground and to a depth of one metre. This excludes the portion of foundations deeper than 1 metre and access tracks kept in agreement with landowners.

In comparison to the construction period, the traffic generated during decommissioning of the site will be significantly less but will include the use of OD and OSOM vehicles to remove WTG and other major components.

The specific impacts and mitigation measures would be reviewed and resolved at the time of decommissioning.

4 Haulage Route Review

4.1 WTG Primary Haulage Route Review

A review of the primary haulage route as described in Section 2.6 has been undertaken by way of a swept path analysis conducted utilising an 85-metre blade truck as the design vehicle. The findings of this review are discussed as follows, with swept path diagrams included as Appendix A.

Following inspection, the following intersections were considered in detail as part of this review:

- Henty Highway / New Street, Portland;
- Henty Highway / Carmichael Street, Hamilton;
- Henty Highway / Coleraine Road, Hamilton;
- Glenelg Highway / Coleraine-Edenhope Road, Coleraine;
- Coleraine-Edenhope Road / Nhill-Harrow Road, Harrow; and
- Goroke-Harrow Road / Nhill-Harrow Road, Wombelano.

As shown on the swept path diagrams included in Appendix A, the above intersections will require some median and/or roadside infill works, potential roadside furniture removal and traffic management works to cater for 85 metre turbine blade vehicles.

Additional higher order traffic management works may be required to cater for these vehicles at key intersections along key intersections intersection as detailed in Table 4-1 below.

Table 4-1 Key Intersection Traffic Management

Intersection	Movement	Traffic Management
Henty Highway / New Street	On approach to this intersection from the south-west, OD vehicles will cross over to the wrong side of the road before negotiating to the north-west.	Construction of temporary kerb or solid infill likely required at a number of locations, primarily toward the inside and outside of the slip lane from the Henty Highway to provide a solid base for OD vehicles.
Henty Highway / Carmichael Street	On approach to this intersection from the southwest, OD vehicles will cross over to the wrong side of the road before negotiating to the north-west.	A number of signs will require temporary removal on approach to this intersection. Construction of temporary kerb or solid infill likely required within the Mount Bainbridge Road / Scoresby Street left-turning lane to provide a solid base for vehicles travelling over this section.
Henty Highway / Coleraine Road, Hamilton	On approach to this intersection from the south, OD vehicles will cross over to the wrong side of the road before negotiating to the north-west.	Construction of temporary kerb or solid infill likely required at a number of locations, primarily toward the Mount Bainbridge Road median and roundabout to provide a solid base for OD vehicles.
Glenelg Highway / Coleraine-Edenhope Road	On approach to this intersection from the south-east, OD vehicles will use the left-hand shoulder before negotiating to the north-east.	Construction of temporary kerb or solid infill likely required in the north-eastern corner of the intersection to provide a solid base for OD vehicles.
Coleraine-Edenhope Road / Nhill-Harrow Road, Harrow	On approach to this intersection from the south-east, OD vehicles will cross over to the wrong side of the road before negotiating to the north-east.	Construction of temporary kerb or solid infill likely required at this intersection on the north east and west corners to provide a solid base for OD vehicles.
Goroke-Harrow Road / Nhill-Harrow Road, Wombelano	On approach to this intersection from the south, OD vehicles will cross over to the wrong side of the road before negotiating to the north-west.	No traffic management required.

Trucks carrying the tower sections will be shorter than the trucks carrying turbine blades and will be able to take a more direct route as previously described in Section 2.6.2.

5 Traffic Management Plan

Traffic Management Plans (TMPs) will be prepared for specific delivers as required throughout construction. It is anticipated that there will be no access issues which will prevent the construction of the subject site.

In general, TMPs would include:

- Confirmation of the Wind Farm construction timeframe and works stages;
- Confirmation of expected traffic volumes generated by the wind farm for all work stages;
- Identification/qualification of all HV and OD vehicle haulage routes for all work stages;
- A mechanism to review identified haulage route road conditions prior to the commencement of works;
- Mechanisms/agreements to maintain haulage route roads and road infrastructure, including local public roads used by internal site traffic, during construction works and to reinstate roads to at least pre-construction conditions;
- Qualify any requirement for specific work stage construction traffic management plans; and
- Qualify and identify relevant mechanisms for OD vehicle permits and traffic management requirements.

6 Native Vegetation Impacts

Cardno and Biosis have previously prepared a traffic study for Rifle Butts Wind Farm. As part of this traffic study, it was concluded that any impact on Tree Protection Zones (TPZs) along the designated route, which follows the same route as detailed in Section 4.1, would only occur after Rifle Butts Road. This was accepted by the Department of Environment, Land, Water and Planning (DELWP), and as such, can be used as acceptance for this project's primary haulage route.

It is therefore considered acceptable and appropriate that the native vegetation impacts along the haulage route only need to be assessed on the divergence of this particular route from the Rifle Butts Wind Farm route, which only encompasses Goroke-Harrow Road.

In line with the above, swept path diagrams have been prepared and provided in Appendix A in order to understand the impact, if any, on potential TPZs. The intersection of Goroke-Harrow Road and Nhill-Harrow Road has been assessed and no TPZs are impacted.

The intersection of Goroke-Harrow Road and the Wind Farm main entrance has also been assessed, with the swept path diagram shown in Appendix A (V200680-SK-TR-07-2). The swept path has been completed so that the rear end of the blade-carrying vehicle only impacts vegetation on the project site-side of Goroke-Harrow Road. The vegetation at this location has been assessed by EHP, and as discussed in their Biodiversity Assessment, clearing of that native vegetation will require a permit from DELWP.

In terms of what constitutes an impact by a haulage vehicle on vegetation, Cardno has sourced information from the following documents:

- Permitted clearing of native vegetation: Biodiversity assessment handbook (DELWP, 2015); and
- Planning Scheme - Clause 52.17: Native Vegetation.

Regarding the impact to a tree that constitutes the loss of native vegetation, the DELWP handbook specifies:

> *"Lopping of canopy trees in excess of what is provided for in the 'lopping and pruning for maintenance exemption in Clause 52.17' is treated as assumed loss, unless an arborist report concludes that the tree will survive."*

The lopping and pruning for maintenance exemption in Clause 52.17 sets this limit at one third of the foliage being removed from any individual plant before a tree is considered to be lost, without requiring an arborist report to demonstrate otherwise.

7 Conclusions

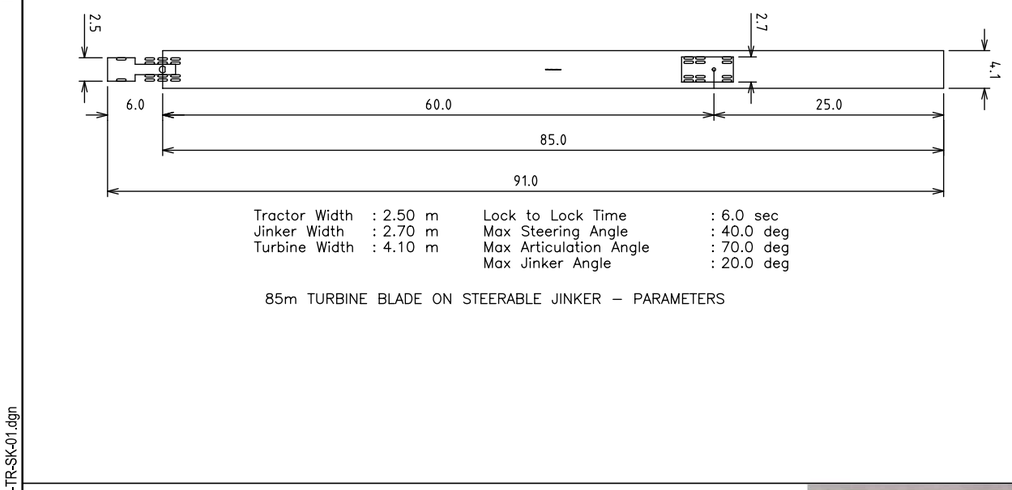
In consideration of the foregoing, it is our view that:

- As proposed, the Wind Farm project and proposed access road network will limit external traffic generated during construction to staff vehicles, HV traffic associated with external bulk materials haulage and OD/OSOM vehicles associated with WTG and other major component delivery. Internal construction traffic will be limited to new internal access tracks to be constructed as part of the Wind Farm and sections of Goroke-Harrow Road identified as part of the Wind Farm access network;
- At the time of peak construction activity, external Wind Farm traffic will add approximately 83 vehicles per day on Wombelano Road including approximately 64 (77%) HV and OD/OSOM vehicles;
- Subject to appropriate traffic management, the use of Goroke-Harrow Road within the Wind Farm site by Wind Farm construction traffic is considered reasonable and acceptable noting that usage of this road is currently limited to local property access only by existing land holders and that this road will be maintained by Wind Projects Australia as part of the Wind Farm project;
- It is expected that the traffic generated by the Wind Farm during the construction and operation periods will be accommodated with minimal impact.
- Subject to the resolution of specific traffic management requirements and procedures, the identified primary over dimensional vehicle route option from the Port of Portland to the Wind Farm site for the transport for WTG and other imported major components has been assessed and is suitable for OD and OSOM transport vehicles; and
- It has been assessed that the only impact on native vegetation is at the site entrance from Goroke-Harrow Road, where widening of the existing entrance will be required. The previous acceptance of the Rifle Butts Wind Farm primary haulage route by DELWP, which is the same for Wombelano Wind Farm up until Goroke-Harrow Road, has been considered as part of this assessment; and
- It is anticipated that the preparation of TMPs will be completed as required for specific delivers throughout construction.

APPENDIX

A

PRIMARY HAULAGE ROUTE SWEPT PATHS DIAGRAMS – BLADE VEHICLES



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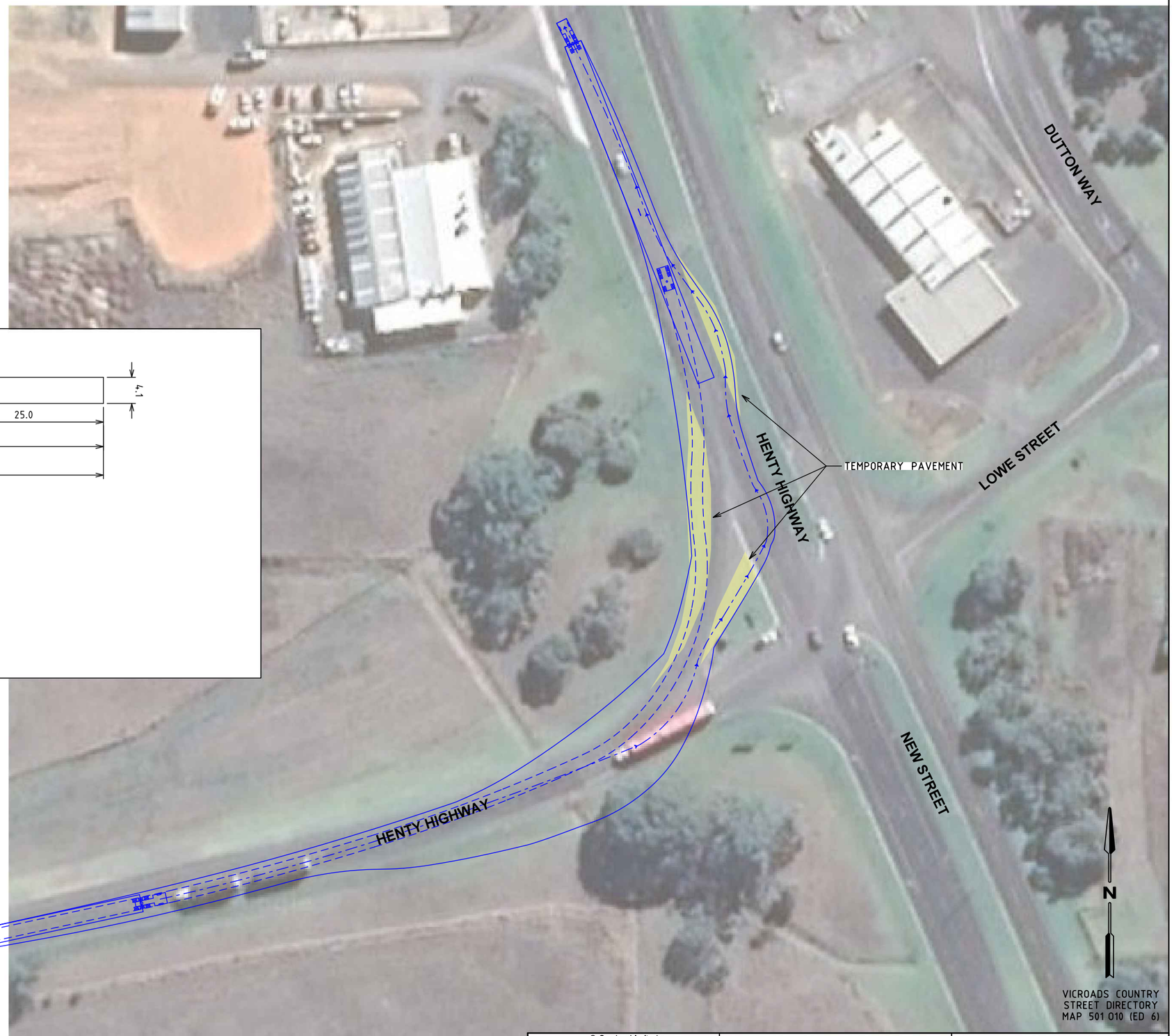
Jinker Width	: 2.70 m	Max Steering Angle	: 40.0 deg
Turbine Width	: 4.10 m	Max Articulation Angle	: 70.0 deg
		Max Jinker Angle	: 20.0 deg

85m TURBINE BLADE ON STEERABLE JINKER – PARAMETERS



LEGEND

- TEMPORARY PAVEMENT
- EXISTING UTILITY POLE
- LOAD SWEPT PATH
- PRIME MOVER STEERED PATH
- JINKER SWEPT PATH

Cardno® Shaping the Future

WIND PROJECTS AUSTRALIA
WOMBELANO WIND FARM
GLENELG SHIRE
85m TURBINE BLADE SWEPT PATH PLOT
HENTY HWY AT NEW ST, PORTLAND

Drawn/Check	Date	Scale	Size
GC/JA	12.02.2021	1:1000	A3

Drawing Number	Revision
V200680-TR-SK-0001	1

Tractor Width : 2.50 m
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Turbine Width : 4.10 m

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Max Steering Angle : 40.0 deg
Max Articulation Angle : 70.0 deg
Max Jinker Angle : 20.0 deg

85m TURBINE BLADE ON STEERABLE JINKER – PARAMETERS

DARTMOOR-HAMILTON ROAD (C187)

MOUNT BAINBRIDGE ROAD

SCORESBY STREET

CONSTRUCT TEMPORARY PAVEMENT

REMOVE UTILITY POLES

CARMICHAEL STREET

HENTY HIGHWAY (A200)

LEGEND

- TEMPORARY PAVEMENT
- EXISTING UTILITY POLE
- LOAD SWEPT PATH
- PRIME MOVER STEERED PATH
- JINKER SWEPT PATH

N

VICROADS COUNTRY STREET DIRECTORY MAP 506 E8 (ED 6)

Cardno® Shaping the Future

WIND PROJECTS AUSTRALIA
WOMBELANO WIND FARM
SOUTHERN GRAMPIANS SHIRE
TURBINE BLADE SWEPT PATH PLOT
HENTY HWY & MT. BAINBRIDGE RD, HAMILTON

Drawn/Check	Date	Scale	Size
GC/JA	12.02.2021	1:1000	A3

Drawing Number: V200680-TR-SK-0002
Revision: 1

BY: User:glenn.carey

DATE PLOTTED: 02/11/21 15:05:35

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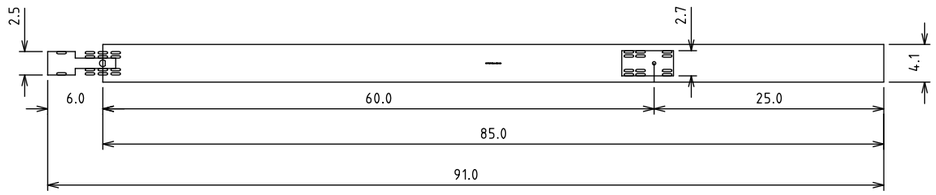

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Turbine Width	: 4.10 m	Max Articulation Angle	: 70.0 deg
		Max Jinker Angle	: 20.0 deg

85m TURBINE BLADE ON STEERABLE JINKER – PARAMETERS

LEGEND

- TEMPORARY PAVEMENT
- EXISTING UTILITY POLE
- EXISTING FENCE
- LOAD SWEPT PATH
- PRIME MOVER STEERED PATH
- STEER AXLE SWEPT PATH
- JINKER SWEPT PATH

COLERAINE ROAD (B160)

BURNS STREET

MOUNT BAINBRIDGE ROAD

MOUNT BAINBRIDGE ROAD (A200)

HENTY HIGHWAY (A200)

KENNY STREET

CONSTRUCT TEMPORARY PAVEMENT / REINSTATE AFTERWARD

N

VICROADS COUNTRY STREET DIRECTORY MAP 506 D6 (ED 6)

Cardno® Shaping the Future

WIND PROJECTS AUSTRALIA
WOMBELANO WIND FARM
SOUTHERN GRAMPIANS SHIRE
TURBINE BLADE SWEPT PATH PLOT
MT. BAINBRIDGE RD / HENTY HWY, HAMILTON

Drawn/Check	Date	Scale	Size
GC/JA	12.02.2021	1:1000	A3

Drawing Number	Revision
V200680-TR-SK-0003	1

COLERAINE - EDENHOPE ROAD (C208)

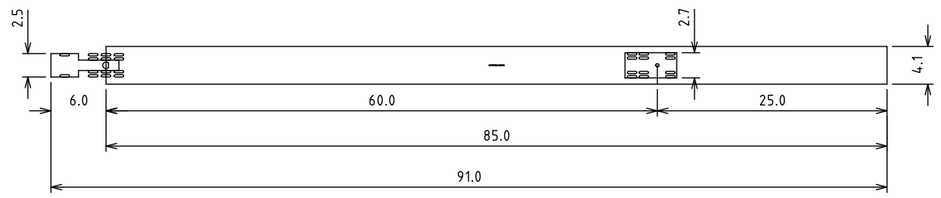
GLENHELG HIGHWAY (B160)

TEMPORARY PAVEMENT

POTENTIAL CONFLICT WITH EXISTING GUARDRAIL

EXISTING SIGN

GLENHELG HIGHWAY (B160)



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Jinker Width : 2.70 m
Turbine Width : 4.10 m
Lock to Lock Time : 6.0 sec
Max Steering Angle : 40.0 deg
Max Articulation Angle : 70.0 deg

85m TURBINE BLADE ON STEERABLE JINKER – PARAMETERS

LEGEND

- TEMPORARY PAVEMENT
- EXISTING UTILITY POLE
- EXISTING FENCE
- LOAD SWEPT PATH
- PRIME MOVER STEERED PATH
- JINKER SWEPT PATH

N

VICROADS COUNTRY
STREET DIRECTORY
MAP 72 C3 (ED 6)

Cardno® Shaping the Future

WIND PROJECTS AUSTRALIA
WOMBELANO WIND FARM
MOORABOOL SHIRE
85m TURBINE BLADE SWEPT PATH PLOT
GLENELG HWY & COL'-E'HOPE RD, COLERAINE

Drawn/Check	Date	Scale	Size
GC/JA	12.02.2021	1:1000	A3

Drawing Number: V200680-TR-SK-0004
Revision: 2

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NHILL-HARROW ROAD (C206)

TEMPORARY PAVEMENT

COLERAINE - EDENHOPE ROAD (C208)

TEMPORARY PAVEMENT

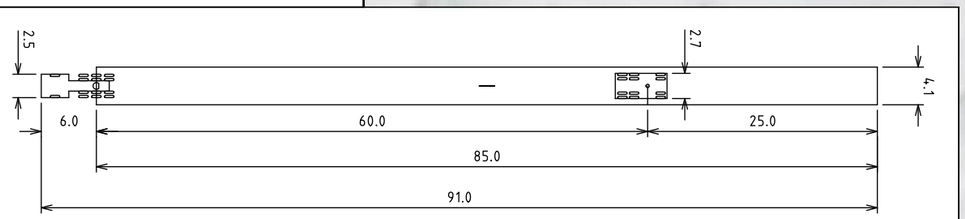
COLERAINE - EDENHOPE ROAD (C206)

E

E

LEGEND

- TEMPORARY PAVEMENT
- EXISTING UTILITY POLE
- EXISTING FENCE
- LOAD SWEPT PATH
- PRIME MOVER STEERED PATH
- JINKER SWEPT PATH



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Turbine Width	: 4.10 m	Max Articulation Angle	: 70.0 deg
		Max Jinker Angle	: 20.0 deg

85m TURBINE BLADE ON STEERABLE JINKER – PARAMETERS

N

VICROADS COUNTRY
STREET DIRECTORY
MAP 54 B4 (ED 6)

Cardno® Shaping the Future

WIND PROJECTS AUSTRALIA
WOMBELANO WIND FARM
MOORABOOL SHIRE
TURBINE BLADE SWEPT PATH PLOT
COL'-E'HOPE RD & NHILL-HARROW RD, HARROW

Drawn/Check	Date	Scale	Size
GC/JA	12.02.2021	1:1000	A3

Drawing Number	Revision
V200680-TR-SK-0005	1

BY: User:glenn.carey
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GOROKE-HARROW ROAD

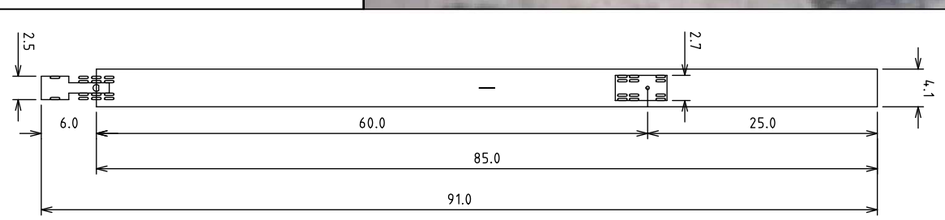
NHILL-HARROW ROAD (C206)

NHILL-HARROW ROAD (C206)

200.01 m

LEGEND

- TEMPORARY PAVEMENT
- EXISTING UTILITY POLE
- EXISTING FENCE
- LOAD SWEPT PATH
- PRIME MOVER STEERED PATH
- JINKER SWEPT PATH



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Jinker Width	: 2.70 m	Max Steering Angle	: 40.0 deg
Turbine Width	: 4.10 m	Max Articulation Angle	: 70.0 deg
		Max Jinker Angle	: 20.0 deg

85m TURBINE BLADE ON STEERABLE JINKER – PARAMETERS

N

VICROADS COUNTRY
STREET DIRECTORY
MAP 54 B3 (ED 6)

Cardno® Shaping the Future

WIND PROJECTS AUSTRALIA
WOMBELANO WIND FARM
MOORABOOL SHIRE
85m TURBINE BLADE SWEPT PATH PLOT
NHILL-HARROW RD & GOROKE-H'W RD, HARROW

Drawn/Check	Date	Scale	Size
GC/JA	12.02.2021	1:1000	A3

Drawing Number: V200680-TR-SK-0006
Revision: 1

BY: User:Russell.Meaney

DATE PLOTTED: 1/11/2021 1:45:13 PM

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GOROKE-HARROW ROAD

29m

40m

SITE ENTRANCE

GOROKE-HARROW ROAD

N

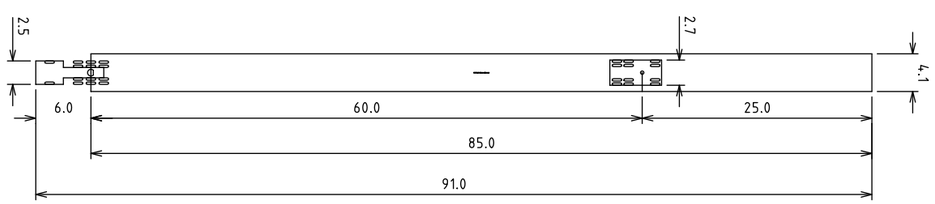
VICROADS COUNTRY
STREET DIRECTORY
MAP 54 A2 (ED 6)

LEGEND

LOAD SWEPT PATH

PRIME MOVER STEERED PATH

JINKER SWEPT PATH



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Turbine Width	: 4.10 m	Max Articulation Angle	: 70.0 deg
		Max Jinker Angle	: 20.0 deg

85m TURBINE BLADE ON STEERABLE JINKER – PARAMETERS

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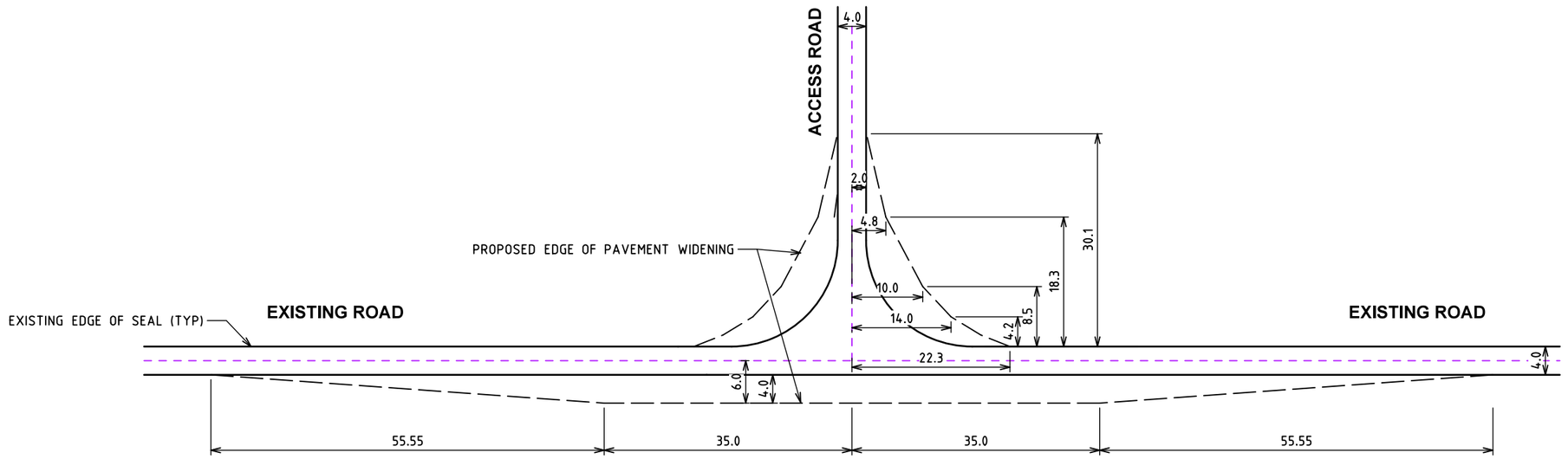
WIND PROJECTS AUSTRALIA
WOMBELANO WIND FARM
WEST WIMMERA SHIRE
85m TURBINE BLADE SWEPT PATH PLOT
SITE ENTRY FROM GOROKE-HARROW RD

Drawn/Check	Date	Scale	Size
RJM/LS	01.11.2021	1:500	A3

Drawing Number: V200680-TR-SK-0007

Revision: 3



GENERAL NOTES:
1. ARRANGEMENT TO BE DESIGNED IN ACCORDANCE WITH IDM STANDARD DRAWING No. SD 265
2. LAYOUT BASED ON 4.0m EXISTING ROADWAY
3. SITE ACCESS ROAD WIDTH 4.0m
4. EXISTING ROAD SPEED ZONE 100KM/H

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WIND PROJECTS AUSTRALIA
WOMBELANO WIND FARM
TYPICAL ACCESS
4.0m EXISTING ROAD

Drawn/Check	Date	Scale	Size
GC / JA	12.02.2021	N.T.S.	A3

Drawing Number	Revision
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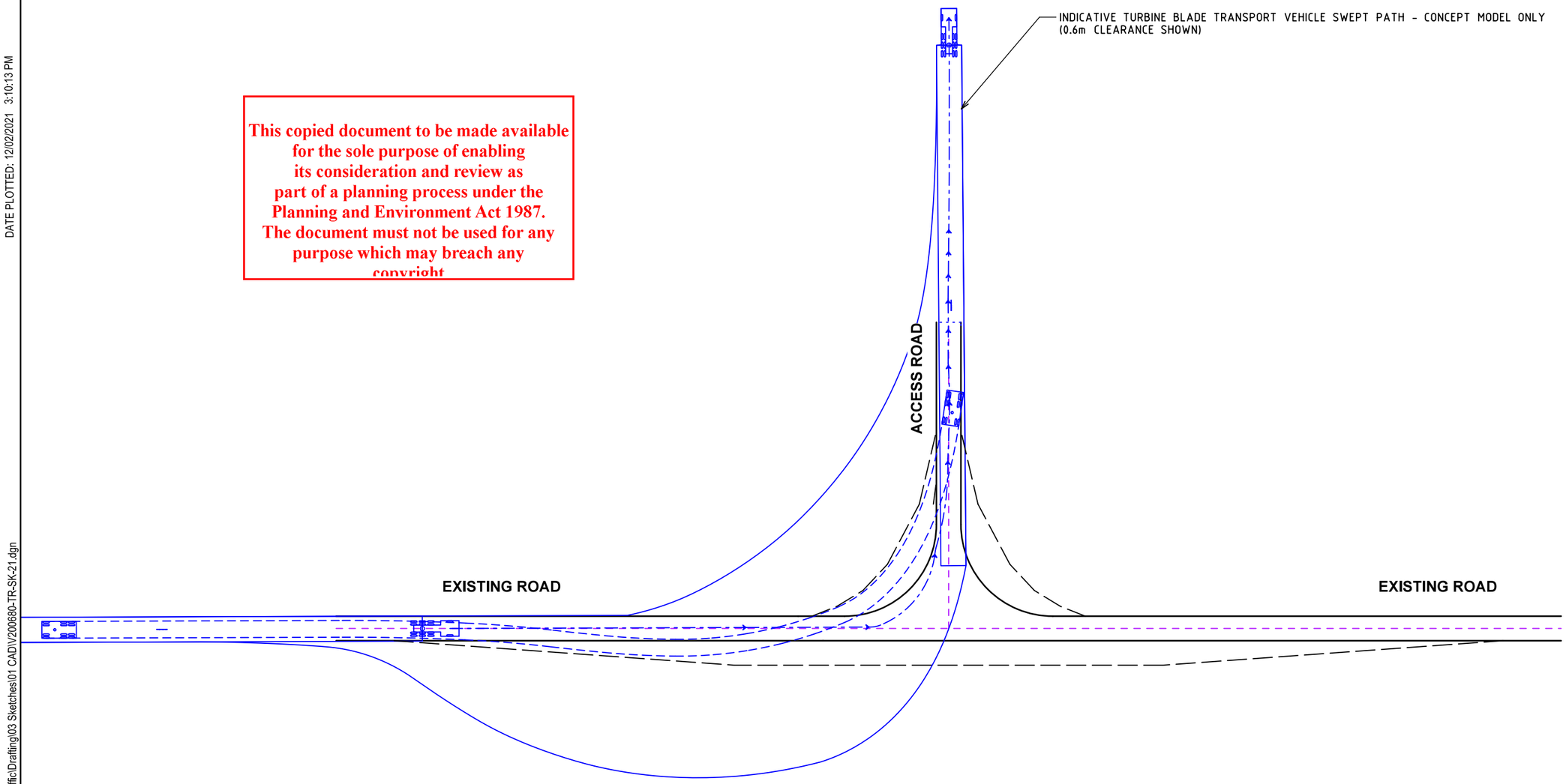
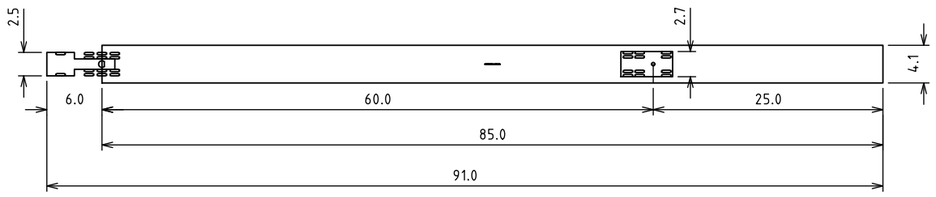


DESIGN VEHICLE



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Jinker Width	: 2.70 m	Max Steering Angle	: 40.0 deg
Turbine Width	: 4.10 m	Max Articulation Angle	: 70.0 deg
		Max Jinker Angle	: 20.0 deg

85m TURBINE BLADE ON STEERABLE JINKER – PARAMETERS

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WIND PROJECTS AUSTRALIA
WOMBELANO WIND FARM
TYPICAL ACCESS
4.0m EXISTING ROAD
85m TURBINE BLADE TRANSPORT VEHICLE

Drawn/Check	Date	Scale	Size
GC / JA	12.02.2021	N.T.S.	A3

Drawing Number	Revision
V200680-TR-SK-21	1