WILLOGOLECHE STAGE 2 WIND FARM

TRAFFIC IMPACT ASSESSMENT REPORT

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1. EXECUTIVE SUMMARY

It is proposed to develop the Willogoleche Stage 2 Wind Farm, in Hallett South Australia.

The construction and operation of the wind farm and associated battery energy storage system will generate additional traffic movements within the vicinity of the respective sites. This report provides an assessment of the potential traffic impacts associated with construction and operation of the Willogoleche Stage 2 Wind Farm project (the Project) to inform the broader assessment of project impacts.

Transport impacts from the Project would arise from:

- increased traffic movements to/from the site during the construction period (including movement of components, construction materials and workforce); and
- increased traffic movements to/from the site once the Project is in its operational phase, including staff involved in monitoring and maintenance activities.

The traffic assessment undertaken identifies existing traffic volumes and conditions on the roads within the defined study area, and forecasts traffic movements associated with the Project's construction and operational phases, distributing traffic movements to the townships and cities within the study area (via the key transport routes identified).

The resulting traffic generation and distribution is expected to be accommodated on the existing road network with negligible impacts on the nature and function of its roads and intersections.

This report includes an assessment of access points and routes for the Project and identifies that appropriate access to/from the adjacent road network can generally be achieved, with direct site access to the Wilkins Highway for the wind farm site generally discouraged (other than locations adjacent the site's western boundary and/or for movements under construction traffic management). Whist the proposed access routes to/from the Project sites are generally appropriate, movements from Weirs Gap Road to Wilkins Highway (associated with access to the wind farm site) should be avoided due to sight distance constraints.

This report also includes a cone of vision assessment for the proposed wind turbine locations and identifies only low levels of distraction risk for traffic on the

adjacent road network. Based on the assessment, all wind turbine locations are considered acceptable.

2. PROJECT DESCRIPTION

2.1 INTRODUCTION

Environmental Resources Management Australia Pty Ltd (ERM) has been engaged by International Power (Australia) Holdings Pty Limited (Engie) to support the delivery of the approvals required under the Hydrogen and Renewable Energy Act 2023 (HRE Act) for the development of the Willogoleche Stage 2 Wind Farm.

Engie is proposing to construct and operate, the Willogoleche Stage 2 Wind Farm (the Project), a renewable energy project located on agricultural land in the mid-north of South Australia (SA). The Project represents an extension to the existing Willogoleche Wind Farm located approximately 190 km north of Adelaide and six (6) kilometres north-west of the township of Hallet in South Australia.

2.2 PROJECT OVERVIEW

The Project is understood to consist of the following components:

- up to 20 wind turbine generators (WTG);
- a meteorological mast for measuring wind speed and other climatic conditions;
- a battery energy storage system (BESS) facility and an expansion of the existing Willalo Substation (located approximately 4 km south of the proposed Willogoleche Stage 2 Wind Farm site); and
- overhead and underground electrical cable reticulation (between WTG, as well as between the proposed Willogoleche Stage 2 Wind Farm site and the existing Willalo Substation).

2.3 LOCALITY DESCRIPTION

The Willogoleche Stage 2 Wind Farm is located in the mid-north region of South Australia. The site locality includes existing operational wind farms (including the Willogoleche Stage 1 Wind Farm site on the south-western side of the Wilkins Highway), with the majority of the surrounding land comprising crops and pastural land.

Landform in the locality is generally defined by tablelands and numerous hills and valleys (with a general north-south orientation).

2.4 STUDY AREA

The defined study area for this assessment (refer Figure 1) incorporates the proposed Willogoleche Stage 2 Wind Farm site and Battery Energy Storage

System (BESS) site and the anticipated traffic catchment around the sites. Specifically, the study area comprises the following access routes:

- Adelaide to Willogoleche Stage 2 Wind Farm/BESS via Gawler (via Horrocks Highway and Barrier Highway);
- Adelaide to Willogoleche Stage 2 Wind Farm/BESS via Port Wakefield (via Port Wakefield Road, Augusta Highway and Wilkins Highway); and
- Port Pirie to Willogoleche Stage 2 Wind Farm/BESS via Jamestown.

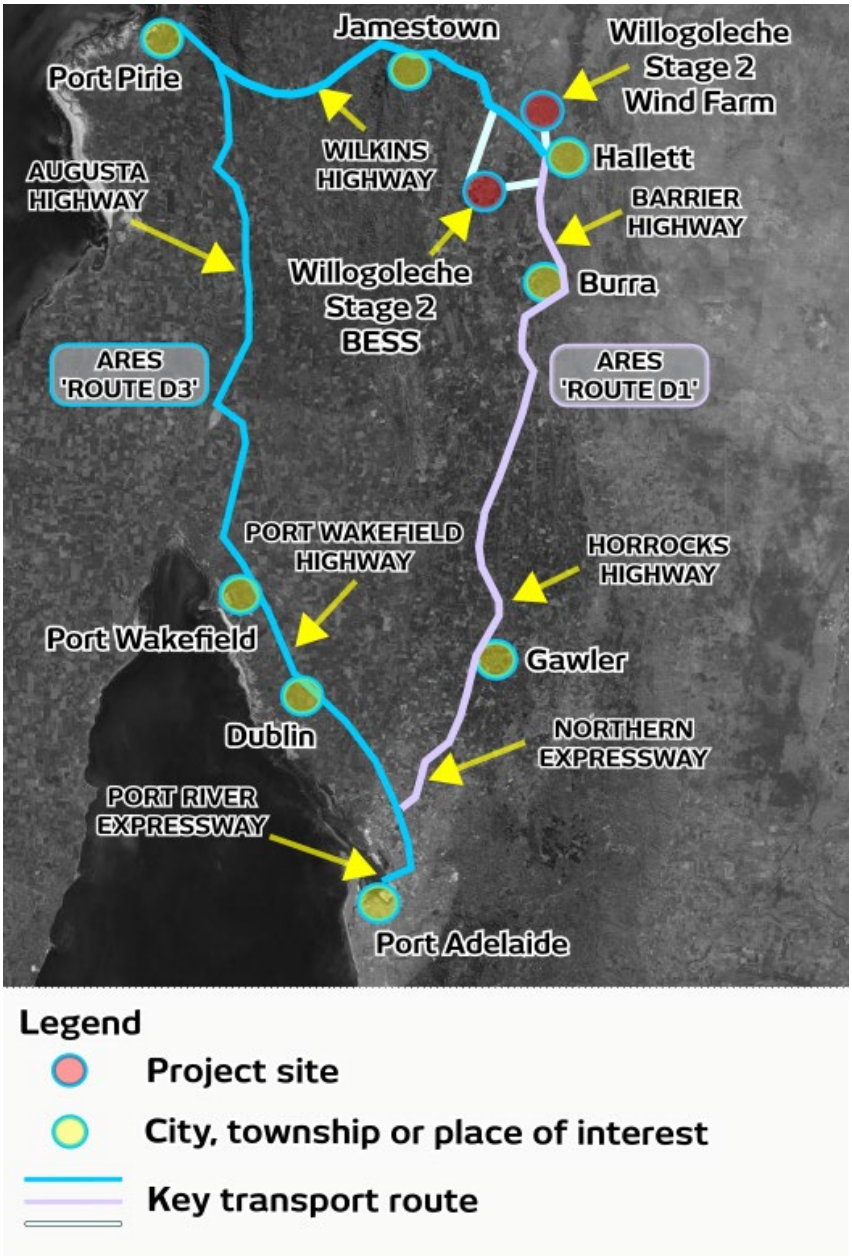

Figure 1 – Location of the Willogoleche Stage 2 Wind Farm and BESS sites and key traffic routes within the study area

The above study area is based in part on the route assessment report prepared by ARES Group for the Project, outlining potential options for access between Greater Adelaide and the Willogoleche Stage 2 Wind Farm site. The ARES Group report recommended the following two key freight access routes to the Willogoleche Stage 2 Wind Farm site:

- Route D1 (Adelaide to Willogoleche Stage 2 Wind Farm/BESS via Gawler) - preferred route for freight up to 5.2m loaded height; and
- Route D3 (Adelaide to Willogoleche Stage 2 Wind Farm/BESS via Port Wakefield) - for oversize (overheight) loads, as a return route for unladen trucks and as a backup option (should Route D1 become unavailable).

In addition to the routes identified by ARES Group, the study area includes routes between Barrier Highway, the Willogoleche Stage 2 BESS site and Wilkins Highway (via Willalo Road and Booborowie Road). Figure 2 illustrates the location of the Willogoleche Stage 2 Wind Farm and BESS sites and the key traffic routes within the locality of the two Project sites.

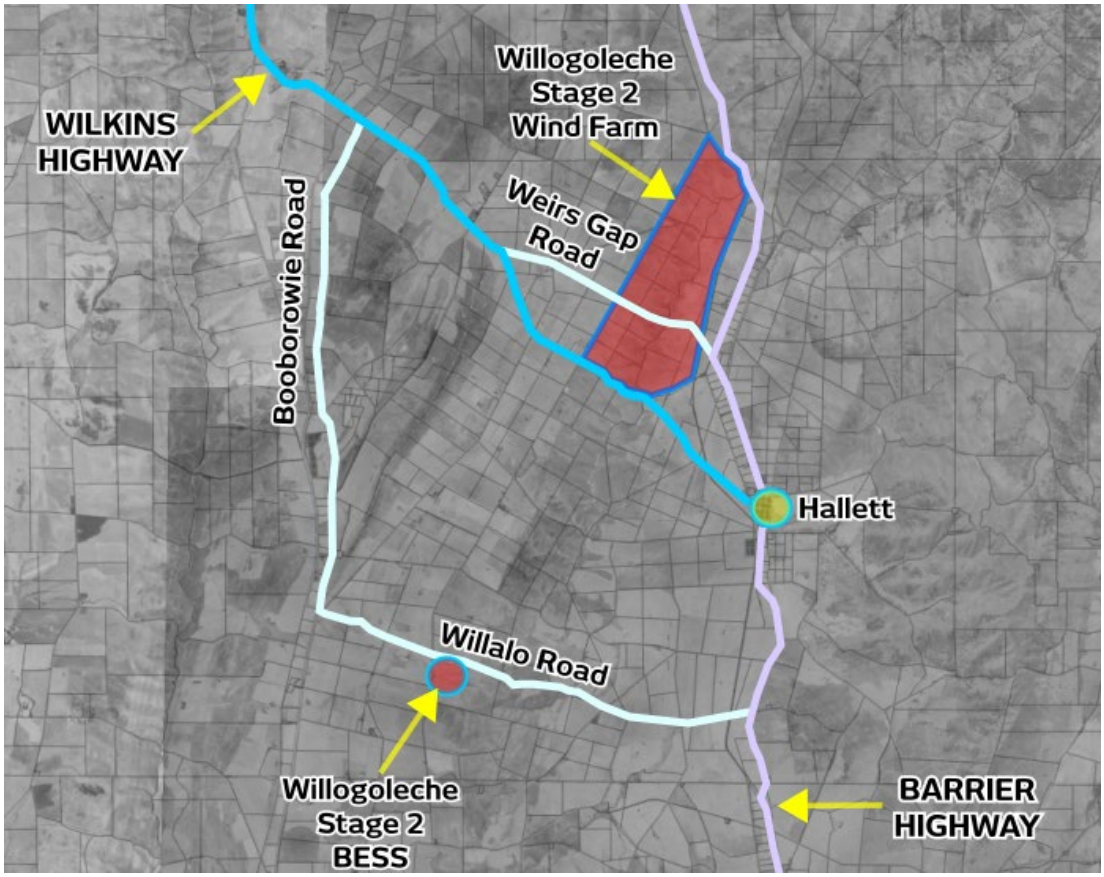

Figure 2 - Willogoleche Stage 2 Wind Farm and BESS sites and key traffic routes within the locality

2.5 PROJECT PHASES

For the purposes of this traffic assessment, the Project has been divided into two phases, namely a construction phase and an operational phase.

The construction phase is anticipated to occur over a 24-month period. On completion of the construction phase, the sites will enter operational phase (estimated at approximately 30 years for both the wind farm and the BESS).

Traffic will be generated by the Project during both phases, however traffic volumes will vary between phases due to the differing nature and variety of vehicles anticipated to be associated with each phase.

Further detail regarding the assessment of traffic associated with each Project phase is provided in Section 4.

2.6 DATA SOURCES AND INPUTS

Data from a variety of sources were utilised to prepare this traffic assessment. Specifically, the following inputs were utilised as well as relevant guidelines considered in the preparation of the assessment:

- traffic volumes – traffic counts for the subject road network were obtained from the Department for Infrastructure and Transport (DIT);
- road network improvements – information on current and planned roadworks on the subject road network were obtained from DIT;
- restricted access vehicle (RAV) routes – existing gazetted routes for RAVs were obtained from the National Heavy Vehicle Regulator (NHVR) website and potential access routes for RAVs associated with construction traffic were referenced from the route assessment report prepared by ARES Group;
- construction data – information regarding anticipated construction related traffic was obtained from review of a Willogoleche Stage 1 Wind Farm construction summary prepared by Catcon;
- operational data – information regarding anticipated operational conditions was obtained from a review of previous wind farm and BESS reporting undertaken by CIRQA; and
- standards and guidelines – key reference documents include (but are not limited to):
  - Australian Road Research Board's (ARRB) *"Best Practice Guide for Unsealed Roads"* October 2020, Edition 2;
  - Austroads' *"Guide to Road Design – Part 3: Geometric Design"* (February 2021);

- Austroads' *"Guide to Road Design – Part 4A: Unsignalised and Signalised Intersections"* (May 2023); and
- Austroads' *"Guide to Road Design – Part 6B: Roadside Environment"* (August 2024).

3. BACKGROUND

CIRQA has been engaged by ERM to provide a Traffic Impact Assessment (TIA) for the proposed Willogoleche Stage 2 Wind Farm Project (the Project).

This TIA provides an overview of the proposed development and study area and details the impacts of the transport movements associated with the life cycle of the Project (through construction and operation phases).

Each phase of the life cycle will be associated with different traffic and access requirements, which have been forecast and assessed to determine the extent of the impacts on the study area.

The construction phase will generate the largest volumes of traffic and therefore have the greatest impact on the road network. This report assesses the identified route options with consideration for the size, weight and frequency of vehicles and their respective loads in order to identify likely requirements for infrastructure or operating restrictions that may be required for the development to proceed. A more detailed Traffic Management Plan will be completed once development approval is obtained and will include more specific on-site inspections and detailed investigations of the final routes selected. The access points will be reviewed in more detail and any mitigating measures required to enable safe and appropriate access will be detailed.

The report is structured as follows:

- an **assessment of existing transport networks** which identifies the existing traffic conditions in the locality of the proposed wind farm site;
- **access routes for vehicles during construction and operational phases** are identified (Section 3)
- a **Traffic Impact Assessment** which identifies the traffic generated through the various stages of the Project, including construction and operation phases (Section 4);
- site layout and access options are assessed to identify **key safety considerations**, (Section 5);
- a **'cone of vision' assessment** which identifies the potential for the proposed wind turbines to result a distraction for users of the adjacent road network (Section 5); and
- finally, **findings and conclusions** are provided in Section 6.

3.1 EXISTING TRANSPORT NETWORKS

Across the study area, a network of roads provides important connections to townships and agricultural districts for a combination of commercial, recreation

and everyday uses. The road network is used by a combination of light vehicles and heavy vehicles, comprising both general access vehicles and restricted access vehicles (RAVs).

Public transport services within the study area are sparse, noting the very low population density and the significant distances between cities and townships within the study area.

The study area also includes an established rail network. Historically, the rail network was primarily used for the transportation of passengers and agricultural freight. Some sections of the rail network have since been closed (i.e. the Roseworthy to Peterborough railway line via Hallett) whilst other sections currently facilitate movement of passengers and freight (i.e. the Australian Rail Track Corporation's Adelaide to Port Augusta railway line).

3.1.1 ROAD NETWORK

The roads servicing the Willogoleche Stage 2 Wind Farm site typically comprise roads under the care and control of DIT, including:

- Port River Expressway (A9);
- Northern Expressway (M2);
- Sturt Highway (A20)
- Port Wakefield Highway (A1);
- Augusta Highway (A1);
- Main North Road (A20)'
- Horrocks Highway (B82);
- Wilkins Highway (B78); and
- Barrier Highway (A32).

In addition, there are roads under the care and control of the Regional Council of Goyder in the vicinity of the site, namely:

- The Braes Road;
- Weirs Gap Road;
- Willalo Road;
- McAskill Road; and
- Booborowie Road.

The wind farm route assessment report prepared by ARES Group recommended the following access routes for oversize/overmass vehicles, which have been assessed in Section 4:

- Route D1 (Adelaide to Willogoleche Stage 2 Wind Farm/BESS via Gawler) - preferred route for freight up to 5.2m loaded height; and
- Route D3 (Adelaide to Willogoleche Stage 2 Wind Farm/BESS via Port Wakefield) - for oversize (overheight) loads, as a return route for unladen trucks and as a backup option (should Route D1 become unavailable).

3.1.2 EXISTING TRAFFIC VOLUMES

Traffic data has been obtained for roads forming the DIT Road Network across the study area (from DIT). Data obtained includes Annual Average Daily Traffic (AADT) volumes and associated commercial vehicle (CV) percentages, as well as the year in which the data was collected. Lane and shoulder width information has been obtained from available aerial imagery. Table 1 and Table 2 list the data obtained for the study area's key access routes.

Table 1 – Available traffic data for key roads along Route D1

Road	AADT volume *(Year)*	CV volume	CV%	Lane widths	Shoulder width	Road authority
Port River Expressway *(Eastern Parade to North-South Motorway)*	42,700 *(2024)*	6,400	1.5%	≈ 3.5 m	≈ 2.0 m (S)	DIT
North-South Motorway *(Port River Expressway to Port Wakefield Highway)*	67,400 *(2024)*	10,300	15.5%	≈ 3.5 m	≈ 2.0 m (S)	DIT
Northern Expressway (Port Wakefield Highway to Sturt Highway)	39,000 *(2023)*	6,400	16.5%	≈ 3.5 m	≈ 3.0 m (S)	DIT
Sturt Highway *(Northern Expressway to Horrocks Highway)*	34,000 *(2023)*	5,000	14.5%	≈ 3.5 m	≈ 3.0 m (S)	DIT
Horrocks Highway *(Sturt Highway to Barrier Highway)*	4,100 *(2024)*	650	16%	≈ 3.3 m	≈ 1.0 m (S)	DIT
Barrier Highway *(Horrocks Hwy to Goyder Highway)*	1,400 *(2024)*	390	28%	≈ 3.3 m	≈ 1.0 m (S)	DIT
Barrier Highway *(Goyder Highway to Hallett)*	900 *(2024)*	250	28%	≈ 3.0 m	≈ 1.0 m (S)	DIT
Barrier Highway *(Hallett to Terrowie)*	650 *(2024)*	190	29%	≈ 3.0 m	≈ 1.0 m (S)	DIT

Road	AADT volume *(Year)*	CV volume	CV%	Lane widths	Shoulder width	Road authority
Wilkins Highway *(Hallett to Willogoleche Stage 2)*	250 *(2024)*	75	30%	≈ 3.1 m	≈ 1.0 m (S)	DIT

(S) = sealed

Table 2 – Available traffic data for key roads along Route D3

Road	AADT volume *(Year)*	CV volume	CV%	Lane widths	Shoulder width	Road authority
Port Wakefield Highway *(North-South Motorway to Two Wells)*	11,900 *(2024)*	2,500	21%	≈ 3.5 m	≈ 3.0 m (U)	DIT
Port Wakefield Highway *(Two Wells to Port Wakefield)*	7.900 *(2024)*	1.700	21.5%	≈ 3.5 m	≈ 3.0 m (U)	DIT
Augusta Highway *(Port Wakefield to Wilkins Highway)*	4,400 (2024)	1,200	27.5%	≈ 3.5 m	≈ 1.0 m (S)	DIT
Augusta Highway *(Wilkins Highway to Port Pirie)*	4,800 (2023(	1,300	27%	≈ 3.5 m	≈ 1.0 m (S)	DIT
Wilkins Highway *(Augusta Highway to Gladstone)*	1,900 (2023)	360	19%	≈ 3.3 m	≈ 1.0 m (S)	DIT
Wilkins Highway *(Gladstone to Jamestown)*	1,000 *(2023)*	240	24%	≈ 3.2 m	≈ 1.0 m (S)	DIT
Wilkins Highway *(Jamestown to Willogoleche Stage 2)*	250 (2024)	75	30%	≈ 3.1 m	≈ 1.0 m (S)	DIT

(S) = sealed; (U) = unsealed

3.1.3 RESTRICTED ACCESS VEHICLE NETWORK

DIT and the National Heavy Vehicle Regulator (NHVR) are responsible for the gazettal or issuance of permits for the operation vehicles greater than 19.0 m in length (i.e. longer than a Semi-Trailer) along the road network. The highways linking the site within the broader arterial/highway network are currently gazetted for use by Road Trains up to 36.5 m in length, operating at Higher Mass Limits (HML), PBS Level 3A vehicles as well as other oversize/overmass vehicles (up to 4.6 m wide load carrying vehicles, 40 t Special Purpose Vehicles and (up to) 6 axle cranes).

No existing gazettals are identified on the roads managed by local government authorities within the study area.

3.1.4 CURRENT AND PLANNED ROAD NETWORK IMPROVEMENTS

DIT has a number of road network improvements committed for (or under construction on) roads and highways within the study area, in response to safety issues and forecast growth in traffic volumes. An overview of these public infrastructure projects is provided below.

3.1.4.1 BARRIER HIGHWAY

DIT is currently undertaking works on the Barrier Highway at multiple locations between Burra and Riverton. DIT has advised that the upgrades include *"...pavement rehabilitation and sealing, shoulder widening and sealing, installation of safety barriers, new line marking and vegetation management..."*. The works are anticipated to be completed in December 2025.

3.1.4.2 WILKINS HIGHWAY

Other than ongoing, general maintenance works, no other works are currently proposed for Wilkins Highway.

4. TRAFFIC IMPACT ASSESSMENT

4.1 CONSTRUCTION PHASE

4.1.1 VEHICLE FLEET

During the construction phase, vehicles associated with transport of turbine components and construction materials are likely to originate from the locations listed in Table 3.

Table 3 - Origin of wind farm construction materials/components and vehicle types

Component/material	Description	Likely origin	Vehicle types
Large turbine components	Blades (up to 91 m in length) Nacelle (single unit) Tower (sections up to 25 m in length) Hub (single unit)	Port Adelaide	Oversize vehicles
Locally manufactured or sourced components	Various	Greater Adelaide	Semi-Trailers and Rigid Trucks
Construction materials	Steel reinforcing, concrete, quarry rubble	Greater Adelaide and local region	Semi-Trailers and Rigid Trucks
Labour	Staff and contractors	Greater Adelaide and local region (i.e. Port Pirie)	Passenger vehicles, vans and utility vehicles

The route assessment report prepared by ARES Group outlines options for access between the wind farm site and the above component/material origins, as well as assessment of road modifications required to facilitate access for oversize/overmass (OSOM) vehicles along each route.

The Project's construction phase will also include vehicles associated with transport of BESS components and construction materials, which are likely to originate from the locations listed in Table 4.

Table 4 - Origin of BESS construction materials/components and vehicle types

Component/material	Description	Likely origin	Vehicle types
Site buildings and plant	Site huts, weatherproof enclosures, cooling systems and racks	Greater Adelaide	19 m Semi-Trailers and Rigid Trucks, including 50-100t mobile crane

Component/material	Description	Likely origin	Vehicle types
Construction materials	Steel reinforcing, concrete, quarry rubble	Greater Adelaide and local region	Semi-Trailers, Truck and Dog Trailer combinations and Rigid Trucks
Battery systems	Batteries, inverters, transformer, conduits and cables	Greater Adelaide	Oversize vehicles, 19 m Semi-Trailers and Rigid Trucks
Labour	Staff and contractors	Greater Adelaide and local region (i.e. Port Pirie)	Passenger vehicles, vans and utility vehicles

4.1.2 TRAFFIC GENERATION AND DISTRIBUTION

As above, movements generated during the construction phase would relate to the delivery of components, construction materials and equipment/heavy machinery to and from the respective sites. The estimated traffic generation over the construction phase of the Project is outlined in Table 5. This traffic generation assessment is based on the following assumptions:

- construction material quantities associated with similar projects including the Willogoleche Stage 1 Wind Farm;
- a 24-month construction period;
- an average of 22 working days per month; and
- an average of 200 light vehicle movements per day associated with each site.

Table 5 - Forecast traffic generation associated with proposal

Material	Est. quantity	Unit	Vehicle type	Forecast one-way vehicle trips		
				Total trips	Average monthly trips	Average daily trips
Concrete materials (wind farm)	15,000	cubic metres	Semi-Trailers/ rigid trucks	1,500	63	3
Reinforcing steel (wind farm)	1,200	tonnes	Semi-Trailers/ rigid trucks	120	5	<1
Road base (wind farm)	100,000	tonnes	Semi-Trailers/ rigid trucks	10,000	417	19
Misc. materials (wind farm)	nominal	N/A	Semi-Trailers/ rigid trucks	50	4	< 1
Turbine components						

Tower sections	100	5 sections/ tower	OSOM	100	4	<1
Nacelles	40	2 sections/ nacelle	OSOM	40	2	< 1
Hub	20	1 hub/ turbine	OSOM	20	1	< 1
Blades	60	3 blades/ turbine	OSOM	60	3	< 1
Site work activities (wind farm site)						
Visitors/ employees	nominal	N/A	Light vehicles	13,200	1,100	100
Construction plant/ equipment	nominal	N/A	Semi-Trailers/ rigid trucks	1200	50	2
Site work activities (BESS site)						
Visitors/ employees	nominal	N/A	Light vehicles	13,200	1,100	100
Construction materials, plant, equipment	nominal	N/A	Semi-Trailers/ rigid trucks	15,000	625	28
Total two-way traffic movements						
OSOM vehicles				440	18	1
Trucks				55,740	2,323	105
Cars				211,200	8,800	400
Total				**267,380**	**11,141**	**506**

As illustrated in Table 4, construction activities are forecast to generate an average of 506 daily vehicle trips over the 24-month construction period, comprising:

- 1 OSOM vehicle trip;
- 105 other truck trips; and
- 400 light vehicle trips.

A forecast general distribution of construction phase OSOM traffic movements to and from the Project sites has been identified as follows:

- 20% of movements undertaken via Route D3 (Adelaide to the Project sites via Port Wakefield and 80% of movements undertaken via Route D1 (Adelaide to the Project sites via Gawler)

A forecast general distribution of construction phase general truck traffic (Semi-Trailer and rigid truck) traffic movements to and from the Project sites has been identified as follows:

- 55% of movements undertaken via Route D1 (Adelaide to the Project sites via Gawler);
- 30% of movements undertaken locally via Route D1 (between Hallett and the Project sites), noting that a significant proportion of quarry materials are likely to be sourced locally (if not sourced on site); and
- 15% of movements undertaken between Port Pirie and the Project sites);

A forecast general distribution of construction phase light vehicle traffic movements to and from the Project sites, has been identified as follows:

- 80% of movements undertaken between Port Pirie and the Project sites); and
- 20% of movements undertaken locally via Route D1 (between Burra and the Project sites).

The resulting distribution of daily construction phase movements forecast for the Project is outlined in Table 5 and Table 6.

Table 6 – Average daily traffic movements associated with construction phase (Route D1)

Road	Existing AADT volume *(Year)*	CV volume	Forecast additional CV	Forecast additional light vehicles	Total AADT volume (% change)	Total CV volume (% change)
Port River Expressway *(Eastern Parade to North-South Motorway)*	42,700 *(2024)*	6,400	59	80	42,839 (+0.3%)	6,459 (+0.9%)
North-South Motorway *(Port River Expressway to Port Wakefield Highway)*	67,400 *(2024)*	10,300	59	80	67,539 (+0.2%)	10,359 (+0.6%)
Northern Expressway (Port Wakefield Highway to Sturt Highway)	39,000 *(2023)*	6,400	59	80	39,139 (+0.4%)	6,459 (+9.2%)
Sturt Highway *(Northern Expressway to Horrocks Highway)*	34,000 *(2023)*	5,000	59	80	34,096 (+0.4%)	5,059 (+1.2%)
Horrocks Highway *(Sturt Highway to Barrier Highway)*	4,100 *(2024)*	650	59	80	4,239 (+3.4%)	709 (+9.0%)
Barrier Highway *(Horrocks Hwy to Goyder Highway)*	1,400 *(2024)*	390	59	80	1,539 (+9.9%)	449 (+15.0%)

Road	Existing AADT volume *(Year)*	CV volume	Forecast additional CV	Forecast additional light vehicles	Total AADT volume (% change)	Total CV volume (% change)
Barrier Highway *(Goyder Highway to Hallett)*	900 *(2024)*	250	59	80	1,039 (+15.4%)	309 (+23.5%)
Barrier Highway *(Hallett to Terrowie)*	650 *(2024)*	190	89	40	779 (+19.8%)	279 (+46.8%)
Wilkins Highway *(Hallett to Willogoleche Stage 2)*	250 *(2024)*	75	89	40	379 (+51.6%)	164 (+119%)

Table 7 – Average daily traffic movements associated with construction phase (Route D3)

Road	AADT volume *(Year)*	CV volume	Forecast additional CV	Forecast additional light vehicles	Total AADT volume (% increase)	Total CV volume (% increase)
Port Wakefield Highway *(North-South Motorway to Two Wells)*	11,900 *(2024)*	2,500	1	< 1	11901 (+< 0.1%)	2501 (+<0.1%)
Port Wakefield Highway *(Two Wells to Port Wakefield)*	7.900 *(2024)*	1.700	1	<1	7901 (+< 0.1%)	1701 (+< 0.1%)
Augusta Highway *(Port Wakefield to Wilkins Highway)*	4,400 (2024)	1,200	1	< 1	4401 (+< 0.1%)	1201 (+< 0.1%)
Augusta Highway *(Wilkins Highway to Port Pirie)*	4,800 (2023(	1,300	1	320	5,121 (+6.7%)	1301 (+< 0.1%)
Wilkins Highway *(Augusta Highway to Gladstone)*	1,900 (2023)	360	1	320	2,221 (+16.9%)	361 (+0.3%)
Wilkins Highway *(Gladstone to Jamestown)*	1,000 *(2023)*	240	1	320	1,321 (+32.1%)	241 (+0.4%)
Wilkins Highway *(Jamestown to Willogoleche Stage 2)*	250 (2024)	75	1	320	571 (+128%)	76 (+1.3%)

Beyond the Wilkins Highway and Barrier Highway, traffic movements will distribute to potential wind farm site access points on The Braes Road and Weirs Gap Road and BESS access points on Willalo Road and McAskill Road. The ARES report identifies potential for up to six (6) site access locations for the wind farm site. In addition, the BESS site is expected to comprise a new access point on Willalo Road and two new access points on McAskill Road. The Braes Road, Weirs

Gap Road, Willalo Road, McAskill Road and Boobowrie Road are all low volume unsealed rural roads.

4.1.3 TRAFFIC IMPACT

During the construction phase, the Project is forecast to generate in the order of 506 movements, including 106 heavy vehicle movements. Due to proximity to the sites, the highest number of vehicle movements will occur on the sections of Wilkins Highway and Barrier Highway in the locality of the sites. The resultant daily traffic volume on these roads is equivalent to between 129 and 321 additional movements above baseline levels. Such movements will be distributed via the existing two-lane two-way unsealed roads adjacent the sites as follows:

- The Braes Road/Weirs Gap Road
  - up to 248 additional daily vehicle movements (including 48 additional commercial vehicle movements), split between the two roads;
- Willalo Road
  - up to 83 additional daily vehicle movements (including 43 additional commercial vehicle movements;
- McAskill Road
  - up to 200 additional daily light vehicle movements; and
- Boobowrie Road
  - up to 174 additional daily vehicle movements (including 14 additional commercial vehicle movements.

The resultant daily traffic volumes are expected to be within respective capacities of the unsealed roads listed above, given that existing daily volumes on these roads are very low, and given that resultant volumes are not likely to exceed the 250 vpd threshold at which the ARRB's "*Best Practice Guide for Unsealed Roads*" recommends road sealing. Furthermore, the resultant daily traffic volumes on Wilkins Highway and Barrier Highway are also regarded to be within the general capacity of these rural highways, noting that the Austroads' "*Guide to Road Design – Part 3: Geometric Design*" identifies that for single-lane rural roads with an AADT between 1,000 and 2,000 vpd, a minimum carriageway of 7.0 m and shoulders of 1.0 m should be provided in order to accommodate two-way traffic movements.

The number of additional movements disperses to the southeast and west of the site (to the Augusta Highway, Sturt Highway, Port Wakefield Highway, Northern Expressway and Port River Expressway. Such volumes would be readily accommodated with negligible effect on the function of these roads (and on road wear/deterioration).

With regard to the operation of the intersections within the study area, the traffic effect on intersections is typically assessed with regard to peak hour traffic volumes, which typically equate to 10% of daily traffic volumes. Additional peak hour traffic volumes (in the order of 15 to 20 additional peak hour movements) are expected to be readily accommodated with negligible effect upon the operation of intersections within the study area, including travel times. As such, the construction phase is expected to have minimal effect on travel times within the study area.

4.2 OPERATIONAL PHASE

4.2.1 TRAFFIC ASSESSMENT

After construction, the Project will generate traffic associated with site monitoring and facilities maintenance. The traffic generation during this phase is expected to be minimal, given that modern wind farms and BESS are designed to accommodate remote operation. As a result, the requirement for staff to access the site would be limited.

Immediately after construction, the wind farm and BESS will require testing and commissioning, which may require daily attendance by a team of up to 30 staff each day over period of up to four months (generating in the order of 20 daily vehicle trips). However, once operational, levels of staff attendance at both sites will reduce significantly, with smaller teams (of up to 10 staff) only required on site infrequently for routine site inspections and maintenance activities (generating in the order of 8 vehicle trips on days scheduled for maintenance).

Furthermore, given that the Project sites are located adjacent the existing Willogoleche Stage 1 Wind Farm and Willalo Substation, respectively, it is possible that maintenance activities may be coordinated between the adjacent sites (i.e. by staff already accessing the sites as part of scheduled maintenance activities). This would result in a proportion of shared vehicle trips, thereby reducing the additional traffic generated by the Project during its operational phase.

Replacement of wind turbine or BESS components may be required as part of maintenance activities, which would require additional heavy vehicle access to the site. The delivery of large turbine or BESS components would be undertaken in accordance with the routes outlined in Section 3 and may require OSOM vehicle access to the site.

Given that the typical day-to-day traffic generation associated with the Project is low, the forecast traffic generation during the operational phase would be readily accommodated with negligible effect on the function of the adjacent roads.

5. SITE LAYOUTS

Concept layouts for the sites are illustrated below in Figure 3 and Figure 4. The concepts have been developed (by Engie) to identify an envisaged site configuration (including the location of WTG) and associated general access arrangements (via the existing road network).

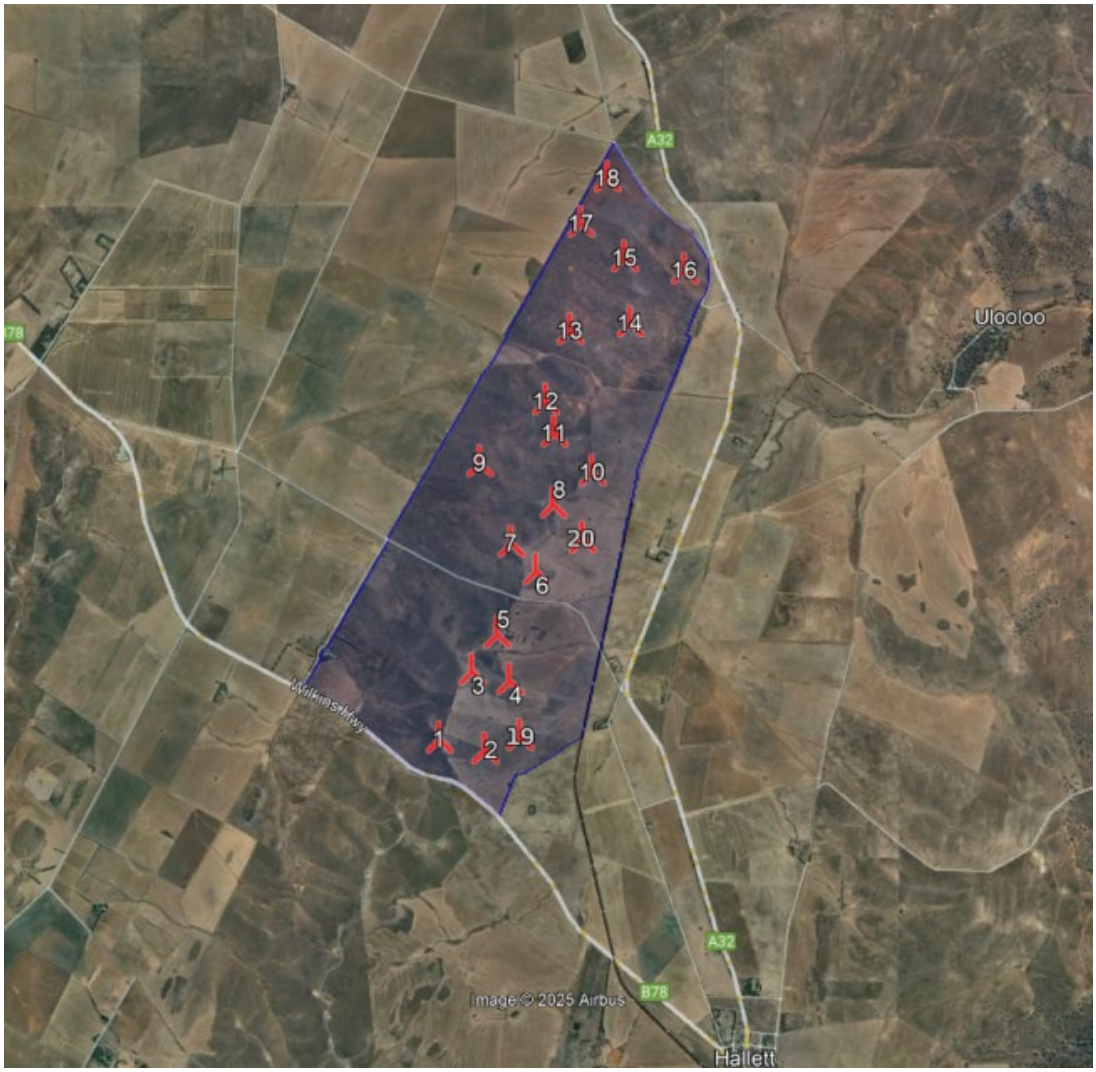

Figure 3 - Proposed layout of Willogoleche Stage 2 Wind Farm (including WTG locations)

Figure 4 - Proposed footprint of Willogoleche Stage 2 BESS and Willalo Substation expansion

5.1 ACCESS CONSIDERATIONS

5.1.1 WILLOGOLECHE STAGE 2 WIND FARM SITE

As noted above, the OSOM access arrangements associated with the construction of the wind farm have been detailed in the ARES Group report. The ARES assessment has included review of swept paths for movements associated with the largest vehicles required to access the site and associated widening requirements at key intersections.

It is understood that the primary access locations for the wind farm will be via Weirs Gap Road and Stock Route Road. However, as noted in the ARES assessment, additional direct access to/from other roads (most notably Wilkins Highway) may be required for individual turbine installation.

It is considered that the access points via Weirs Gap Road and Stock Route Road can be safely accommodated with minimal impact on the road network. Both roads are unsealed roads with carriageways with appropriate formed widths (generally 7.5 to 8.5 m including shoulders for Weirs Gap Road and 6.5 to 7.5 m including shoulders for Stock Route Road). Both roads are also currently in good condition. Figures 2 and 3 provide an example of the general arrangement for Weirs Gap Road and Stock Route Road, respectively.

Figure 5 - Weirs Gap Road (looking east)

Figure 6 - Stock Route Road (looking north)

Access points shall be designed to accommodate the swept path of the relevant vehicles (i.e. whether provided for construction, ongoing management or both purposes). Given the low traffic volumes separated turning facilities are not considered warranted for access points on Weirs Gap Road and Stock Route Road.

Whist access could be safely accommodated the site's westernmost point on Wilkins Highway (i.e. the recommended sight distances would be achieved), should construction access be required via the eastern portion of the site's frontage to Wilkins Highway, traffic management (including temporary speed reduction) would need to be implemented due to sight distance limitations. Similarly, ongoing direct (maintenance) access via the eastern portion of the site's frontage to Wilkins Highway is not desirable unless a higher order access treatment is provided.

The routes to/from the proposed primary access points are generally considered appropriate. However, the following issues were identified during the road network inspection:

- the intersection of Weirs Gap Road and Wilkins Highway has sight distance limitations due to both the vertical and horizontal alignments on the intersection and its approaches. Specifically, the curved alignment and crest associated with the north-western leg of the intersection limits sight distance at this location (refer Figure 4). The available sight distance provisions would be below those recommended by the Austroads' "Guide to Road Design". Specifically, 330 m sight distance is generally recommended by Austroads' or at least 257 m under the reduced Extended Design Domain provision (only approximately 200 m is available between drivers approaching from the north-west and drivers exiting Weirs Gap Road). This presents a conflict risk for vehicles exiting Weirs Gap Road to Wilkins Highway. The risks associated with this limitation can be addressed during the construction phase with the implementation of traffic management (i.e. localised speed reduction and/or access under escort arrangements). However, for longer term maintenance access staff/contractors should be instructed to utilise alternative routes (such as North Bluff Road or, if available for use, the private access connection to Wilkins Highway opposite Ashby Road). It is highlighted that similar issues are present at the intersection of Popperinghi Road and Wilkins Highway and that this would not be an appropriate alternative route (for uncontrolled movements).

Figure 7 - Crest and curve in Wilkins Highway to the north-west of Weirs Gap Road

- for access via Stock Route Road, there are similar restrictions on sight distance provision at its intersection with the Barrier Highway (due to the curved alignment of Barrier Highway south of the intersection) if taken against the alignment of the property boundary/road reserve. However, the provisions are better than those identified at the Weirs Gap Road/Wilkins Highway intersection and, additional visibility is provided across the property to the south (refer Figure 5). Specifically, sight distance provisions between drivers approaching from the south and drivers exiting Stock Route Road equate to approximately 285 m (if taken against the road reserve/property line). While short of the general sight distance recommendation, the available sight distance exceeds the Extended Domain Design recommendation of 257 m. Acknowledging the low levels of traffic volumes both on Barrier Highway (through-bound) and those associated with the proposal, application of the Extended Design Domain provisions is considered acceptable and that access can be safely accommodated via this intersection. Furthermore, as above, there is additional sight distance provision across the adjacent property which would likely mean sight distances in excess of the general recommendation are also achieved – albeit, there is limited control over the potential for obstructions within the property – though unlikely given the rural nature of the property). Regardless of the above, movements by OSOM vehicles should still be undertaken with appropriate traffic management as required.

Figure 8 - Curve alignment of Barrier Highway south of Stock Route Road

5.1.2 WILLOGOLECHE STAGE 2 BESS SITE

It is understood that the primary access locations for the Willogoleche Stage 2 BESS site will be via Willalo Road and McAskill Road. It is considered that site access points can be safely accommodated on these roads with minimal impact on the road network. Both roads are unsealed roads in good condition, with carriageways with appropriate formed widths (generally 8.0 to 9.0 m). In addition, both roads have a vertical and horizonal alignment that is likely to result in sight distance requirements being achieved at site access points (with further detailed assessment undertaken when access points are identified).

Beyond the site's access points, commercial vehicle (19.0 m Semi-Trailer) turn paths have been reviewed at the following key intersections within the site locality:

- Barrier Highway/Willalo Road intersection
  - 19.0 m Semi-Trailer movements can be undertaken within the available formed carriageways on the two roads. Semi-Trailers exiting Willalo Road to travel southbound on Barrier Highway would be required to give way to any vehicle entering Willalo Road from Barrier Highway (albeit such an incidence would be unlikely due to the low traffic volumes at the intersection);

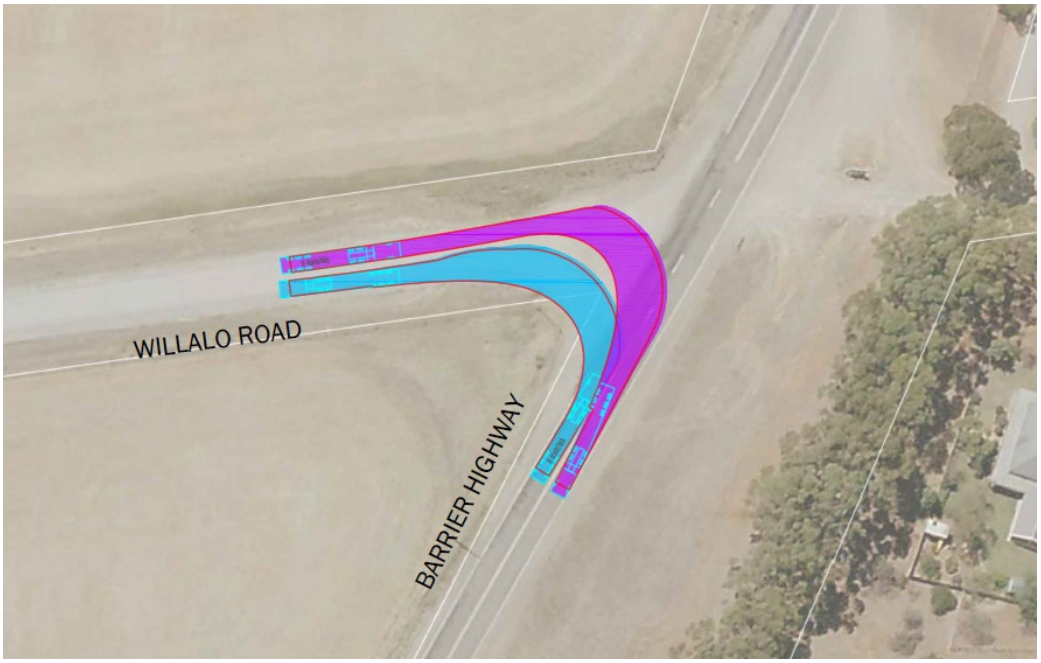

Figure 9 - 19.0 m Semi-Trailer turn paths at the Barrier Highway/Willalo Road intersection

- Willalo Road/McAskill Road intersection
  - inbound 19.0 m Semi-Trailers turning from Willalo Road (both from east and west) will be required to utilise the full width of the McAskill Road carriageway. Traffic management (i.e. communication protocols) should be implemented to minimise risk of conflict between exiting and entering vehicles;

Figure 10 - 19.0 m Semi-Trailer turn paths at the Willalo Road/McAskill Road intersection

- Wilkins Highway/Booborowie Road intersection
  - 19.0 m Semi-Trailer turns can be adequately accommodated (even simultaneously); and

Figure 11 - 19.0 m Semi-Trailer turn paths at the Wilkins Highway/Boobowrie Road intersection

- **Booborowie Road bend** (3.75 km northwest of the Willogoleche Stage 2 BESS site)
  - simultaneous 19.0 m Semi-Trailer movements are adequately accommodated.

Figure 12 - 19.0 m Semi-Trailer turn paths at the Boobowrie Road bend

It should be noted that OSOM vehicle access for the BESS site will require further detailed review once specific vehicle types and combinations are identified. It is expected that, given the relatively wide road reserves in the locality, such vehicles will generally be able to be physically accommodated within the available road reserves, however widening of intersection run-off areas (and/or RAV traffic management, including escort vehicles) may be required to accommodate very large OSOM combinations and/or loads.

5.2 WIND FARM CONE OF VISION ASSESSMENT

The 'Cone of Vision' assessment plays a key role in road design, particularly in ensuring adequate conveyance of necessary road safety information whilst minimising roadside distractions for drivers. This assessment evaluates the field of view from the driver's perspective, ensuring that critical signs, signals, and potential hazards are visible and within the driver's line of sight whilst avoiding other visual distractions.

Austroads' "*Guide to Road Design – Part 6B: Roadside Environment*" details the methodology for the Cone of Vision assessment. Specifically, the Guide provides recommended 'cones of vision' for 64 km/h, 80 km/h and 100 km/h travel speeds as illustrated in Figure 13. Objects located within the 'cones of vision' adjacent roads have greater potential to distract drivers and, in such instances, the Austroads' Guide recommends screening to prevent driver distraction. More desirably, objects (such as the proposed wind turbines) would be located entirely clear of the cone of vision applicable to the respective speed limit.

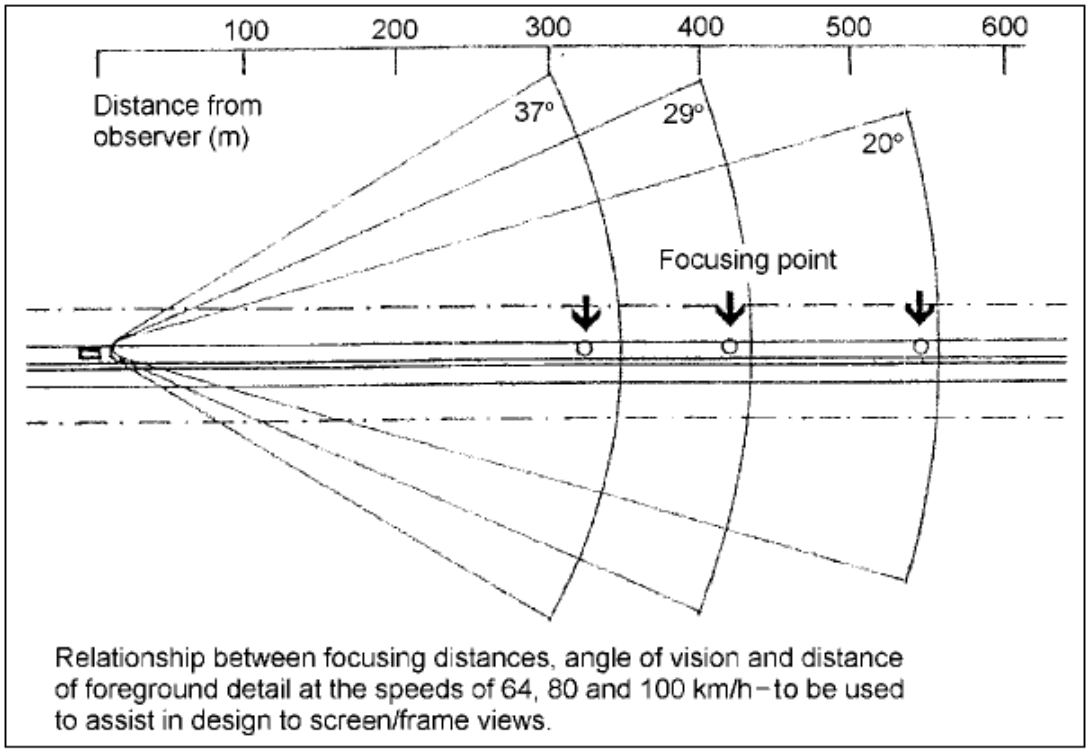

Figure 13 - Cones of vision for various travel speeds (source: Austroads AGRD6B, 2021)

An assessment of the 'cones of vision' for the adjacent road network and proposed wind turbines has been undertaken based on the Austroads' Guide methodology. This has been based on the following application of the different speed envelopes:

- sealed roads – both the 80 km/h and 100 km/h cones of vision (noting that, while the posted speed limit is 100 km/h there are some areas of horizontal and/or vertical alignment where lower speeds are likely); and
- unsealed roads – both the 64 km/h and 80 km/h cones of vision (noting that typical speeds on unsealed roads would be within this range depending on driver confidence).

The cones of vision have been applied as an 'array' along the alignments of the adjacent public roads (where the cones would overlap the site). The proposed wind turbine locations have been plotted against this 'envelope' as illustrated in Figure 14.

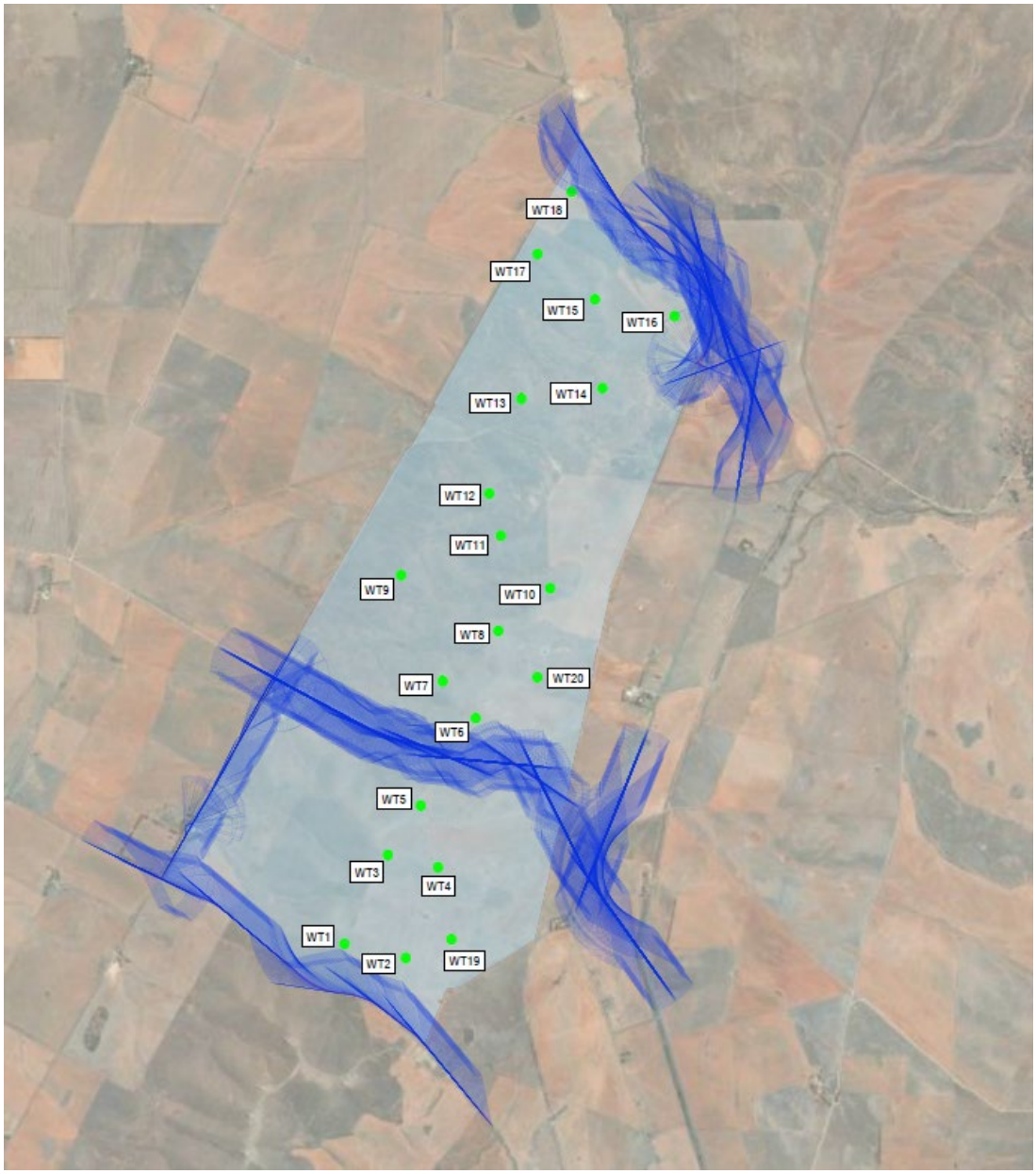

Figure 14 - Cone of vision assessment for roads adjacent to the site

As illustrated in the above figure, the majority of the proposed WTG locations are outside the envelope associated with the cone of vision assessment. However, the following proposed WTG locations are within the cone of vision 'envelopes', namely:

- WT16 – located in the north-eastern corner of the site. In reality, the cone of vision is less than indicated by the above plan given it relates to movements around a bend where speeds would be much lower than adopted for the assessment. Therefore, WT16 will be outside of the cone of vision for realistic speeds in this location. The location of WT16 is therefore considered to represent a very low level of risk and is acceptable; and
- WT18 – located in the northern corner of the site adjacent to Stock Route Road site. The turbine is within the cone of vision for the 80 km/h design speed for the unsealed section of Stock Route Road. Realistic travel speeds would typically be less than the design speed (given the road's unsealed nature). Stock Route Road would also be associated with extremely low traffic volumes and would primarily be utilised by road users familiar with the environment. The location of WT18 is therefore considered to represent a very low level of risk and is acceptable.

Importantly, all turbines located in general proximity of the nearby highways (higher volume, higher order roads) are clear of the cone of vision assessment.

6. FINDINGS AND CONCLUSIONS

Following the assessment of the traffic impact associated with the proposal undertaken in this report, the following findings and conclusions have been determined:

- the construction phase is forecast to generate an average of 506 daily vehicle trips over the 24-month construction period, comprising: 1 OSOM vehicle trip; 106 truck trips; and 400 light vehicle trips;
- the operational phase is forecast to generate between 8 and 20 vehicle trips, comprising predominantly light vehicle movements;
- traffic volumes associated with all project phases are expected to have negligible effects on travel times, as well as the nature and function of existing roads and intersections within the study area; and
- access via the adjacent road network can generally provided appropriately. Access point design will need to accommodate the swept paths of the largest vehicles intended for use at each access location. Access points direct to the Wilkins Highway would be limited to the western extent of the site's Wilkins Highway frontage. Access points direct to the Wilkins Highway in locations further east would desirably be avoided, other than for use during construction (when traffic management measures can be implemented). Higher order access layouts would be required if permanent access was proposed direct from the eastern portion of the site's frontage to the Wilkins Highway;
- the access routes to/from the Project sites are generally considered appropriate. However, there are sight distance constraints associated with vehicles exiting Weirs Gap Road to Wilkins Highway. Egress movements from Weirs Gap Road could be managed during construction (with appropriate traffic control). However, for ongoing maintenance access (without temporary traffic management) this route would desirably not be utilised for egress from the site. Vehicles accessing the site without traffic management arrangements should be directed to utilise alternative access routes when seeking to exit to the north-west via Wilkins Highway; and
- two of the proposed wind turbine locations (WT16 and WT18) would be located within the 'cone of vision' for movements on the adjacent road network. However, given realistic vehicle speeds and low volumes on the adjacent roads, the subject (two) turbine locations are considered to present minimal risk to road safety and are considered acceptable.