Report

Paling Yards, Transport Impact Assessment

10 APRIL 2012

Prepared for

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Executive Summary

URS Australia Pty Ltd (URS) has been engaged by Union Fenosa Wind Australia Pty Ltd (UFWA) to conduct a Transport Impact Assessment (TIA) to support a Major Project Application for a Wind Farm development at Paling Yards, Oberon in south-eastern New South Wales.

The TIA analyses the impacts of the construction and on-going operation of the proposed development on the existing transport network. Network operation performance is assessed at two key intersections during morning and evening peaks and at a number of key midblock locations along Abercrombie Road. SIDRA is used to analyse intersection performance, while the RTA's '*Guide to Traffic Generating Developments'*, version 2.2 (October 2002) is used to analyse the performance of the road infrastructure at midblock locations along Abercrombie Road.

Based on existing Annual Average Daily Traffic (AADT) volumes and estimates for existing local traffic volumes, the additional traffic generated from the proposed development is not expected to significantly alter the Level of Service from the existing performance levels along Abercrombie Road.

1

Introduction

1.1 Background

URS has been engaged by UFWA to undertake this TIA for the proposed wind energy facility at Paling Yards, Oberon. This TIA focuses on the route selection of vehicles (particularly those that are over-dimensional), traffic generated from the development, existing pavement and intersection conditions and the impact of the development.

This report has been prepared in accordance with the scope agreed between URS and UFWA dated 9 March 2011 and focuses on the public roads defined as the preferred transportation routes between the site and the Port of Newcastle and Port Kembla.

1.2 Site Location

The proposed wind farm site is located in Paling Yards, Oberon in south-eastern NSW. It is situated 60km south of Oberon, 60km north of Goulburn, 140km west of Sydney and approximately 40km northeast of the existing Crookwell 1 and approved Crookwell 2 wind farms.

The site is divided by the Goulburn-Oberon (Abercrombie) Road with 15 of the 59 proposed wind turbines to be located on the eastern side of the split site and the remaining 44 turbines located on the western side.

There are six access points proposed to access the site from Abercrombie Road. The first access point is located approximately three kilometres north of the Abercrombie River and the remaining five access points are positioned within a distance of seven and a half kilometres from the first access. Figure 1-1 illustrates the location of the site with respect to Sydney.

1.3 Works Proposed

UFWA proposes to build a wind energy facility in Paling Yards that will include the following elements:

- Up to 59 turbines with maximum height of 175m and capacity of up to 4.5MW per turbine;
- Internal unsealed tracks for turbine access;
- Localised road improvements where the access tracks intersect the public road network;
- An underground electrical and communication cable network linking turbines to each other and the proposed substation;
- A temporary concrete batching plant;
- Potential for obstacle lighting to selected turbines;
- Removal of small portions of vegetation within the site;
- A control room and facilities building; and
- An electrical substation and overland connection to the transmission line.

In addition, grid connection will be achieved by one of two options:

- Via the Mt Piper to Bannaby 500kV transmission line which is located to the north-east of the site; and
- Via the Crookwell 2 Wind Farm located approximately 55km to the southwest of the site.

In consideration of the concerns raised through the stakeholder consultation process regarding the potential impacts of the proposed extensive transmission lines infrastructure southbound towards Crookwell 2 wind farm substation, UFWA has decided to only propose the northern Transmission Line route, due to the shorter length and reduced potential impacts.

1.4 Director General's Requirements

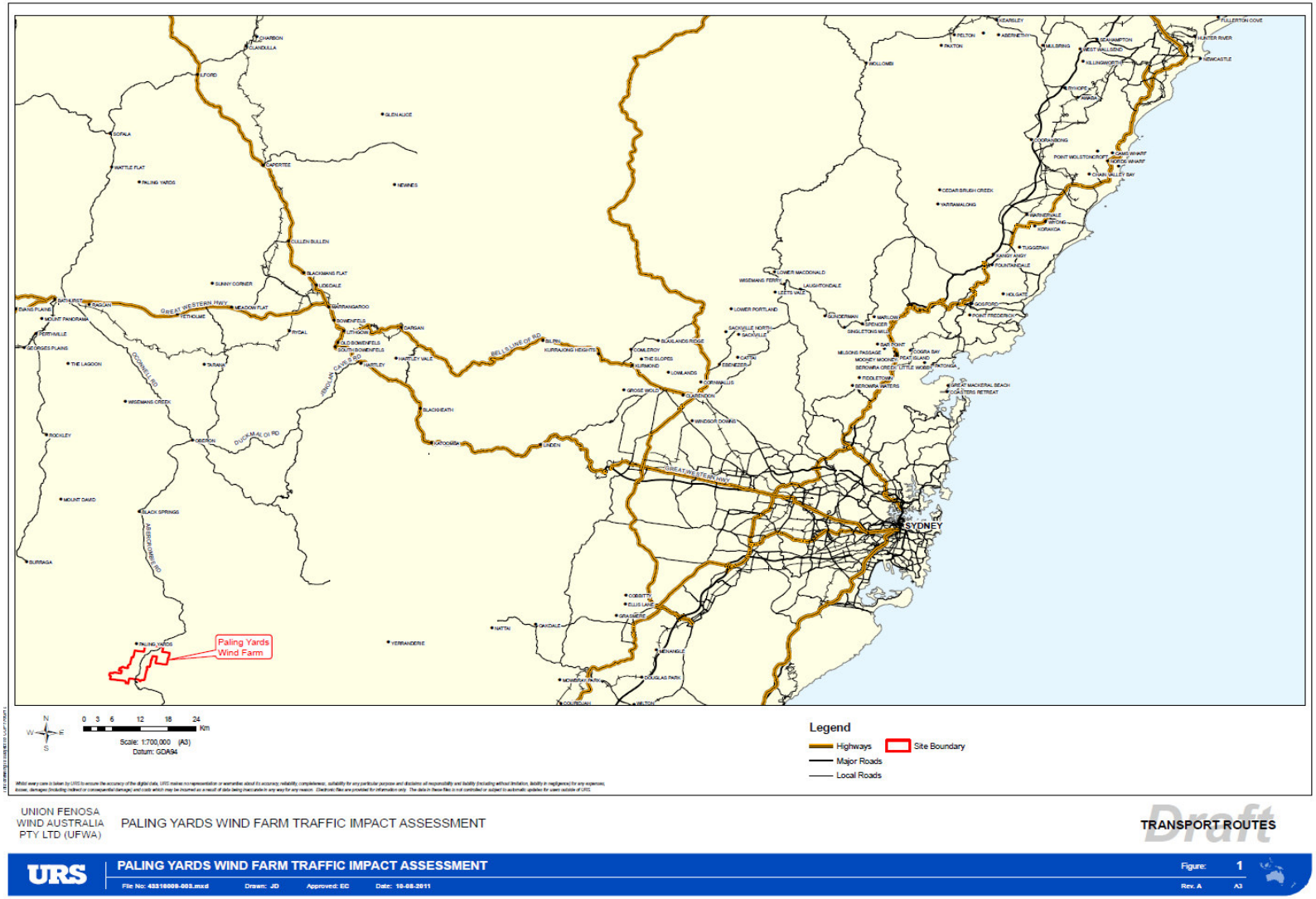
This TIA has been prepared in response to the Director-General's Requirements for the Environmental Assessment for the proposed development and conforms to the NSW Department of Planning's requirements in assessing the traffic impacts of vehicles generated by the development.

The Director-General Requirements under a letter from the NSW Department of Planning (Application Reference 10_0053) specifically outlines the items to be addressed in this document. A brief summary of all requirements under these items and where the responses may be found in this TIA are as follows:

- Details of the nature of traffic generated – refer section 4.1;
- Details of transport routes – refer section 3.2;
- Details of traffic volumes – refer section 2.3 and 4.3;
- Details of potential impacts on local and regional roads, bridges and intersections (including proposed road upgrades and repairs) – refer sections 4;
- Details of measures to mitigate and/or manage the potential impacts (including measures to control soil erosion and dust generated by traffic volumes – for inclusion in TMP, refer section 5;
- Details of site access roads including how these would connect to the existing road network and any operational maintenance or handover requirements – refer section 2.4.

1 Introduction

Figure 1-1 Regional Site Location



2 Existing Transport Conditions

2.1 Levels of Service

In accordance with the *Guide to Traffic Generating Developments*, version 2.2 (RTA, October 2002), the Levels of Service relevant to rural local roads are summarised in Table 2-1. The threshold volumes for the peak hour flow (veh/h) on two-lane rural roads associated with each Level of Service (LOS) are based on the combined counts for both directions. These traffic volumes account for total vehicle movements. Using axle pair data supplied by the RTA, it was found that 7.6% of the AADT in 2005 comprised heavy goods vehicles. In order to represent the 'worst case scenario' the proportion of heavy vehicles will be increased to 10 percent for LOS estimates.

Table 2-1 Levels of Service, Rural Two-Lane Two-Way Roads *(Table 4.5, Guide to Traffic Generating Developments, version 2.2, RTA, October 2002)*

Level of Service	Traffic Volume Threshold (Rolling Terrain)	Traffic Volume Threshold (Mountainous Terrain)	Definition
A	N/A	N/A	Free-flow conditions with a high degree of freedom for motorists to select speed and manoeuvre within traffic flow
B	360 veh/h	180 veh/h	Stable flow conditions, reasonable freedom to select speed and manoeuvre within traffic flow
C	650 veh/h	320 veh/h	Stable flow conditions, restricted freedom to select speed and manoeuvre within traffic flow
D	970 veh/h	500 veh/h	Approaching unstable flow conditions, severely restricted to select speed and manoeuvre within traffic flow
E	1,720 veh/h	1,040 veh/h	Close to capacity, virtually no freedom to select speed and manoeuvre within traffic flow. Small increases in traffic volume would generally cause operational problems.

Assumptions:

1. Design Speed of 100km/h.
2. Rolling terrain of 40% with no overtaking opportunity.
3. Mountainous terrain of 60% with no overtaking opportunity.
4. 3.7m traffic lane width with side clearances of at least 2m.
5. 60/40 directional split of traffic.

Roads operating at a LOS of C or better are generally considered to have acceptable flow conditions.

2.2 Road Network

Access to the 59 proposed wind turbines will be via a network of access tracks connecting to the Abercrombie (Goulburn-Oberon) Road north of the Abercrombie River. The roads most relevant to this study are described below.

2 Existing Transport Conditions

Abercrombie (Goulburn-Oberon) Road (MR256)

Abercrombie Road is a classified road comprising a two-lane, two-way configuration. It extends a distance of 150km from north to south and connects to O' Connell Road, Oberon at its northern terminus and to the Hume Highway, Goulburn at its southern terminus. The site access furthest north is located a distance of 63km south of its intersection with O' Connell Road. There is a shoulder on both sides of the road generally with a width of approximately one metre. Its surface condition varies considerably along its length, with excellent road surface conditions located northwards of a point 2km north of the Abercrombie River crossing. There are winding sections with diminishing road surface conditions south of this location to the Abercrombie River. Moderate surface conditions exist between Goulburn and the Abercrombie River.

The wooden bridge providing passage for road users across the Abercrombie River is load restricted and is unsuitable for heavy vehicles (NB: the exact load restriction is unknown).

Abercrombie Road has a posted speed limit of 100 km/h for the majority of its length reducing to 50km/h or 60km/h through town centres.

The nearest RTA count station located south of the site (99.327) is along Goulburn-Oberon Road at the Abercrombie River crossing and the nearest count station located north of the site (99.327) is along Goulburn-Oberon Road at Black Springs.

Plate 2-1 Typical Layout of Abercrombie Road at Paling Yards

Plate 2-2 Abercrombie Road on the approach to the Abercrombie River Crossing, located south of the site

Source: URS, 4 February 2010.

2 Existing Transport Conditions

O' Connell Road (MR253)

O' Connell Road is a classified road and extends a distance of 41km from north to south, connecting to the Great Western Highway, Kelso at its northern terminus and to Abercrombie Road, Oberon at its southern terminus. The posted speed limit is 100km/h with a 60km/h speed limit through the town of O' Connell.

O'Connell Road is hilly along its length, with 3.5km of the road experiencing an incline of more than five percent, 320 m of road recording an incline of more than ten percent and 100m with an incline greater than fifteen percent. The highest elevation along its length is 1,120m and the lowest point is 670m.

Duckmaloi Road

Duckmaloi Road extends a distance of 18km from east to west. It connects to the Jenolan Caves Road at its eastern terminus and to Abercrombie Road at its western terminus, with its elevation ranging between 934m and 1,150m. Duckmaloi Road experiences inclines greater than five percent for a distance of 6.2 km and inclines greater than ten percent for a distance of 830m.

Jenolan Caves Road (MR253)

Jenolan Caves Road extends a distance of 49km from north to south, connecting to Edith Road at its southern terminus and to the Western Highway at it northern terminus. Its highest elevation is 1,290m and the lowest point is at 681m. Approximately 12.2 km has an incline of more than five percent, 1.7 km with an incline of more than ten percent and 3.1 km with an incline of more than fifteen percent. The steepest gradient along its length is at its southern extent (suggested haulage routes require only the use of the middle and northern sections of this road).

Great Western Highway (National Route 32)

The Great Western Highway extends a distance of 203 km from east to west, commencing at the intersection of George Street, Pitt Street and Broadway, Sydney at its eastern terminus and connecting to the Mitchell Highway, Bathurst at its western terminus. It carries a number of different road classification titles along its route including Met Road 4, State Route 44 and national route 32. The most relative to the study area is National Route 32 which applies between the end of the Western Motorway at Lapstone to its terminus at Bathurst.

Bells Line of Road (National Route 40)

Bells Line of Road, National Route 40, extends a distance of 89 km from east to west, commencing in the north-western outskirts of Sydney at its eastern terminus at its intersection with Putty Road and connecting to the Great Western Highway, Lithgow at its western terminus. It has a posted speed limit of 100km/hr west of Bell and a posted speed limit of 80km/hr east of Bell.

2.3 Existing Traffic

Traffic count data for relevant locations along Abercrombie Road has been obtained from the RTA database and from local counts supplied by Oberon Council.

Seven RTA count stations are located along Abercrombie Road. The Annual Average Daily Traffic (AADT) volumes for the two count stations closest to the site are summarised in Table 2-2.

Table 2-2 Summary of Historical AADT for Surrounding Road Network using RTA Count Stations

Station	Location	1999 AADT	2002 AADT	2005 AADT
99.327	**MR256 Abercrombie Road(Goulburn-Oberon Road)**at Abercrombie River M'Waree-Oberon Boundary	85	99	144
99.329	**MR256 Abercrombie Road(Goulburn-Oberon Road)** at Black Springs-24Km South of MR253, east of MR268 Bungendore Road, Bungendore	822	539	180

Source: RTA Traffic Volume Data Western Region 2005.

Notes:

1. Based on the assumption that approximately ten percent of the AADT represents the peak traffic volume.

Following discussions with Oberon Council, it was identified that a number of more recent counts were recorded at local count stations along Abercrombie Road. Table 2-3 shows the Annual Average Daily Traffic (AADT) volumes at the three count stations closest to the site, the first of which is located along the section of Abercrombie Road that bisects the site.

Table 2-3 Summary of Historical AADT for Surrounding Road Network using Local Count Data

Station	Location	2006 AADT	2008 AADT	2011 AADT	Peak Hour Volume Estimate[2]
Top of Abercrombie Hill	**MR256 Abercrombie Road (Goulburn-Oberon Road)** at a point approximately 5km north of the Abercrombie River crossing.	191 (average, 11/10/06-20/11/06)	126 (average, 14/05/08-11/06/08)	205 (average, 20/01/11-16/03/11)	21
Oberon Cemetery	**MR256 Abercrombie Road (Goulburn-Oberon Road)** at a point approximately 1km south west of its intersection with Rupert Street, Oberon.	-	-	1968 (average, 19/01/11-16/03/11)	197
East of Black Springs	**MR256 Abercrombie Road (Goulburn-Oberon Road)** at a point just east of Black Springs	-	-	1036 (average, 19/01/11-16/03/11)	104

The Levels of Service thresholds in Table 2-1 indicate that the Goulburn-Oberon Road currently operates at Level of Service B.

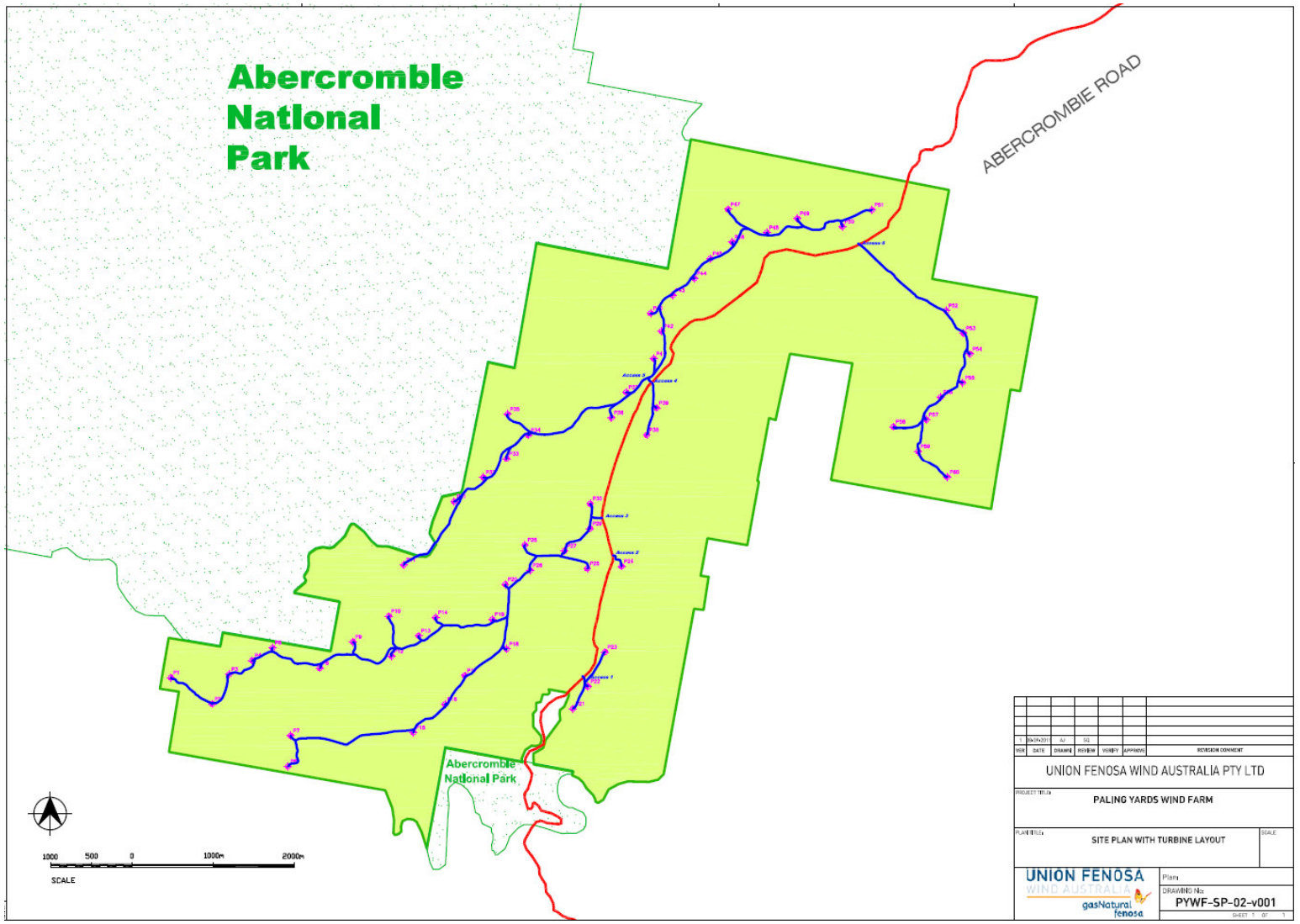
2.4 Access Arrangements

Travelling north, there are six points proposed to access the site along Abercrombie Road over a distance of 7.5km. These access points are required due to the topographic constraints of the land and to avoid additional vegetation removal within the site. The first access point is located approximately 3km north of the Abercrombie River crossing. Typical road layout arrangements at the six proposed site access points are shown in figures 2-1.

The six site access points are briefly described below. It should be noted that these descriptions link each access point to its closest identified wind turbine number. All access points intersect as T-intersections onto Abercrombie Road, while two of them (four and five) also provide a cross intersection.

2 Existing Transport Conditions

Figure 2-1 Wind Turbine Locations and Site Access Points



2 Existing Transport Conditions

Access One

Access One is located approximately 3km north of the Abercrombie River crossing. It provides access from Abercrombie Road to Wind Turbine structures P21, P22 and P23 via a network of access tracks. Access One forms a T-intersection at its intersection with the Abercrombie Road, providing access to the eastern portion of the site.

Access Two

Access Two is located approximately 1.5km north of Access One. It provides access from Abercrombie Road to Wind Turbine structure P24 (east of Abercrombie Road), via an access track. The intersection layout is a T-intersection providing access to the eastern portion of the site.

Access Three

Access Three is located approximately 700m north of Access Two. It provides the closest access point from Abercrombie Road to Wind Turbine structures P1-P10, P12-P20 and P25-P30 (west of Abercrombie Road) via a network of access tracks. Access Three forms a T-intersection at its intersection with the Abercrombie Road, providing access to the western portion of the site.

Access Four

Access Four is located approximately 2.3km north of Access Three. It provides access from Abercrombie Road to the heavy vehicle access track leading to Wind Turbine structures P38 and P39, forming a combined cross intersection with Access Five at Abercrombie Road.

Access Five

Access Five is located opposite Access Four and provides access from Abercrombie Road to Wind Turbine structures P11, P31-37, and P41-P51. This access point is located on the western side of Abercrombie Road and creates a cross intersection when combined with Access Four.

Access Six

Access Six is located approximately 3km north of Access Four and Access Five. It provides access from Abercrombie Road to the construction access tracks which lead to Wind Turbine structures P47-P51 on the western side and P52-P60 on the eastern side. Access Six creates a T-intersection with Abercrombie Road.

Plate 2-3 Typical Road Layout at Access Points

Source: URS, 4 April 2011.

2.5 Public Transport, Pedestrians and Cyclists

The closest bus service to the site is a school bus service provided by Oberon Sand and Gravel. Its route commences in Oberon and continues south along Abercrombie Road to a point approximately 20km north of the site, where it continues east at Little River Road. During the site inspection, no pedestrians or cyclists were observed on Abercrombie Road within close proximity of the site.

3

OD Vehicle and Transport Routes

This section outlines haulage requirements for the construction of the wind turbines. More specifically, it provides details on the Over-dimensional (OD) vehicles required to transport construction materials to the site, provides information with respect to OD vehicle swept paths and provides details on haulage route options.

3.1 Details of Over Dimensional Vehicles

OD vehicles will be required during the transportation of certain wind farm turbine components – particularly in the delivery of the tower sections, nacelles and rotor blades. The following turbine options are being considered by Union Fenosa:

1. Gamesa – *G97 2.0MW;*
2. *Gamesa – G128 4.5MW;*
3. Gamesa – *G136 4.5MW;*
4. REpower Systems – *M3.4-104 3.4MW*;
5. Vestas Wind System – *V100 1.8MW;*
6. Nordex – *N100 2.5MW*;
7. Siemens – *SWT-2.3-101 2.3MW*;
8. Vestas Wind System – *V112 3MW*;
9. Siemens – *SWT-2.3-113 2.3MW;*
10. Acciona – *AW116 3.0MW;*
11. Norex – *N117 2.4MW;*
12. Acciona – *AW109 3.0MW;*
13. Alstom – *ECO100 3.0MW*;
14. Alstom – *ECO110 3.0MW*;
15. Gamesa – *G90 2.0MW*;
16. GE Energy – *2.75-103 2.75MW*;
17. REpower Systems – *MM92 2.0MW*;
18. REpower Systems – *MM100 2.0MW*;
19. REpower Systems – *M114 3.2MW*;
20. Siemens – *SWT-2.3-108 2.3MW*; and
21. Vestas Wind System – *V90 2.0MW*.

The delivery of these large components are the critical transport movements as these determine the necessary height clearances, road widths and swept paths required for safe manoeuvrability of the OD vehicles. As a final manufacturer has not been selected for the wind turbines at this site, a 'worst-case scenario' will be adopted whereby the greatest width, height and turning circle requirements are taken into account based on the transport requirements of each manufacturer – see Tables 3-1 (turbines 1-11) and 3-2 (turbines 12-21) below.

3 OD Vehicle and Transport Routes

Table 3-1 Turbine Manufacturers (List 1)

	Gamesa	Gamesa	Gamesa	REpower	Vestas	Nordex	Siemens	Vestas	Siemens	Acciona	Nordex
Model / Turbine	G97 2.0MW	G128 4.5MW	G136 4.5MW	M3.4-104 2.0MW	V100 1.8MW	N100 2.5MW	SWT-2.3-101 2.3MW	V112 3.0MW	SWT-2.3-113 2.3MW	AW116 3.0MW	N117 2.4MW
Rotor Diameter	97m	128m	136m	104m	100m	100m	101m	112m	113m	116m	117m
Blade Length	47.5m	63m*	67m*	51m	49.0m	48.7m	49.0m	55m	55m	56.7	58.4m
Vehicle Requirements											
OD Vehicle Length	~57m	~50m*	~50m*	~57m	61 m	57.6 m	54.5 m	~61m	~61m	~63m	**~64.4m**
Minimum Height Clearance Required	Not specified	Not specified	Not specified	Not specified	**6.6 m**	5 m	Not specified	Not specified	Not specified	Not specified	Not specified
Minimum Road Width Required	Not specified	Not specified	Not specified	Not specified	**5.5 m**	5 m	5 m	Not specified	Not specified	Not specified	Not specified
Maximum Slope Gradient Permitted	Not specified	Not specified	Not specified	Not specified	8%	**6% (gravel)**, 9% (asphalt)	11%	Not specified	Not specified	Not specified	Not specified
Maximum Side Inclination Permitted	Not specified	Not specified	Not specified	Not specified	**2%**	**2%**	**2 %**	Not specified	Not specified	Not specified	Not specified

Notes:

** The blades for the Gamesa G128 and G136 models are segmented for transportation purposes and are assembled on-site. The maximum length of a segmented blade section is 39m.*

Values in bold indicate the critical measurement for the particular transportation requirements of all turbines and are therefore associated with the 'worst-case' scenario.

3 OD Vehicle and Transport Routes

Table 3-2 Turbine Manufacturers (List 2)

	Acciona	Alstom	Alstom	Gamesa	GE Energy	REpower	REpower	REpower	Siemens	Vestas
Model / Turbine	AW109 3.0MW	ECO100 3.0MW	ECO110 3.0MW	G90 2.0MW	2.75-103 2.75MW	MM92 2.0MW	MM100 2.0MW	M114 3.2MW	SWT-2.3-108 2.3MW	V90 2.0MW
Rotor Diameter	109m	101m	110m	90m	103m	93m	100m	114m	108m	90m
Blade Length	54m	49m	54m	44m	50m	46m	49m	56m	53m	44m
Vehicle Requirements										
OD Vehicle Length	~60m	~57m	~60m	~55m	~58m	~55m	~57m	~62n	~60m	~55m
Minimum Height Clearance Required	Not specified	Not specified	Not specified	Not specified	Not specified	Not specified	Not specified	Not specified	Not specified	Not specified
Minimum Road Width Required	Not specified	Not specified	Not specified	Not specified	Not specified	Not specified	Not specified	Not specified	Not specified	Not specified
Maximum Slope Gradient Permitted	Not specified	Not specified	Not specified	Not specified	Not specified	Not specified	Not specified	Not specified	Not specified	Not specified
Maximum Side Inclination Permitted	Not specified	Not specified	Not specified	Not specified	Not specified	Not specified	Not specified	Not specified	Not specified	Not specified

Notes:

Values in bold indicate the critical measurement for the particular transportation requirements of all turbines and are therefore associated with the 'worst-case' scenario.

The transport requirement for the nominated 'worst-case' scenario for OD vehicular movements, encompassing the requirements of all wind turbine manufacturers, is therefore defined as follows:

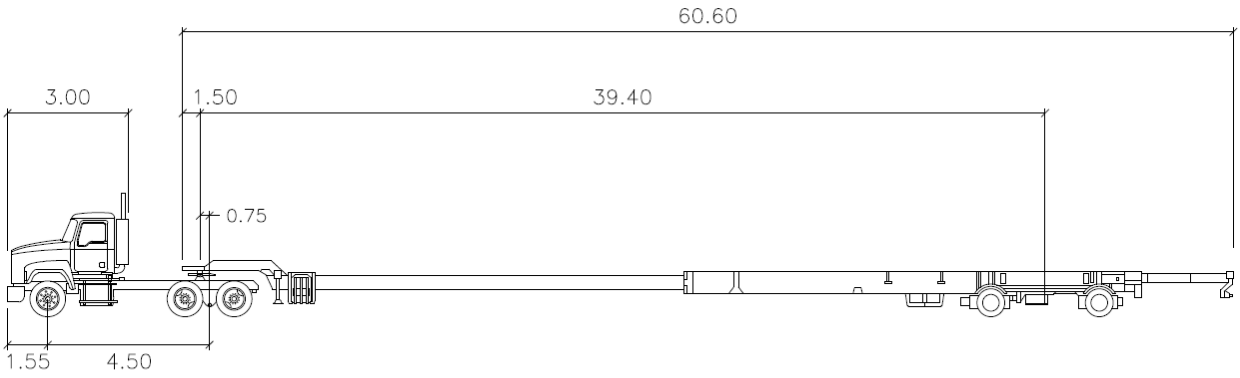
- Maximum OD Vehicle Length: 64.4 metres
- Minimum Height Clearance Required: 6.6 metres
- Minimum Road Width Required: 5.5 metres
- Maximum Slope Gradient Permitted: 6%
- Maximum Side Inclination Permitted: 2%

3.1.1 Swept Paths

The longitudinal section of an OD vehicle (blade truck) with a length of 64.4 metres is defined in Figure 3-1. The resultant swept path of this vehicle is detailed in Figure 3-2.

3 OD Vehicle and Transport Routes

Figure 3-1 OD Vehicle

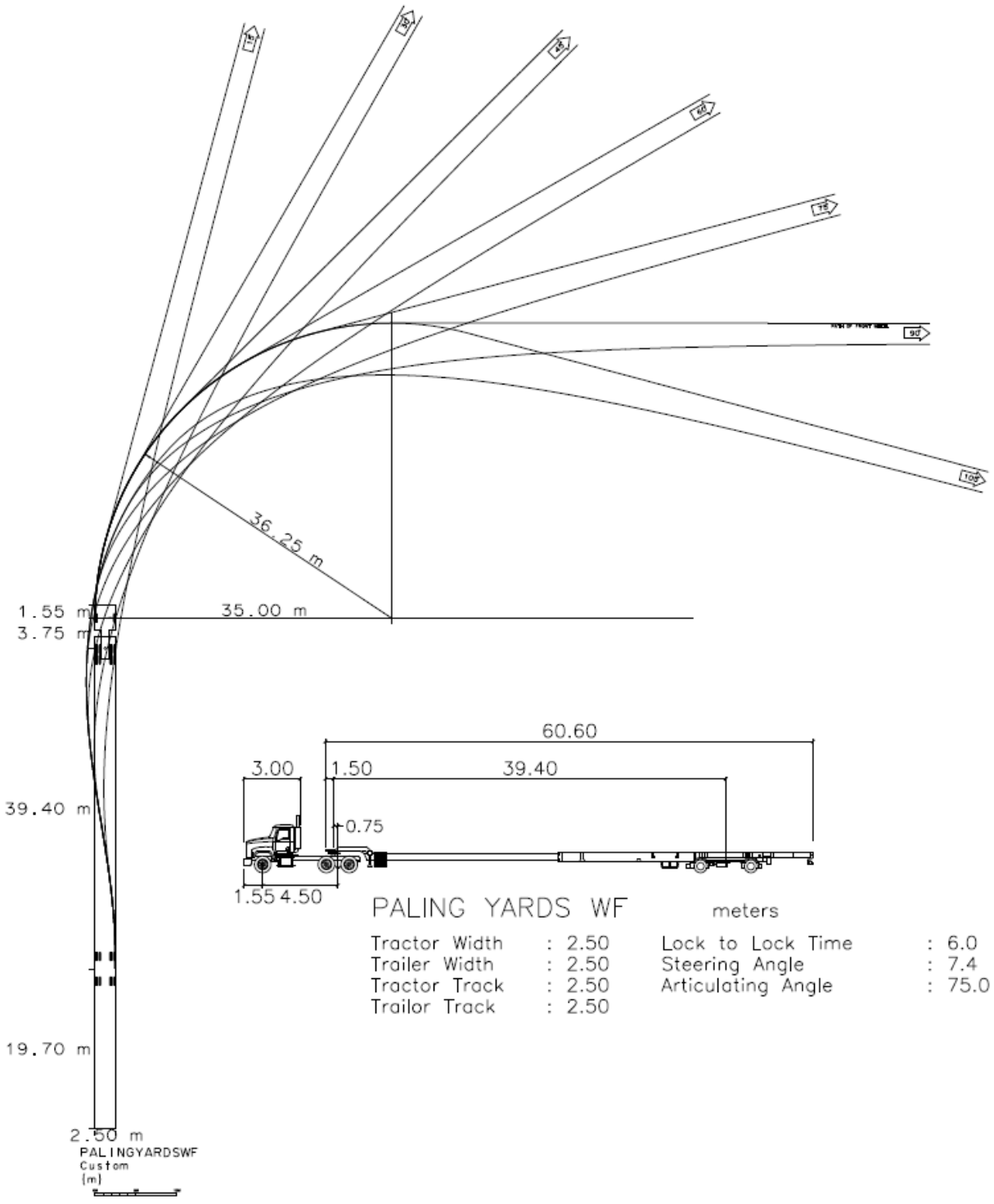


PALING YARDS WF meters

Tractor Width	: 2.50	Lock to Lock Time	: 6.0
Trailer Width	: 2.50	Steering Angle	: 7.4
Tractor Track	: 2.50	Articulating Angle	: 75.0
Trailor Track	: 2.50		

3 OD Vehicle and Transport Routes

Figure 3-2 OD Vehicle Swept Path



3.2 OD Vehicle Routes

This section describes the haulage route options for OD vehicles between Port Kembla and the site at Paling Yards and between the Port of Newcastle and the site.

3.2.1 Port Kembla to Paling Yards Route

Figure 3-3 shows two haulage route options between Port Kembla and the site at Paling Yards. Paling Yards is located west of Port Kembla, but due to the mountainous terrain separating the port from the site, vehicles must travel north or south first before continuing west. Further directional restrictions apply to heavy vehicles using Abercrombie Road due to load restrictions on the bridge at the Abercrombie River crossing. Therefore, heavy vehicles cannot access the site from the south, unless significant upgrades are performed on this bridge. Please refer to Plate 3.1 for photos of the wooden bridge across the Abercrombie River.

Plate 3-1 Abercrombie River Crossing (South of Paling Yards Site)

Instead, vehicles travelling from Port Kembla to Paling Yards to must detour along a semi-circular alignment by travelling north before progressing west and then realigning south to reach their destination. The two haulage route options shown in figure 3.3 are as follows;

Route 1

The first route option progresses north from Port Kembla along the Northern Distributer, Bulli Pass Road, Appin Road, the Hume Highway and the Westlink M7. From here, it continues west by continuing onto Bells Line of Road and the Great Western Highway. The Great Western Highway connects to Jenolan Caves Road which, in turn, connects to Duckmaloi Road. Duckmaloi Road connects to the Abercrombie Road at Oberon. Travelling South from here, the site is positioned along the Abercrombie Road at a distance of approximately 60 kilometers from Oberon.

B-Double vehicles using this route must be no longer than 19 metres in length and must weight less than 50 tonnes (based on information sourced from maps 25, 26, 30, and 31 of the RTA's *Travel Restrictions Vehicle Routes)*. The total length of this route is 328km.

Under normal traffic conditions, the estimated travel time from origin to destination is approximately five hours.

3 OD Vehicle and Transport Routes

The dotted green line shown in Figure 3-3 identifies a potential future option along the Great Western Highway. This route is currently not recommended by the RTA as a haulage route but may be into the future following the current upgrade works being conducted.

Route 2

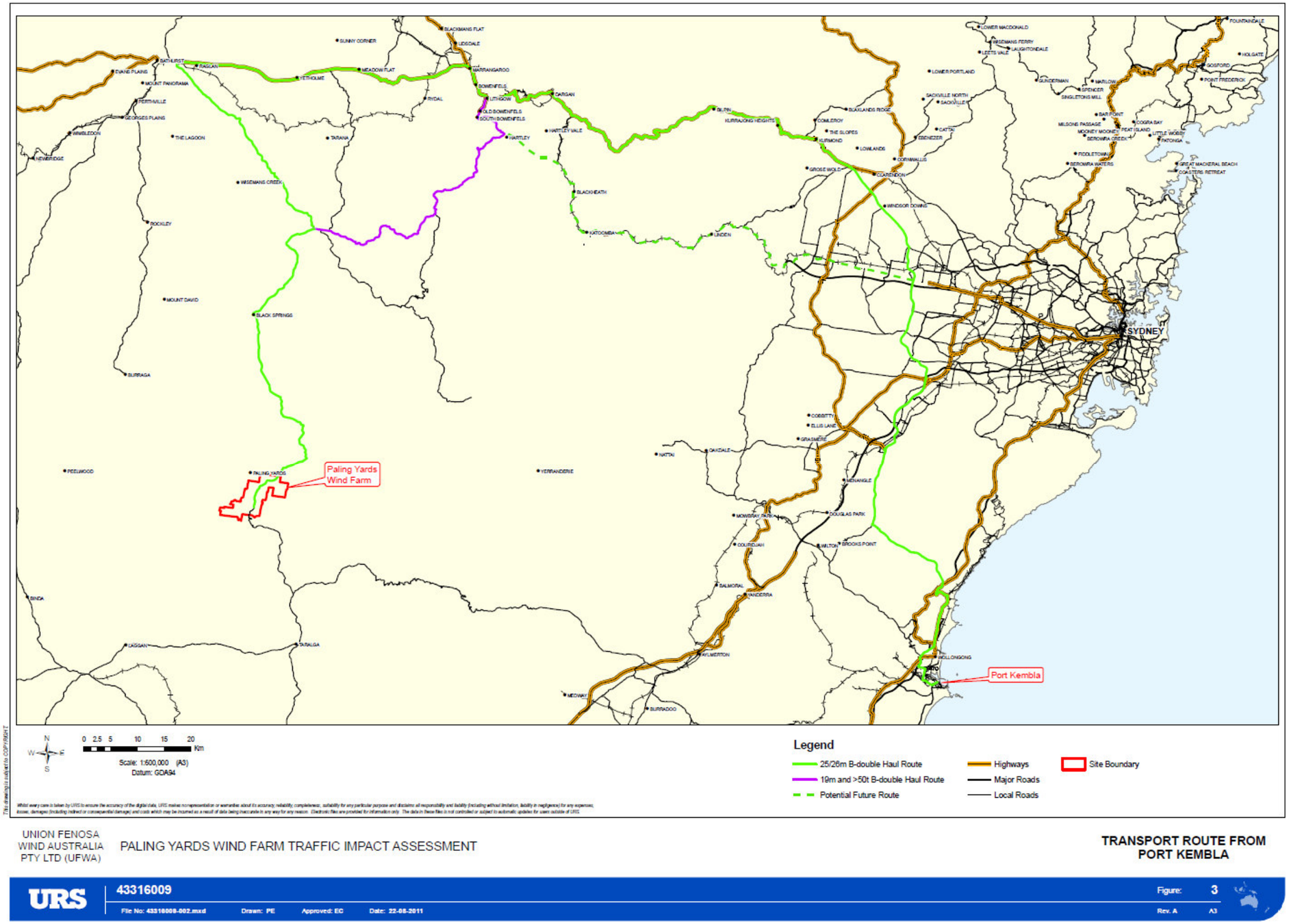
The second haulage route option is very similar to the first route option but is marginally longer in length. It progresses north from Port Kembla along the Northern Distributer. It then continues along Bulli Pass Road, Appin Road, the Hume Highway, the Westlink M7. It then progresses onto Bells Line of Road before continuing onto the Great Western Highway at Lithgow. Continuing along the Great Western Highway, it connects to O'Connell Road at Kelso, which in turn connects to the Abercrombie Road at Oberon. The site is located approximately 60 kilometres south of Oberon.

B-Double vehicles using this route must be no longer than 26 meters in length (based on information sourced from maps 25, 26, 30, and 31 of the RTA's *Travel Restrictions Vehicle Routes)*. The total length of this route is 372km. Under normal traffic conditions, the estimated travel time from origin to destination is 5.5 hours.

The dotted green line shown in Figure 3-3 identifies a potential future option along the Great Western Highway. This route is currently not recommended by the RTA as a haulage route but may be into the future following the current upgrade works being conducted.

3 OD Vehicle and Transport Routes

Figure 3-3 OD Route between Port Kembla and Paling Yards



3 OD Vehicle and Transport Routes

3.2.2 Port of Newcastle to Paling Yards Route

Figure 3-4 again illustrates two route options between the Port of Newcastle and the site at Paling Yards. Commencing from Newcastle Port, the two routes follow the same path between the port and Bells Line of Road, progressing south west from the port along the Pacific Highway, the F3 Sydney Newcastle Freeway, Cumberland Highway, m2, the Westlink M7, Richmond Road, Blacktown Road and Kurrajong Road. It then connects to the Bells Line of Road, where two route options may be considered in crossing the Blue Mountains to the site at Paling Yards. The first route follows the same path between Bells Line of Road as 'Route 1' defined in section 3.2.1 and the second Route follows the same path as 'Route 2', again defined in section 3.2.1.

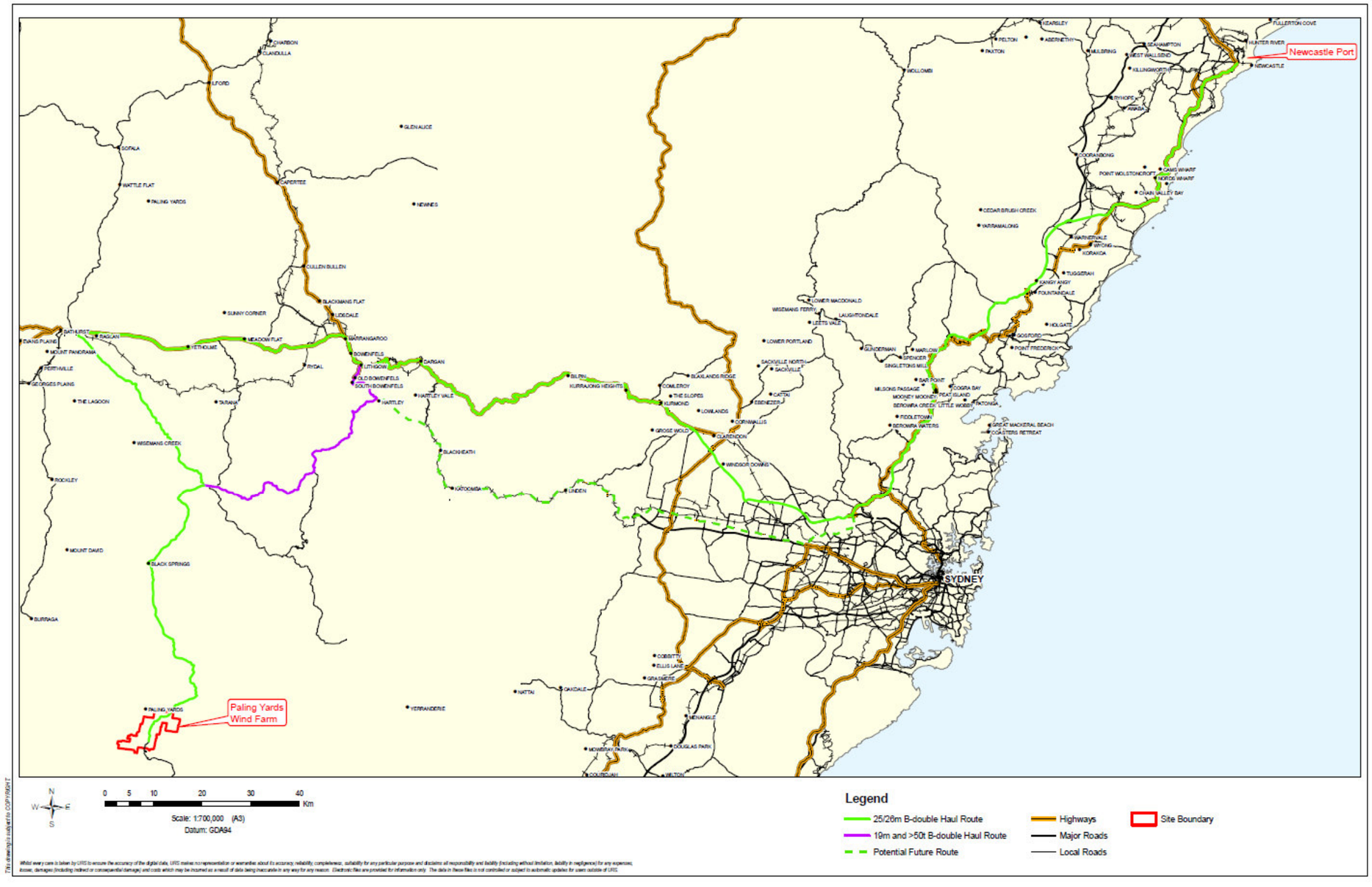
Referring to the first route option, B-Double vehicles using this route must be no-longer than 19 metres in length and must weigh less than 50 tonnes (based on information sourced from maps 18, 19, 25, and 26 of the RTA's *Travel Restrictions Vehicle Routes)*. The total length of this route is 381 kilometres. Under normal traffic conditions, the estimated travel time from origin to destination is approximately six hours.

Referring to the second route option, B-Double vehicles using this route must be no-longer than 26 metres in length and must weigh less than 50 tonnes (based on information sourced from maps 18, 19, 25, and 26 of the RTA's *Travel Restrictions Vehicle Routes)*. The total length of this route is 425 kilometres. Under normal traffic conditions, the estimated travel time from origin to destination is approximately 6.5 hours.

The dotted green line shown in Figure 3-4 identifies a potential future option along the Great Western Highway. This route is currently not recommended by the RTA as a haulage route but may be into the future following the current upgrade works being conducted.

3 OD Vehicle and Transport Routes

Figure 3-4 OD Route between Port of Newcastle and Paling Yards



4

Impact of Traffic Generation

The impact of the additional traffic generated from the construction activities associated with the Wind Farm development will be assessed at key intersections using the SIDRA modelling package and at midblock sections using RTA guidelines for traffic generating developments.

4.1 Traffic Generation Estimates

A number of parameters are required to estimate traffic generation during the construction period including daily site operational hours, number of construction days per month and number of months to completion. This data is not yet available for the Paling Yards Wind Farm site. Therefore, the following assumptions will be adopted for the Paling Yards development (previously used for traffic generation estimates for Union Fenosa's proposed Ryan Corner Windfarm in Victoria which involves the installation of 68 wind turbine):

- 18 month construction program;
- 11-hour (7am to 6pm) working weekday;
- 24 working days per month; and
- The eighth month being the peak construction month.

The Paling Yards site involves the installation of up to 59 wind turbines and therefore these parameters present a worst case scenario in terms of traffic generation. Based on these parameters, the breakdown of vehicles generated at the site during the peak construction phase is outlined in Table 4-1.

4 Impact of Traffic Generation

Table 4-1 Peak Construction Vehicles Generated

Vehicle Class	Peak One-Way Vehicle Movements Generated			Activity
	Per month	*Per day**	*Peak Hour***	
Over-Dimensional	35	2	1	Delivery of Tower Sections
	23	1	1	Delivery of Blades/Nacelles etc.
Heavy Vehicles	111	5	1	Gravel for Foundations
	24	1	1	Water for Concreting
	16	1	1	Cement for Foundations
	7	1	1	Steel for Foundations
	96	4	1	Water for Foundations
	10	1	1	Fuel for Foundation Works
	149	7	1	Gravel for Road Construction
	1	1	1	Substation Works
	2	1	1	Sand for Cabling Works
	2	1	1	Cables for Cabling Works
	3	1	1	Conduit for Cabling Works
	3	1	1	Switchgear Works
	2	1	1	Steel for Substation Electricals
	3	1	1	Switchgear for Substation Electricals
Light Vehicles (cars, utes etc.)****	2,000	84	84	Construction Personnel
	116	6***	4***	Escort Vehicles for OD Deliveries
Total	**2,603**	**120**	**104**	**Vehicle Proportion during Peak Hour**
Over-Dimensional	*58*	*3*	*2*	*OD Proportion: 1.9%*
Heavy Vehicles	*429*	*27*	*14*	*HV Proportion: 13.5%*
Light Vehicles	*2,116*	*90*	*88*	*LV Proportion: 84.6%*

Notes:

** Rounded up to next whole vehicle.*

*** During AM or PM peak hour it is assumed that all personnel vehicles will arrive or depart in that hour, with construction vehicle activities being spread evenly over the 11-hour working weekday. NB: all values are rounded up to the next whole vehicle.*

**** Due to total number of OD vehicles – based on two escort vehicles per OD vehicle (one pilot and one escort at rear).*

***** It is assumed that no car pooling is taking place.*

4.2 Intersection Analysis

The SIDRA modelling package was used to analyse the performance of the road network at two access point T-intersections on Abercrombie Road (one on the east side and the other on the west side) under existing and future construction conditions during peak periods.

The 'degree of saturation' and '95th percentile queue length' are used to compare the impact that construction vehicles may have on the performance of these intersections.

The Degree of Saturation refers to the ratio between an intersections traffic demand and total capacity. An intersection with a Degree of Saturation approaching 0.90 to 0.95 is considered to be at capacity.

The 95% queue length value is used as an indication of the length whereby the probability of exceeding it is only 5% - often referred to as the design queue length.

4.2.1 Input into SIDRA Models

Access to the site will be via six access points along Abercrombie Road at Paling Yards. Given the very low volumes currently using Abercrombie Road, no major intersections are located within close proximity of the site, and that (during the construction period) most of the peak vehicle movements will be generated from the development, the intersections most likely to approach capacity are at the access points where the construction vehicles are turning in and out of the site. Two sets of SIDRA models (Existing and Peak Construction), comprising a total of six models, were executed to compare existing network performance to future network performance and to determine construction vehicle activity impacts on the public road network.

Four scenarios were developed to determine the worst-case scenario impacts. These scenarios were used in the models and compared to existing conditions;

- Scenario 1: All construction vehicles enter and exit the site via one access point forming a T-intersection with Abercrombie Road on the eastern side of the site during AM peak;
- Scenario 2: All construction vehicles enter and exit the site via one access point forming a T-intersection with Abercrombie Road on the western side of the site during AM peak;
- Scenario 3: All construction vehicles enter and exit the site via one access point forming a T-intersection with Abercrombie Road on the eastern side of the site during PM peak; and
- Scenario 4: All construction vehicles enter and exit the site via one access point forming a T-intersection with Abercrombie Road on the western side of the site during PM peak.

Notes and Assumptions:

- AM and PM peak volumes are the same for existing conditions.
- A 50/50 directional split is assumed for existing volume data.
- Ten percent of existing volumes are CVs.
- The speed on Abercrombie Road is 100km/h.
- The speed on the access tracks is 50km/h.
- The intersections are modelled as 'Give Way' controlled intersections.

- The scenarios outlined above assume that all vehicles enter and exit the site via one access point forming a T-intersection with Abercrombie Road. It is not necessary to model the access points which form cross intersections with Abercrombie Road as this would allow the volumes to be split between more than one entry and exit point. Therefore the results from these models would be more desirable and do not represent the worst case scenario.
- All personnel vehicles will be arriving at the particular access point during the AM peak.
- All personnel vehicles will be departing the particular access point during the PM peak.
- The construction vehicle volumes and types likely to be used during peak construction periods are currently not specified for the Paling Yards Wind Farm project. Therefore, the peak construction activity volumes modelled are taken from a similar wind farm project of a similar size (the project from which the volume data is obtained involved the construction of 68 wind turbines as opposed to 59 wind turbines at Paling Yards).
- All OD vehicles associated with construction activities travel to and from the site from the north given the limitations of using the Abercrombie River crossing.
- The location of where personnel reside is based on a gravity model taking into consideration major town populations and their respective distance to be travelled to site:
  - 12.5% located north of the site (Oberon, Bathurst, Lithgow)
  - 85.9% located south of the site (Canberra, Goulburn)
  - 1.5% located west of the site (Cowra)
- Personnel residing west of the site will have to detour north, east and subsequently south to access the site from the north (this constitutes the shortest route to the site).

4.2.2 Summary of Intersection Performance (SIDRA Analysis Outputs)

Table 4.2 illustrates that no major increases in DOS or queue lengths will occur to the road network during the peak construction period of the Project. Minor impacts may occur during the PM Peak Hour; however these result in a negligible increase in the queue lengths (i.e. one car length or less). As mentioned previously, roads operating at a Level of Service of C or better are generally considered to have acceptable flow conditions. Based on the results of the SIDRA models outlined in table 4-2, the performance of each of the proposed access point intersections is well within acceptable performance criteria.

Table 4-2 SIDRA Analysis Results

	Existing Conditions		Peak Construction Period			
	Eastern T-Intersection	Western T-Intersection	Eastern T-Intersection AM Peak Hour	Western T-Intersection AM Peak Hour	Eastern T-Intersection PM Peak Hour	Western T-Intersection PM Peak Hour
Level of Service	B	B	C	C	C	C
Critical Movements	Right turn from southern approach and left turn from northern approach	Left turn from southern approach and right turn from northern approach	Left turn from northern approach	Right turn from northern approach	Right turn from southern approach and Left turn from northern approach	Left turn from southern approach and right turn from northern approach
95th Percentile Queue Length (m)	Less than one car	Less than one car	Less than one car	Less than one car	Less than one car	Less than one car
Degree of Saturation (v/c)	<0.01	<0.01	0.07	0.06	0.13	0.12

4.3 Midblock Analysis

The impact of the additional traffic generated from the construction activities associated with the Wind Farm development were assessed at midblock sections using RTA guidelines for traffic generating developments.

The impact on three midblock sections of the Abercrombie Road with respect to increased traffic volumes resulting from the Paling Yards Wind Farm development are illustrated in Table 4-3.

Table 4-3 Midblock LOS – Background and Construction Traffic

Road Section	Traffic Volumes								Level of Service	
	2011 Existing		2013 Background		Construction Traffic		2013 with Construction Traffic		2013 Background	2013 with Construction Traffic
	ADT	Peak	ADT	Peak	ADT	Peak	ADT	Peak		
Abercrombie Road, 5km north of Abercrombie River crossing	205	21	209	21	120	104	329	125	B	B
Abercrombie Road,1km south west of intersection with Rupert Street, Oberon.	1968	197	1992	200	44	30	2036	230	B	B
Abercrombie Road, barely east of Black Springs	1036	104	1042	105	44	30	1086	135	B	B

Notes:
1. ABS data shows a population increase of 0.6% per annum between 2006 and 2009 – this figure has been used to factor up 2011 volumes to 2013 figures.
2. To determine a worst-case scenario, all vehicles generated by the development will access the site from one access point.
3. Level of Service estimates are based on peak data
4. Peak flows are assumed to be 10% for existing traffic, with volumes rounded up to represent the worst case scenario.
5. Rolling Terrain is assumed for Level of Service calculations.
6. AADT volumes represent two-way movements along Abercrombie Road.
7. A level of service 'B' is still considered to have reasonable freedom of congestion and is not of any concern (NB Level of service 'A' is not considered possible for Rolling Terrain).

All midblock sections are shown to continue to operate at Level of Service B during the construction period, which is the highest performance rating possible for Rolling Terrain.

Therefore, taking intersection and midblock construction impacts into account, it is evident that no significant impact will occur to the performance of the road network from the vehicles generated during the peak construction period of the Paling Yards Wind Farm development.

4.4 Operational Phase Volumes

The number of vehicles generated by the Project during its operational phase will be insignificant relative to that experienced during the construction phase. The impact that construction traffic had on the existing Degree of Saturation and Queue Lengths of all intersections modelled were minimal if non-existent. As such, the impact produced by operational traffic associated with the wind farm will be also insignificant.

4.5 Other Developments in Area

Following discussions with Oberon Council, it was found that there are no existing or future proposed developments in the area.

4.6 Access Arrangements

Each access point will need to cater for the vehicles intended to use that particular location. Firstly, all access points will be required to be designed to accommodate up to the defined OD vehicle entering from the north. Access from the south may be by passenger vehicles or light commercial vehicles (due to the limitations of the Abercrombie River crossing).

4.7 Parking Provision

Appropriate on-site parking provision will need to be investigated in the Traffic Management Plan following further refinement of the Project's construction timeline, number of personnel and material deliveries

5

Mitigation and Management Measures

This TIA has identified that the operation of the public road network will not be significantly impacted due to the vehicles generated by the proposed Paling Yards windfarm development. However, following further refinement of construction timelines and material requirements, this Project will require that mitigation and management measures be investigated and outlined in a Transport Management Plan (TMP). This TMP should include:

- Confirmation of the route selection;
- Define RTA approvals for OD vehicles;
- Further consultation with the RTA and local Council;
- Define operating hours and speed limits for construction vehicles;
- Develop traffic control signage plans where required at site access points and other intersections;
- Recommend and provide concept designs of vehicles swept paths at site access points and for OD vehicles at key intersections along the defined OD vehicle route between Port and site;
- Outline a program for collecting a baseline assessment of the surrounding road network and a program of regular inspections; and
- Detail any roadworks required and when these are required.
- Details of measures to control soil erosion and dust generated by traffic volumes.

6

Conclusion

Traffic generated by this proposal is not considered to have a significant impact on the existing transport network, with current operation anticipated to remain at an acceptable Level of Service for key roads. The Mitigation and Management measures recommended by the Traffic Impact Assessment are provided in Table 6-1.

Table 6-1 Statement of Commitments

Task	Notes
Prepare detailed Transport Management Plan	To be completed prior to construction phase of project
Finalise traffic generation numbers and proposed routes	To be included in Transport Management Report
Confirm Haulage Contractor and prepare Haulage Transport Plan	To be completed prior to finalisation of Transport Management Plan
Liaise with appropriate road authorities	To be undertaken during Transport Management Plan tasks
Finalise design of access points	To be included in Transport Management Plan following finalisation of preferred site accesses
Finalise design of internal site tracks network	To be completed prior to construction phase of project
Undertake existing conditions assessment and roadside vegetation assessment	Any additional assessments required specific to the Paling Yards windfarm sites to be included in Transport Management Plan
Intersection and road upgrades along OD route to safely accommodate the manoeuvrability of these vehicles	To be recommended in the Transport Management Plan and completed prior to the construction phase of the project

7

Limitations

URS Australia Pty Ltd (URS) has prepared this report in accordance with the usual care and thoroughness of the consulting profession for the use of Union Fenosa Wind Australia Pty Ltd and only those third parties who have been authorised in writing by URS to rely on the report. It is based on generally accepted practices and standards at the time it was prepared. No other warranty, expressed or implied, is made as to the professional advice included in this report. It is prepared in accordance with the scope of work and for the purpose outlined in the Proposal dated 9 March 2011.

The methodology adopted and sources of information used by URS are outlined in this report. URS has made no independent verification of this information beyond the agreed scope of works and URS assumes no responsibility for any inaccuracies or omissions. No indications were found during our investigations that information contained in this report as provided to URS was false.

This report was prepared between April 2011 and April 2012 and is based on the conditions encountered and information reviewed at the time of preparation. URS disclaims responsibility for any changes that may have occurred after this time.

This report should be read in full. No responsibility is accepted for use of any part of this report in any other context or for any other purpose or by third parties. This report does not purport to give legal advice. Legal advice can only be given by qualified legal practitioners.

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