

Rye Park *Wind Farm*

Traffic and Transport Assessment | April 2016

EPURON

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1 Introduction

This report provides an assessment of the Traffic and Transport impacts of the proposed Rye Park Wind Farm. The Rye Park Wind Farm is a renewable energy project in NSW extending approximately 45 km north to south and 2 – 3 km east to west. The southern point is roughly 10 km north of Yass and northern most points is about 6 km south east of Boorowa. The proposal is for up to 109 wind turbines and associated infrastructure such as site tracks, electrical cabling, crane areas etc. The proposal also includes an overhead powerline connecting the wind farm to an existing 330kV transmission line located at the southern end of the site.

An Environmental Assessment for the project was prepared by Epuron in January 2014. It was approved by the NSW Department of Planning and Environment for exhibition from March to May 2014. A number of submissions were received during this period about traffic and transport issues. These submissions as well as consultation more broadly with the community and statutory agencies has resulted in a number of changes to the proposed wind farm itself as well as more specifically to the proposed Traffic and Transport activities for the project.

The key changes to the proposed access route to the wind farm site since the exhibition of the EA include:

- ▶ no over-dimensional or over-mass vehicles passing through the outskirts of Yass;
- ▶ no over-dimensional or over-mass vehicles on Cooks Hill Road; and
- ▶ no over-dimensional or over-mass vehicles for most of Blakney Creek Road.

This Traffic and Transport Assessment considers a number of items including:

- ▶ existing Traffic and Transport situation
- ▶ Council regions and their respective traffic and road policies
- ▶ calculation of the expected number of vehicle movements by vehicle type
- ▶ description of proposed access routes
- ▶ details on expected council road upgrades that might be required
- ▶ discussion about changes and how they relate to submissions and community consultation more generally
- ▶ assessment of potential impact
- ▶ recommendations and mitigation measures are included

It should be noted that the majority of traffic and transport impact will be temporary and during the construction phase of the project. Construction is expected to last 18 -24 months and subsequent operational traffic will be relatively minor and will mostly utilise a road network that has been improved for over-size and over-mass vehicles. The proposed access roads for both over-dimensional and over-mass construction traffic and normal operational light traffic only are provided in this report. Construction traffic is however the focus of this Traffic and Transport Assessment.

1.1 Project Location

The proposed Rye Park Wind Farm is located north of Yass in NSW. It extends from about 10 km north of Yass in a northerly direction to about 6 km south east of Boorowa and to the east of the town of Rye Park. In total, north to south is about 45 km and east to west is roughly 2-3 km.

The proposal is located within three Local Government Areas of Boorowa Council, Upper Lachlan Shire Council and Yass Valley Council and is proposed to make use of roads within each of the three areas. RMS roads are also proposed to be used.

The Rye Park Wind Farm is adjacent to the proposed Bango Wind Farms, but as there is not yet any publically available details for the proposed Bango wind farm transport routes it has not been considered any further in this assessment.

1.2 Project Description

The project consists of up to 109 wind turbines and associated infrastructure including access tracks and overhead powerlines. A new 330kV electrical substation will be located on the proposed wind farm adjacent to the existing TransGrid 330 kV transmission line (Yass – Bannaby) which crosses the southern end of the site.

The construction phase of the project will involve the establishment of temporary construction facilities, compounds, access tracks, crane hardstand areas and foundations at each turbine location, underground electrical cabling, erection of wind turbines and the construction of the electrical substations and associated switchgear and control room buildings.

Traffic generated will be made up of the following:

- ▶ Construction traffic for the roadworks, foundation works, turbine erection works, substation and collector station works, cabling and transmission line works.
- ▶ Delivery of Imported Wind Turbine Materials including: Tower Segments, Nacelle (Engine housings), Hub Units, Blades.
- ▶ Delivery of locally sourced road base materials for onsite access roads and council road modifications.
- ▶ Delivery of locally sourced sand and concrete materials for onsite batching for foundations of wind turbine units and minor buildings.
- ▶ Delivery of water for roadworks, concrete batching, and dust suppression practices.
- ▶ Delivery of building materials for all buildings and structures proposed on the site areas.

1.3 Wind farm equipment features

The exact turbine model has not yet been determined for the project. It is expected that a competitive tender process will be undertaken post approval to select the most appropriate turbine for the site. It should be noted that turbines comprise of multiple components including blades, a nacelle and tower sections and the exact dimensions do vary from model to model. For this reason a representative turbine has been used in assessing delivery of these components to the site. Various assumptions have been made for various load types.

Over-dimension vehicles


Blade length of 63m has been used for this assessment.

Over-size vehicles

Those over 19m in length, 2.5m in width and 4.3m in height or over 42.5 tonnes are defined as over-size.

2 Director General's Requirements

Director General Requirements were provided on 14th February 2011 for the project. Supplementary Requirements were also provided on 16th August 2011. Those relating to Traffic and Transport state that the EA must assess the construction and operational traffic impacts of the project including:

- ▶ Details of the traffic volumes (both light and heavy vehicles) and transport routes during construction and operation;
 - ▶ Assess the potential traffic impacts of the project on road network function (including intersection level of service) and safety;
 - ▶ Assess the capacity of the existing road network to accommodate the type and volume of traffic generated by the project (including over-dimensional traffic) during construction and operation, including full details of any required upgrades to roads, bridges, site access provisions (for safe access to the public road network) or other road features;
 - ▶ Details of measures to mitigate and/or manage potential impacts, including construction traffic control, road dilapidation surveys and measures to control soil erosion and dust generated by traffic volumes;
 - ▶ Details of access roads within the site including how these connect to the existing public road network (ie site access) and ongoing operational maintenance requirements for on-site roads; and
 - ▶ Consideration of relevant council traffic/road policies.
- 

3 Existing Conditions

In order to access the wind farm site a combination of RMS managed major roads and local council roads will be used. Other transport modes, such as rail or air, are not viable options and have not been considered in this assessment.

3.1 RMS Roads

Wind turbine component delivery will be via Port Kembla which is well connected to a road network that can accommodate high traffic volumes and oversize and over-dimensional loads. The Port Kembla to the Southern Highlands route has been used for a number of previous wind farm projects without any significant impacts.

The majority of the delivery route is via the Hume Highway and the Lachlan Valley Way that are specified for over-size vehicle use. The most recent traffic counts are as follows:

- ▶ 3,600 vehicles per day - 0.5 km west of the Yass Valley Way on the Hume Highway as measured in 2012.
- ▶ 3,400 axle pairs per day - corner of Marsden and Pudman Streets in Boorowa

3.2 Local roads

After vehicles leave the RMS roads they will enter roads managed by one of the three local councils. Boorowa and Upper Lachlan Shire Councils do not have traffic count data available. Yass Valley Council does have regular traffic counts conducted and some details of relevant roads are included below from the information available on their website.

- ▶ 23 vehicles per day (13% heavy vehicles) on Coolalie Road at the Yass Valley Council boundary from 2003.
- ▶ 12 - 52 vehicles per day (5 - 7% heavy vehicles) at various places on Bushs Road from 2009.
- ▶ 118 – 298 vehicles per day (9 – 19% heavy vehicles) at various places on Cook Hill Road from 2009.
- ▶ 89 – 91 vehicles per day (12 – 14% heavy vehicles) at various places on Blakney Creek Road from 2006 and 2011.

It is clear from this data that local road use is significantly lower than on the major roads.

3.3 Road use

Whilst the number of road users is important, vehicle type is also an important factor. Data on the RMS roads does not differentiate between vehicles but the Yass Valley Council Data does specify how many heavy vehicles are using the roads. From this data it appears that the majority of road users are not heavy vehicles on the local roads around the sites but a reasonable number of heavy vehicles do already utilise the area.

3.4 Council road and traffic policies

The Proponent has consulted extensively with each of the three local councils to understand the potential impacts of the project on the local road network. Details of the agreed approach to standards and road upgrades are included in section 6 of this report.

4 Proposed Transport Route

4.1 Road transport via major road network

The wind turbine components will be manufactured overseas and delivered to Port Kembla. Yass is 180 km from Port Kembla which is well equipped to accept wind turbines having done so numerous times in the past. **Error! Reference source not found.** below shows that proposed route from Port Kembla to the site via the major road network.

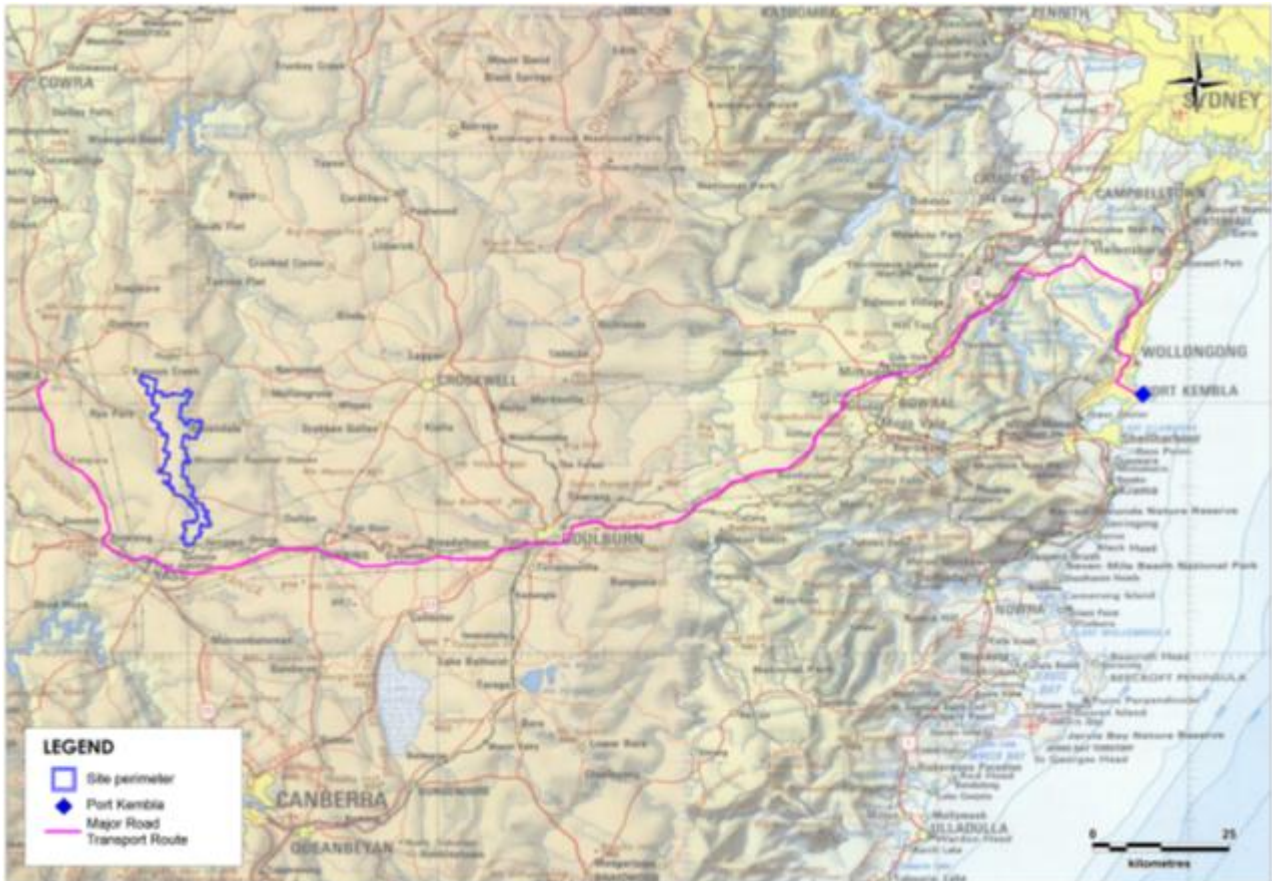


Figure 4-1 Road transport route to Rye Park Wind Farm

The route from Port Kembla to Yass via the Hume Highway is a viable option for heavy and over dimensional vehicles as it is wide, is in good condition and has been used for wind turbine transport in the past. Whilst no modification is expected to be required on this part of the route, there are several sections of the highway which will need more detailed assessment by a transport contractor for the largest oversize loads specific to the actual turbine being used and should be included in the Traffic Management Plan to be produced prior to construction:

- ▶ in Wollongong there is a requirement to pass below the Northern Distributor overpass from the Southern Highway; and
- ▶ a steep ascent at Mount Ousley Road;

It is possible that the tower sections for the turbines will be manufactured in Australia. The tower sections would be delivered by road transport following the same route, depending on their site location and dimensions.

Once near Yass on the Hume Highway, the over-dimensional and over-mass route separates into two alternative proposed routes:

- ▶ The southern portion of the site is accessed off the Hume Highway east of Yass via Jerrawa Road, Coolalie Road and Bushs Road. Further details on these roads are provided below.

- ▶ The northern section of the site exits the Hume Highway to the west of Yass onto the Lachlan Valley Way to Boorowa. This is a designated heavy vehicle route. Once off the Lachlan Valley Way, the route enters the local council road network and heads east towards Rye Park.

This preferred route has changed since the exhibition in 2013 and now does not have over-dimensional vehicles passing through the outskirts of Yass and makes use of what was the alternative delivery route through Boorowa.

4.2 Road transport via the local road network

Council roads are used for over-dimensional and over-mass deliveries once off the RMS network. Other light vehicles and trucks associated with the construction of the wind farm will also use these roads. Table 4-1 and Figure 4-2 show the proposed over-dimensional (including over-mass) and light vehicle (secondary access) site access routes.

Table 4-1 Site access routes on local roads

Over-dimensional and over-mass routes				
Road	Purpose	Start - End	Length (m)	LGA
Coolalie Road	Access Point 6	Jerriwa Road to Bushs Road	6,900	Upper Lachlan Council & Yass Valley Council
Coolalie Road	Access Point 6	Hovell Street to Bushs Road	10,700	Yass Valley Council
Jerriwa Road	Access Point 6	Hume Highway to Coolalie Road	4,300	Upper Lachlan Council
Bushs Road	Access Point 6	Coolalie Road to Access Point 6	1,440	Yass Valley Council
Trucking Yard Road	Rye Park Township	Lachlan Valley Way to Dillion Street	660	Boorowa Council
Dillion Street	Rye Park Township	Trucking Yard Road to Long Street	990	Boorowa Council
Long Street	Rye Park Township	Lachlan Valley Way to Boorowa Rye Park Road	1,100	Boorowa Council
Boorowa Rye Park Road	Rye Park Township	Long Street to Yass Street	19,400	Boorowa Council
Rye Park Rugby Road	Access Point 2, 10 & 3	Yass Street to Maryvale Road	9,700	Boorowa Council
Maryvale Road	Access Point 3	Rye Park Rugby Road to Access Point 3	13,500	Boorowa Council & Upper Lachlan Council
Yass Street	Access Point 4, 12, 5 & 13	Boorowa Rye Park Road to Rye Park Dalton Road	1,900	Boorowa Council
Rye Park Dalton Road	Access Point 4, 12, 5 & 13	Yass Street to Access Point 13	23,900	Boorowa Council & Upper Lachlan Council
Flakney Creek Road	Access Point 4	Rye Park Dalton Road to Access Point 4	1,400	Boorowa Council
Rye Park Cemetery Road	Access Point 4, 12, 5 & 13	Rye Park Rugby Road to Rye Park Dalton Road	5,000	Boorowa Council
Dirthole Creek Road	Access Point 4, 12, 5 & 13	Boorowa Rye Park Road to Rye Park Dalton Road	4,400	Boorowa Council
Cook Street	Access Point 9	Boorowa Rye Park Road to Banks Street	600	Boorowa Council
Banks Street	Access Point 9	Cook Street to Cemetery Drive	1,400	Boorowa Council
Cemetery Drive	Access Point 9	Banks Street to Access Point 9	1,000	Boorowa Council
Lagoon Creek Road	Access Point 1	Rye Park Cemetery Road to Access Point 1	1,400	Boorowa Council
Cooks Hill Road	Access Point 5	Faulder Ave to Rye Park Dalton Road	18,300	Yass Valley Council & Upper Lachlan Council
Blakney Creek Road	Access Point 13	Cooks Hill Road to Rye Park Dalton Road	7,900	Yass Valley Council & Upper Lachlan Council

Normal light vehicle only access routes (Secondary Access)				
Cooks Hill Rd	Site Access 5 & 13	Yass to Site Access 5	18,300	Yass Valley Council & Upper Lachlan Council
Blakney Creek Road	Site Access 13	Cooks Hill Road to Rye Park Dalton Road	7,900	Yass Valley Council & Upper Lachlan Council
Coolalie Rd	Site Access 6	Yass to site access 6	10,700	Yass Valley Council & Upper Lachlan Council

The access routes differ from that proposed in the EA in 2014. Changes have been made in response to submissions and recent consultation. Wind turbine and other oversize component deliveries are no longer proposed through the outskirts of Yass, on Cooks Hill Road and on much of Blakney Creek Road.

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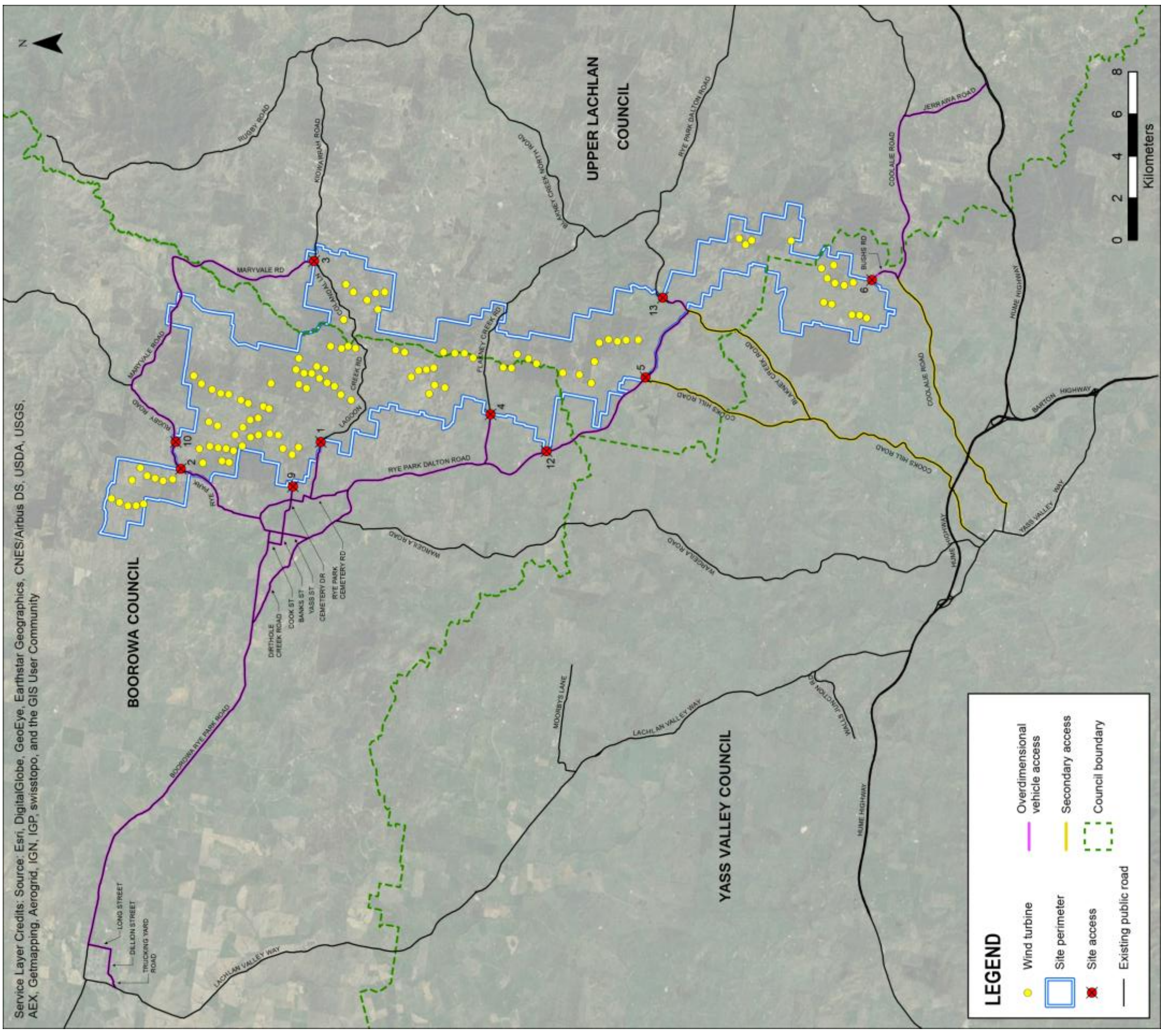


Figure 4-2 Site access routes via local council roads

4.3 Access onto the site

The majority primary access points to the project site will be from the west via upgraded access points off the Rye Park – Dalton Road. These access points will cross involved landowners property and provide access to various parts of the wind farm site.

Table 4-2 Site access points

Site Access Point	Location	Proposed use
1	Lagoon Creek Road	Access to wind turbines in close proximity to Lagoon Creek Road
2	Rye Park Dalton Road	Access to wind turbines north of Rye Park Dalton Road
3	Maryvale Road	Access to wind turbines southwest of Maryvale Road
4	Flakney Creek Road	Access to wind turbines within close proximity to Flakney Creek Road
5	Rye Park Dalton Road	Access to wind turbines north of Cooks Hill Road
6	Bushs Road	Access to wind turbines north of Bushs Road
9	Cemetery Drive	Access to wind turbines east of Rye Park
10	Rye Park Dalton Road	Access to wind turbines south of Rye Park Dalton Road
12	Rye Park Dalton Road	Access to wind turbines south of Flakney Creek Road
13	Rye Park Dalton Road	Access to wind turbines east of Blakney Creek Road



Figure 4-3 Access via Blakney Creek North Road



Figure 4-4 Access via Rye Park - Dalton Road



Figure 4-5 Access to Bushs Road via Coolalie Road



Figure 4-6 Access via Rye Park - Rugby Road



Figure 4-7 Access via Maryvale Road

4.4 Access within the site

Access tracks to each of the wind turbine locations will generally be across open paddocks and be along the ridgelines that the turbines are located on. The location of the access tracks has been selected with consideration for existing environmental constraints and to minimise the overall length of tracks on the site.

The internal site access tracks are located on private property and there will be no traffic impacts to the general public from vehicle movements within the site.

Empty delivery vehicles will exit the site via one of the site access points. The Traffic Management Plan will address and avoid potential scheduling conflicts of vehicles entering and leaving the site. Provision will be made on site for an area that will allow for the turning of semi-trailers and oversized vehicles so no vehicles would need to reverse onto the public road network.

5 Predicted Traffic and Equipment Transport Requirements

The proposed development will generate significant additional traffic movement during the construction phase and a minimal increase over the operational phase of the project. The anticipated additional traffic type and volume is described in the following section.

5.1 Construction Traffic

Construction traffic will be generated by the delivery of equipment and materials to site including the construction work force travelling to and from the site on a daily basis. The construction traffic associated with the project is temporary and form the largest proportion of impact on the community local to the project.

Sourcing road base and concrete batching material

There is no commitment by the Proponent to source material from a particular location as it is anticipated that external contractors will need to take competitive bids on supply of these materials. There are at least two commercial quarries in the region that are capable of extracting materials that meet RMS requirements in the volumes predicted for the site. These are Glenella Quarry located in Cowra and Bogo Quarry in Bookham. The company that owns both quarries uses “truck and dog” vehicles capable of delivering up to 1,200 tonnes per day in units 19 m in length and of weight 32 tonnes. These vehicles are within acceptable size and load limits. It is expected that sand, aggregate and road base will be sourced in this manner whilst concrete and steel would be travelling from Port Kembla.

Construction Traffic Generation

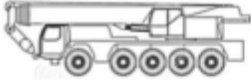
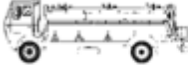






Calculations have been performed to quantify the number of vehicle movements predicted on council roads as a result of the proposal. Movements within the site that do not utilise council roads have not been included. Table 5-1 on the following page shows the estimated transport task associated with the project and is broken down by vehicle type. Table 5-2 shows additional details on the predicted two way traffic volumes during construction. Based on these estimates and an 18 month construction period with 22 working days per months results in the following predicted daily truck traffic volumes:

$30,100 \text{ trips} / 18 \text{ months} / 22 \text{ days} = 76 \text{ total two way truck trips per working day.}$

Construction staff traffic can be estimated based on peak staff on site of 150 and 1.5 persons per vehicle:

$150 \text{ staff} / 1.5 \text{ per vehicle} \times 2 = 200 \text{ total two way light vehicle trips per working day.}$

Table 5-1 Total transport task and typical vehicles

Vehicle	Estimated trips*	Typical Vehicle
Mobile crane	16	
20t Tanker	6,948	
Tanker (28t)	1,620	
Heavy Rigid Vehicle	520	
Six Axle Articulated	3,736	
32t truck and dog	15,270	
Low Loader	38	
Extendable Trailer / Dolly (various sizes)	1,962	
Total	30,110	

Note: A trip is defined as a vehicle movement in a single direction, either to the site or from the site.

Table 5-2 External project construction traffic generation

Item		Loads	Typical Vehicle	Total Trips	Assumptions
Access Track Construction					
Delivery of Plant		18	Low Loader	36	Nominal
Road Base		3,350	32t truck and dog	6,700	107,250t for 25km of road/access track + 10%
Stabiliser		25	32t truck and dog	50	Allowance - one load per km
Geofabric		25	Six Axle Articulated	50	Allowance - one load per km
Fuel		90	20t Tanker	180	Nominal Allowance
Foundation Preparation and Turbine Construction					
Turbine Parts	Tower sections	436	Extendable Trailer	872	Four sections per turbine
Nacelles (Generators)		109	Extendable Trailer	218	One per turbine
Blades		327	Extendable Trailer	654	Three per turbine
Hubs		109	Extendable Trailer	218	One per turbine
Cables/controllers		109	Six Axle Articulated	218	One load per turbine
Tools, misc goods for erection		109	Six Axle Articulated	218	One load per turbine
Plant and Equipment	Delivery of plant for civil work	80	Six Axle Articulated	160	Allowance of 20 items of plant per work face
Cranes - Crawler		40	Six Axle Articulated	80	Four work faces, each with one crane - 10 loads per crawler crane
Cranes - Mobile		8	Mobile crane	16	Four work faces, each with two mobile cranes
Equipment (Generators, lighting etc)		40	Six Axle Articulated	80	Allowance of 10 loads of equipment per work face
Fuel		104	20t Tanker	208	One truck fill per week
Site and Foundations	Slab	-	Concrete Truck	-	Sourced from batching plant
Walls		20	Six Axle Articulated	40	To be confirmed
Yard		20	Six Axle Articulated	40	To be confirmed
Fencing		4	Six Axle Articulated	8	Four work faces, each with one load of fencing
Concrete		-	Concrete Truck	-	Sourced internally from batching plant
Reinforcing Steel		450	Six Axle Articulated	900	5% of concrete; 181,000t concrete = 9,050t steel; 20t per truck
Batching Plant	Delivery of batching plant	9	Six Axle Articulated	18	Estimated from typical modular plant
Cement		810	Cement Tanker (28t)	1,620	22,700t (181,000 tonnes of concrete)
Sand and Aggregate		4,260	32t truck and dog	8,520	135,750t (181,000 tonnes of concrete)
Water		680	20t Tanker	1,360	13,600t (60% of cement mass)
Sub Station Transformer		1	Low Loader	2	
Switch Grid		20	Six Axle Articulated	40	Estimate to be confirmed
Fencing		10	Six Axle Articulated	20	
Power Transmission	Transmission Cables	50	Six Axle Articulated	100	10km, nominal 10 lines, 3km rolls, 2 rolls per vehicle
Transmission Pylons		500	Six Axle Articulated	1,000	To be confirmed - nominal 10 loads per pylon, pylons spaced at 200m
Support	Delivery of site offices	164	Six Axle Articulated	328	nominal 1.5 loads per turbine, assuming support office serves several turbines
Deliveries		130	Heavy Rigid Vehicle	260	One load every second week day, 24 month duration
Waste Disposal		130	Heavy Rigid Vehicle	260	One load every second week day, 24 month duration
Water		2,600	20t Tanker	5,200	10 loads per day for duration, road construction, dust suppression, concrete
Site Rehabilitation					
Delivery of plant for civil work		-	Low Loader	-	Re-used from construction
Equipment		109	Six Axle Articulated	218	One load per turbine
Seed/Plants		109	Six Axle Articulated	218	One load per turbine
Total		15,055		30,110	

5.2 Operational Traffic

A modern wind farm is designed to operate automatically and unmanned, but a small crew of technicians are based on the site during normal working hours Monday to Friday to carry out scheduled and non-scheduled maintenance on the wind turbines. Operational staff will regularly visit all of the wind turbine locations on site using light weight service vans. It is anticipated that operational requirements including scheduled and un-scheduled maintenance will generate approximately 8 trips per day on the nearby road network.

On-site access roads would only require minimal operational maintenance as only light vehicles would require access during the operational phase. Significant maintenance of on-site tracks would only be required for major wind turbine maintenance should road have deteriorated or for decommissioning.

6 Impact Assessment

6.1 General

The main impact of the proposed wind farm with regard to traffic and transport is the additional number of vehicles on the roads during the construction period and the size of some of the loads.

The amount of additional traffic generated by the wind farm will be negligible relative to the significant daily traffic volumes on the Hume Highway. Some minor disruptions may be caused by the passage of the oversize vehicles on the highway.

The additional traffic through Yass and the surrounding regions has the potential to cause minor disturbance to local users. The road authorities and other stakeholders will be consulted as part of developing the project Traffic and Transport Plan.



Figure 6-1 Transport of turbine blades with escort vehicle



Figure 6-2 Transport of tower section on steep site access track

6.2 Suitability of Existing Road Layout

Prior to the commencement of the project a detailed route survey will be carried out by the transport contractor to ensure safe access and minimise potential impacts to other road users. If there is a need for any temporary modification of any road structures, then it will need to be discussed and agreed with the councils or the RMS as relevant and incorporated into the Traffic Management Plan.

Multiple access points to the wind farm site have been selected to achieve safe access and minimise community disruption during the construction stage. Further planning and consultation with Councils and the RMS will be undertaken to ensure the safe passage of vehicles entering and leaving the site.

6.3 Structural capacity of existing roads and drainage structures

The increased traffic during construction has the potential to accelerate degradation of the road condition. Discussions are well advanced with each of the local councils on any pre-construction road upgrades and increased inspection and maintenance and will be agreed with each of the relevant councils prior to construction.

An initial visual assessment of bridges, culverts and causeway structures has been carried out by a structural engineer. Refer to Appendix 1 of this report for further details. The assessment noted that the use of the proposed access routes is feasible and recommended some additional assessments once the detailed transport requirements have been finalised. It is likely that minor upgrades to some of the structures will be required once the more detailed engineering assessments have been completed. Any upgrades to bridges, culverts or causeways will be undertaken to the appropriate standards for the anticipated weights and traffic volumes.

6.4 Road Upgrades

Some road upgrades will be required prior to the construction of the Rye Park Wind Farm. The Proponent has held extensive consultation with the local councils as part of refining the proposed access route and identifying where upgrade works may be required. The Proponent will be responsible for the costs of any agreed road upgrades prior to construction.

6.4.1 Design Standards:

Unless an alternative standard is agreed with the council prior to construction and depending on the availability of local material from local quarries, the Proponent has agreed to the below design standards to be implemented on specific road sections where they are to be used for over-dimensional and over-mass construction traffic.

Unsealed roads to be sealed: 200 mm road base topped with double spray seal (14/7 double/double). 7.0 m seal and 8.5 m formation width (as per Upper Lachlan Shire Council recommendation).

Unsealed Roads: Construction width minimum 6 metres wide, maximum 8 metres wide. Pavement minimum thickness 100 mm on existing sheeted road (as per Upper Lachlan Shire Council recommendation).

Where separate roads have been identified for light vehicle operational traffic only, appropriate road conditions and safety measures will be agreed with councils and be implemented in advance of construction.

6.4.2 Road Maintenance

Unless otherwise agreed with the relevant council the Proponent will be responsible for the costs of maintenance of any upgraded unsealed roads during the wind farm construction period. Where roads have been sealed prior to construction, the maintenance during construction and operation of the wind farm will be by the responsibility of the local Council.

The intention for the development is to provide the community with safe road network conditions during the construction period and to complete the project without damaging the existing road network.

The site access route has separate access to the northern and southern parts of the site as shown in Figure 4-2. This is to prevent construction traffic passing through residential areas of Yass as well as minimise traffic on Cooks Hill Road, Blakney Creek Road and Coolalie Road. The over-dimensioned trucks, specifically the articulated vehicles with rear wheel steering would require pilot vehicles and some traffic management planning on the local roads leading to the site. These details will be included in the Traffic Management Plan.

6.4.3 Commitments

The proposed road upgrade commitments and design standards are based on the following assumptions:

- ▶ The agreed design standards and upgrades will only be implemented on the roads or road sections to be actually used for over-mass and over-dimensional construction traffic based on the final wind farm construction layout or staged development construction. Appropriate and adequate safety measures will be

agreed with Councils prior to commencement on all access roads, including roads identified for normal light vehicle access only.

- ▶ The proposed road upgrades are based on the current anticipated traffic numbers and proposed access routes for constructing the wind farm. Should the final construction layout and design result in materially different construction traffic numbers or different routes to be considered, the Proponent and the council will negotiate in good faith appropriate alternative standards in conjunction with appropriate traffic management measures to ensure safe construction activities.
- ▶ The dimensions proposed are subject to on-site assessments to ensure there are no significant impacts on sensitive native vegetation within the road reserves or significant physical constructability constraints. council and the Proponent will negotiate in good faith to agree on appropriate options to avoid or minimise significant impacts where this will be the case.
- ▶ The proposed upgrades are subject to the roads not being upgraded by council or a 3rd party prior to the Rye Park wind farm construction. The Proponent, in consultation with the councils, will undertake a final review of road conditions and suitability prior to construction to confirm road conditions and upgrade requirements based on the agreed design standards for each road.
- ▶ The Proponent will agree with councils on a suitable method for determining and capturing road conditions before and after upgrades, including how best to undertake any dilapidation report requirements that may be required under the development consent conditions.
- ▶ Any bridge or other structures to be upgraded will be assessed for suitability and upgraded as required to comply with the appropriate standards.
- ▶ These commitments will be reflected in the final Traffic Management Plan which will be developed in consultation with the road authorities prior to the commencement of any construction activities.

6.4.4 Existing road condition and proposed upgrades

Over-dimensional and over-mass construction access roads

The tables below provide a summary of the current road conditions and proposed upgrades for each section of road if they are to be used for over-dimensional and over-mass construction access roads. The Proponent will secure agreement with the respective councils on the final specific upgrade requirements prior to construction and ensure any upgrades are completed prior to substantial construction traffic on the respective roads.

In and around Boorowa

Table 6-1 Boorowa roads conditions and proposed upgrades

Road	Length (m)	Existing condition	Proposed upgrade
Trucking Yard Road (Lachlan Valley Way to Dillon St)	660	Currently sealed	Some sections may require widening and pavement strengthening. The existing causeway may also require widening.
Dillon Street (Trucking Yard Road to Long Street)	990	Currently sealed	Some sections may require widening and pavement strengthening. Some modifications required to Dillon Street/ Long Street intersection for over dimensional vehicles.
Long Street (Dillon Street to Boorowa Rye Park Road)	1,100	Currently sealed	Some sections may require widening. Some modifications required to Long Street / Boorowa Road intersection for over dimensional vehicles.
Junction: Dillon Street / Long Street junction	-		Minor upgrade required within road reserve to allow access for over-dimensions vehicles
Junction: Long Street / Boorowa Rye Park Road	-		Minor upgrade required within road reserve to allow access for over-

Road	Length (m)	Existing condition	Proposed upgrade
			dimensions vehicles

Boorowa - Rye Park Road

This stretch is about 20 km long and is generally in appropriate condition and width to carry wind farm delivery loads. Table 6-2 below details the current condition and possible upgrades required.

Table 6-2 Boorowa Rye Park Road current road description and required upgrade

Road or drainage structure	Length (m)	Existing Road condition	Proposed upgrade
Boorowa Rye Park Road (Long Street to Yass Street)	19,360	Currently sealed	Some sections may require widening and pavement strengthening.
Boorowa Road reinforced concrete bridge over Dirthole Creek (S010)	-	Poor condition, but serviceable	The bridge over Dirthole Creek will likely require upgrading. To assess suitability and structural integrity prior to construction.

Dirthole Creek Road

This section of road has been selected as an alternative route through/around Rye Park. Upgrades will be required if this is chosen as a final transport route. Table 6-3 shows more detail on existing condition and upgrades proposed.

Table 6-3 Dirthole creek Road current road description and required upgrade

Road	Length (m)	Existing Road condition	Proposed upgrade
Dirthole Creek Road (Boorowa/Rye Park Road to Yass Street)	4,400	Unsealed – average condition	This section of road has inadequate width and alignment and will require widening and pavement strengthening.
Junction: Dirthole Creek Road / Boorowa Rye Park Road	-	-	Minor upgrade likely required within road reserve to allow access for over-dimensions vehicle

Rye Park Rugby Road

Turning left from Boorowa Rye Park Road enters Rye Park Rugby Road. Table 6-4 details the existing road condition as the proposed upgrade.

Table 6-4 Rye Park Rugby Road current road description and required upgrade

Road	Length (m)	Existing Road condition	Proposed upgrade
Grassy Creek Road (Yass Street to Maryvale Road – including Site Access 2 and 10)	9,700	Currently sealed	Acceptable in most areas, some sections may require upgrading. Large Culvert over Pudman Creek requires upgrading to ensure structural capacity.
Junction: Boorowa Rye Park Road / Rye Park Rugby Road	-	-	Minor upgrade likely required within road reserve to allow access for over-dimensions vehicle

Maryvale Road

Maryvale Road follows after Grassy Creek Road. It is currently an unsealed road and will require upgrade for construction of the wind farm. Table 6-5 shows more detail on the current condition and proposed upgrades.

Table 6-5 Maryvale Road current road description and required upgrade

Road	Length (m)	Existing Road condition	Proposed upgrade
Maryvale Road (Rye Park Rugby Road to Site Access 3)	13,500	Unsealed gravel – 50mm-80mm thickness.	Adequate width and alignment along majority of road. Some upgrades may be required if Site Access 3 used for heavy & OD vehicles.
Junction: Rye Park Rugby Road / Maryvale Road	-	-	Minor upgrade likely required within road reserve to allow access for over-dimensions vehicle

Yass Street

This section of road has been selected as an alternative route through/around Rye Park. Table 6-6-6 shows more detail on the current condition and proposed upgrade.

Table 6-6 Yass Street current road description and required upgrade

Road	Length (m)	Existing condition	Proposed upgrade
Yass St (Rye Park Rugby Rd to Dirthole Cr Rd intersection)	1,900	Currently sealed.	Some sections may require upgrading. May need work on alignment and on bridge over Bobby's Creek (circa 1951).
Junction: Yass Street / Boorowa Rye Park Road			Minor upgrade likely required within road reserve to allow access for over-dimensions vehicle.

Cooks Street and Banks Street

Cooks Street and Banks Street are a possible route through Rye Park. Table 6-7 shows the current condition and proposed upgrades.

Table 6-7 Cook Street and Banks Street current road description and required upgrade

Road	Length (m)	Existing condition	Proposed upgrade
Slattery Street / Banks Street (Boorowa Rye Park Road to Site Access 9 - <i>optional alternative</i>)	3,000	Sealed	Road in average condition and will require upgrading in some areas.
Junction: Cooks Road / Boorowa Rye Park Road			Minor upgrade likely required within road reserve to allow access for over-dimensions vehicle
Junction: Cooks Road / Banks Road			Minor upgrade likely required within road reserve to allow access for over-dimensions vehicle

Rye Park Cemetery Road

Provides a route to the wind farm directly east from Rye Park. Table 6-8 provides detail on the existing conditions and proposed upgrades.

Table 6-8 Rye Park Cemetery Road current road description and required upgrade

Road	Length (m)	Existing condition	Proposed upgrade
Rye Park Cemetery Rd (Rye	5,000	Currently sealed	Road in average condition and will require upgrading in some areas

<i>Road</i>	<i>Length (m)</i>	<i>Existing condition</i>	<i>Proposed upgrade</i>
Park Rugby Rd to Rye Park Dalton Rd)			

Lagoon Creek Road

Table 6-9 shows the details of the existing condition and proposed upgrades.

Table 6-9 Lagoon Creek Road current road description and required upgrade

<i>Road</i>	<i>Length (m)</i>	<i>Existing condition</i>	
Lagoon Cr Rd (Rye Park Cemetery Rd to Site Access 1)	1,400	Unsealed	Road in average condition and will require upgrading in some areas, including shoulder improvements at intersection. Creek crossing will require upgrading

Rye Park Dalton Road

The Rye Park Dalton Road covers both Boorowa and Upper Lachlan Shire Council areas in the proposed area of use. Along the length there are various conditions of both seal and unsealed sections. Table 6-10 shows the detail of the existing road condition and proposed upgrade for each segment. Note that some sections are proposed to be upgraded from unsealed to sealed should certain access points be used for over-dimension and over-weight loads.

Table 6-10 Rye Park Dalton Road current road description and required upgrade

<i>Road or drainage structure</i>	<i>Length (m)</i>	<i>Existing condition</i>	<i>Proposed upgrade</i>
Rye Park Dalton Road (Dirthole Creek Road to Shire Boundary)	14,600	Currently sealed	Some sections may require upgrading.
Rye Park Dalton Road (Shire boundary to Cooks Hill Road and Site Access 5)	4,300	Unsealed gravel – 50mm-80mm thickness	To be sealed in accordance with proposed sealed standard.
Rye Park Dalton Road (Cooks Hill Road to Blankney Creek Road) <i>(optional segment if Site Access point 13 used only)</i>	3,600	Unsealed gravel – 50mm-80mm thickness	To be sealed in accordance with proposed sealed standard.
Rye Park Dalton Road (Blankney Creek Road to Site Access 13) <i>(optional segment if Site Access point 13 used only)</i>	1,400	Currently sealed	Road dimensions adequate with minor upgrades potentially required.
Rye Park Dalton Road bridge over Pudmans Creek	-	-	Some upgrades may be required to the concrete bridge.
Rye Park Dalton Road over Flakney Creek (just north of Flakney Creek Road)	-	-	Some upgrading may be required if the southern site access points are utilised.
Rye Park Dalton Road over Blakney Creek (just west of Blakney Creek Road)	-	-	Some upgrading may be required if the southern site access points are utilised.

Flakney Creek Road

Flakney Creek Road provides access to the central area of the site. Table 6-11 contains information on existing road condition and proposed upgrades.

Table 6-11 Flakney Creek Road current road description and required upgrade

Road	Length (m)	Existing condition	Proposed upgrade
Flakney Creek Road (Rye Park/Dalton Road to Site Access 4)	1,400	Unsealed.	Will require upgrading in some areas, including shoulder improvements at intersection. Creek crossing will require upgrading.

Jerrawa Road

The exit from the Hume Highway on to Jerrawa Road is suited for oversize loads with its large exit lane and sufficiently wide entry. Some signage may be temporarily removed or relocated and traffic management control may be required while crossing the Hume Highway. Table 6-12 contains further detail on the existing condition and proposed upgrades.

Table 6-12 Jerrawa Road current road description and required upgrade

Road	Length (m)	Existing Road condition	Proposed upgrade
Jerrawa Rd (Hume Highway to Coolalie Rd)	4,300	Currently sealed	Road dimensions adequate with minor upgrades required in some areas.

Coolalie Road

Coolalie Road west of Jerrawa Road is a mixture of sealed and unsealed road that continues to the site access point at Bush's Road. As the majority of the road is unsealed, a study will be conducted before and after construction to ensure the quality of the road is maintained once the delivery of over-dimension vehicles has stopped.

The Australian Rail Track Corporation has been consulted with in regards to the railway level crossing found on Bush's Road within the site boundary. A Rail Safety Management Plan will be developed in further consultation with the Australian Rail Track Corporation to establish safe crossing times and procedures prior to any construction or use of this railway crossing.

Table 6-13 Coolalie Road current road description and required upgrade

Road Segment Identification	Length (m)	Existing Road condition	Proposed upgrade
Coolalie Rd (Jerrawa Rd to Shire Boundary) leading to Site Access 6	5,400	Currently unsealed.	Upgrade as required up to proposed unsealed standard. Road dimensions adequate in majority of locations. Upgrades and alignment improvements potentially required in some sections.
Coolalie Rd (Shire Boundary to Site Access 6)	1,500	Currently unsealed with adequate width and alignment.	Road dimensions adequate in majority of locations. Upgrades and alignment improvements potentially required in some sections

Light vehicle only access roads

The tables on the following page provide a summary of the current road conditions for each section of road identified for normal light vehicle access only. These sections of road will not be used for over-dimensional and over-mass access. Roads to be used for light vehicle traffic only will be assessed separately in consultation with council to ensure an adequate unsealed condition and safety management measures prior to use of the roads for substantial traffic. The

Proponent will secure agreement with the respective Councils on the final specific upgrade requirements prior to construction.

Table 6-14 Proposed light vehicle only access roads

Road Segment Identification	Length (m)	Existing Road condition
Cooks Hill Rd (Yass to Site Access 5)	18,300	Sealed and unsealed
Blakney Creek Road (Cooks Hill Road to Rye Park Dalton Road)	7,900	Sealed and unsealed
Coolalie Rd (Yass to site access 6)	10,700	Sealed and unsealed

Intersections

A number of intersections on the delivery route will require minor modifications to safely accommodate the over-dimensional vehicles and loads. The modifications will include local widening of the roads, temporary removal of road furniture and signs and trimming of vegetation within the road reserve. The suitability of a number of key intersections on the transport route has been assessed using a swept path analysis based on the worst case turbine blade delivery vehicle. See Appendix 2 to this report for the swept path analysis for each of the intersections listed in the table below.

Table 6-15 Intersections utilised for site access to Rye Park

Street 1	Street 2	Comments
Boorowa Road	Yass Street	Turning north and south onto Yass Street
Rye Park – Rugby Road	Rye Park – Cemetery Road	
Boorowa Road	Dirt Hole Creek Road	
Dirt Hole Creek Road	Rye Park – Dalton Road	Heading south
Dirt Hole Creek Road	Yass Street	Heading north
Rye Park – Dalton Road	Rye Park – Cemetery Road	

6.5 Disturbance to Local Community

The main impacts of wind farm construction traffic on the local communities will involve:

- ▶ movements of vehicles through Yass and along the Hume Highway and to and from the site entry;
- ▶ increased frequency of vehicle movements on the surrounding roads to the wind farms that would otherwise have low traffic volumes; and
- ▶ potential safety risks arising from increased traffic movements.

The volume of construction traffic indicated in section 5 will be spread over the construction period but on a daily basis the frequency of vehicle movements would fluctuate depending on the construction activities occurring at the time. Deliveries of long loads such as the wind turbine blades may involve up to 6 oversize vehicles per day. Pouring concrete for a turbine foundation can involve around 50 one-way truck movements in a day.

The general increase in daily traffic has the potential to increase the short-term traffic noise levels along the proposed access route. The level of disturbance to residents will be directly related to the proximity of the existing premises to

the access roads. During construction the timing of vehicle movements will be mostly within the normal site working hours. Night time deliveries will be avoided wherever possible.

The oversize and over-mass vehicles are likely to travel at lower speeds than those normally used by local residents. Some delays may be experienced by local residents due to the nature of the vehicles being used to deliver materials to the site. Special consideration will be provided to routes that pass residential areas, schools, school bus routes and intersections in the transport Management Plan to schedule deliveries outside of peak or important times. Consultation with local stakeholders will be undertaken prior to the finalisation and implementation of the Traffic Management Plan.

6.6 Road Safety

The Boorowa and Yass townships and the Hume Highway (locally) generally have low accident rates; however, have recorded fatalities in recent years. The 2010 statistics for the Yass and Boorowa townships relative to the entire South Eastern Region can be seen in Table 6-16 and the statistics for the Hume Highway in the local vicinity of the project relative to the entire South Eastern Region can be seen in Table 6-2 (RTA, 2010).

Table 6-16 Accident rates in the South Eastern Region

<i>Roadway</i>	<i>Fatal Crashes</i>	<i>Injury Crashes</i>	<i>Non Casualty Crashes</i>	<i>Total Crashes</i>	<i>Killed</i>	<i>Injured</i>
Boorowa	0	12	8	20	0	14
Yass	5	48	81	134	5	77
Local subtotal	5	60	89	154	5	91
Other areas in the region	23	601	750	1,374	24	868
Entire South Eastern Region Total	28	661	839	1,528	29	959

Table 6-17 Accident rates on the Hume Highway

<i>Roadway</i>	<i>Fatal Crashes</i>	<i>Injury Crashes</i>	<i>Non Casualty Crashes</i>	<i>Total Crashes</i>	<i>Killed</i>	<i>Injured</i>
Gunning	0	7	14	21	0	10
Yass	2	20	24	46	2	34
Harden	0	6	6	12	0	9
Local subtotal	2	33	44	79	2	53
Other areas in the region	7	415	509	931	8	588
Entire South Eastern Region Total	9	448	553	1,010	10	641

The transport of large items of equipment on oversize and over-mass vehicles as well as an increase in traffic using a road network has the potential to have some impact on road safety. Such potential safety impacts may result from:

- ▶ other road users becoming frustrated by delays behind slow moving vehicles;
- ▶ normal traffic expectation by local road users not allowing for the presence of large vehicles; and
- ▶ an increase in traffic numbers on the roads.

These potential safety impacts will be minimised by the use of escort vehicles that will accompany the oversize and over-mass vehicles. The Traffic Management Plan will include appropriate safety and traffic control measures to be finalised in consultation with the Councils.

7 Recommendations and Mitigation Measures

A number of measures will be incorporated during the construction and operation of the proposed wind farm to ensure that traffic and transport impacts arising from the development are managed and minimised. These measures will be incorporated into a Traffic Management Plan for the project and developed in consultation with the RMS and Boorowa, Upper Lachlan Shire and Yass Valley Councils to ensure that applicable safety standards are achieved and disruption to local traffic is minimised.

An important mitigation measure during the construction period will be the implementation of a community information and awareness program. This will ensure that the local residents are fully aware of the planned construction activities and construction traffic. The program will include notices in the local newspapers, newsletters to local residents and up to date information available of the project website.

Temporary signage will be erected during the construction period in consultation with the RMS and councils to provide specific warning of construction traffic. Other mitigation measures will include:

- ▶ Use of a licensed and experienced haulage contractor, to be responsible for obtaining all necessary permits and approvals from the RMS and councils and for complying with conditions of consents.
- ▶ Escorts for oversize and over-mass vehicles will be provided in accordance with RMS requirements.
- ▶ Development of a Traffic Management Plan that will identify detail actions such as scheduling of deliveries, managing timing of transport through major centres (Yass) to avoid peak times (beginning / end of school), consultation activities during haulage activities, designing and implementing modifications to intersections and street furniture and managing the haulage process.
- ▶ The Traffic Management Plan will establish a procedure to monitor traffic impacts during construction such as noise, dust nuisance and travel timings so adjustments can be made to minimise impacts.
- ▶ Improvements to any public roads impacted by the project in consultation with the RMS & councils. The improvements may include upgrades to the intersection at the site entrance, provision of entry/exit lanes and upgrades to gates and cattle grids.
- ▶ Re-instating pre-existing conditions after temporary modifications, if required.
- ▶ Providing a 24hr telephone contact during construction to enable any issue or concern to be rapidly identified and addressed.
- ▶ Prepare a road dilapidation report (or similar as agreed with the councils) prior to the commencement of construction and following completion of construction to determine any damage attributable to the project. Any damage caused by the wind farm construction would be repaired by the Proponent unless otherwise agreed with the Council.
- ▶ Agreed road upgrades and control measures will be implemented on the specific roads prior to substantial construction activities and traffic commences on the respective roads.
- ▶ Should deterioration of roads occur during construction activities, an inspection and maintenance program would be established, if required by the council.
- ▶ Implementation of appropriate erosion and sediment control measures for new access tracks within the site.
- ▶ Implementation of appropriate dust control measures for unsealed tracks within the site.

8 Conclusion

The operational phase of the wind farm will require low levels of vehicle access to the site via local roads and will have correspondingly little impact on local traffic.

During the construction phase there is potential for temporary impacts on the local traffic. The construction phase is expected to last for 18 – 24 months. In particular the delivery of the over-mass and oversize wind turbine equipment components may at times affect the flow of local traffic. Traffic management procedures will be implemented to ensure that the impacts of the oversize vehicles are minimised and safety and protection measures will be implemented to reduce the risks of accidents to an acceptable level.

The proposed access routes to site and proposed road upgrades as agreed with the councils and to be implemented prior to substantial construction traffic together with the mitigation measures proposed in this report will minimise the impact of traffic impacts during the construction phase and ensure that the road network can be maintained to a satisfactory standard. Considering the high quality of the access roads to the site and the mitigation proposed, likely traffic impacts are considered acceptable and manageable.

A Traffic Management Plan developed and implemented in consultation with the RMS and the councils will ensure that any traffic and transport issues arising as a result of the project are appropriately addressed and have minimal impact on the local community and the local environment.



9 References

RTA (2006) "*Annual Average Daily Traffic data.*" Roads and Traffic Authority. Retrieved July, 2012, from http://www.rta.nsw.gov.au/trafficinformation/downloads/aadtdata_dl1.html

RTA (2010) "*Road Traffic Crashes in New South Wales - Statistical Statement for the year ended 31 December 2010.*" Roads and Traffic Authority. Retrieved July, 2012, from <http://www.rta.nsw.gov.au/roadsafety/downloads/crashstats2010.pdf>

Appendix 1 – Preliminary drainage structure inspection & assessment



RYE PARK WIND FARM

TRANSPORT ROUTE - PRELIMINARY DRAINAGE STRUCTURE INSPECTION & ASSESSMENT

Located within

Boorowa Council, Upper Lachlin Shire Council and
Yass Valley Council

For



*Document Reference
16-007 - R01*

February 2016



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Prepared By	Mitchell Lowry
Released By	Nick Canto
Date	02.02.2016
Job Number	16-007
Document Name	16-007-R01
Version	A
Status	For Review

Approved by:

Nick Canto
5th February 2016



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1 INTRODUCTION

The Rye Park Wind Farm is a Utility Scale Energy Project for the capturing of wind resource from an area of private land measuring a length of approximately 45 km (north to south) and a variable width of approximately two (2) to three (3) km (east to west).

The development area is located just north of Yass and occupies portions of Boorowa Council, Upper Lachlin Shire Council and Yass Valley Council areas. There are 27 separate landowners that have entered into lease agreements with Trustpower, for the development and operation of the proposed facilities.

An Environmental Assessment (EA) for this project was prepared by Epuron in January of 2014. This was reviewed and approved for exhibition by the NSW government in March of 2014. Appendix E of the EA contained a Traffic and Transport Assessment completed by Epuron in April of 2013. Siemens was also commissioned to provide a Route Survey for the over-mass and over-dimensioned vehicles travelling from Port Kembla to the site area. This Survey, dated June of 2014, identified three possible routes and determined the areas that would require modifications to the existing roads to accommodate the required turning radii.

Trustpower has commissioned ZEM Energy to assist in furthering the traffic and transport assessment efforts in support of the Development Application process. Initially, the task assignment is to undertake;

1. intersection manouvering analysis for the over length vehicles and,
2. visual condition assessment of some bridge, culvert and causeway structures.

ZEM Energy engaged icubed consulting to carry out the the structural engineer assessment as per point 2 above ad produce this report. As a part of this assessment, an inspection of the local council roads was completed by representatives from icubed and ZEM Energy on 14th January 2016.

2 STRUCTURAL INSPECTION

2.1 Observations

There are a number of Creek crossings located on the transport route which are traversed by Bridge, Culvert and Causeway structures. A preliminary inspection was completed on the 14th of January 2016 to evaluate the condition of the structures and assess if further investigation or structural calculations are required as part of the Transport Route Assessment. Observations were made at creek crossings summarised in Table 2.1.

ID	Location	Type
S001	Rye Park Rugby Road 30m West of Maryvale Road	RCP Culvert
S002	Coolalie Road - 900m from Jerrawa	RC Causeway
S003	Coolalie Road - 2000m from Jerrawa	RC Causeway
S004	Culvert 4000m North from Blackney Creek Intersection	RC Box Culvert
S005	Rye Park Rugby Rd - 500m South of Maryvale Rd	RC Causeway
S006	Rye Park Rugby Rd - Culvert - 300m North Rye Park	Metal Pipe Culvert
S007	Rye Park Dalton Rd 7500m South of Rye Park	RC Causeway
S008	Rye Park Dalton Road - Blakney Creek South Rd	RC Causeway
S009	Rye Park Road - 950m West	RCP Culvert
S010	Rye Park Road - 3700m West – Bridge	RC Bridge
S011	Rye Park Dalton Road - Lagoon Creek North	RC Culvert
S012	Rye Park Rugby Rd Culvert 3500	RC Causeway
S013	Flakney Creek Culvert - 1500m East	Metal Pipe Culvert

Table 2.1 – Creek Crossing Structures

Field records and Observation Photographs for each of the inspected structures have been provided in Appendix C of this report.

Generally, concrete Causeway and Concrete Pipe Culverts that were inspected appear to be in fair condition for their age and the rural setting of the roads on which they service. It is apparent that from a structural perspective these roads are capable of supporting loads from road legal vehicles, with a moderate degree of periodic maintenance. This would include suitably proportioned Heavy Load Platforms depicted in Figure 2.2.

The Steel Pipe Culvert Located on Rye Park – Rugby Road, some 300m North of Rye Park is in Poor Condition. This structure comprises three large diameter multi plate metal pipes and we assume earth fill between the pipes and over their crown. The invert of the pipes has been fully corroded and there are signs of erosion of the pipe bedding material. There are a number of cracks in excess of 1cm in the concrete headwalls on either side.

The Reinforced Concrete Bridge Located on Rye Park Road, some 3700m West of Rye Park and near to the Intersection of Dirt Hole Creek Road is Labeled DMR 1934. The bridge appears to be of reinforced concrete construction, cast insitu with the deck and beams cast integrally. The Deck is approximately 6.15m wide, inside of Kerbs and is two spans, each approximately 7.4m. Each end abutment is integrated into a retaining wall, approximately 3.0m high and the central support comprises two hexagonal columns and rectangular headstock spanning between them.

The condition of the Deck and Beams appear in fair condition as do the visible sections of the end abutments, however signs of scour and undermining of the abutments was noted.

All faces of the central support columns show signs of vertical cracking in the lower 1.0 – 1.5m section of the columns, which is consistent with expansion of the reinforcement due to corrosion. This cracking is almost certainly diminishing the structural capacity of this structure. More detailed assessment of the original engineering drawings and the physical condition of this structure should be completed prior use of this structure for transportation of Wind Turbine Components. It is likely that the original bridge was designed to a HS20 design vehicle and would therefore require structural verification for the final agreed HLP configuration.

2.2 Recommendations

The brief for this study did not provide for a rigorous analysis of the structures only the opinion of an experienced Structural Engineer. Further detailed engineering analysis will be required on a number of structures due to either;

1. Geometric Constraints
2. Poor Condition or Major defects

Table 2.2 summarises recommendations for all structures inspected and the suggested timing of further assessment and works.

ID	Condition	Further Assessment / Type	Timing of Study	Probability of Upgrade
S001	Fair and Servicable	None	N/A	N/A
S002	Fair and Servicable	Yes - Type 1	Prior to HLP Traffic	Low - Temporary
S003	Poor and Servicable for LV's	Yes - Type 5	Prior to HLP Traffic	Very High
S004	Fair and Servicable	Yes - Type 2	Prior to HLP Traffic	Very Low
S005	Moderate and Servicable	Yes - Type 1	Prior to HLP Traffic	Low - Temporary
S006	Poor and Servicable	Yes - Type 4	Prior to HLP Traffic	Moderate
S007	Fair and Servicable	Yes - Type 1	Prior to HLP Traffic	Low - Temporary
S008	Fair and Servicable	Yes - Type 1	Prior to HLP Traffic	Low - Temporary
S009	Excellent and Servicable	None	N/A	N/A
S010	Poor and Servicable	Yes - Type 2, 3 & 4	Prior to HLP Traffic	Very High
S011	Fair and Servicable	None	N/A	N/A
S012	Poor and Servicable	Yes - Type 1	Prior to HLP Traffic	Low - Temporary
S013	Poor and Servicable	Yes - Type 5	Prior to HLP Traffic	Very High

Table 2.2 – Structure Recommendations

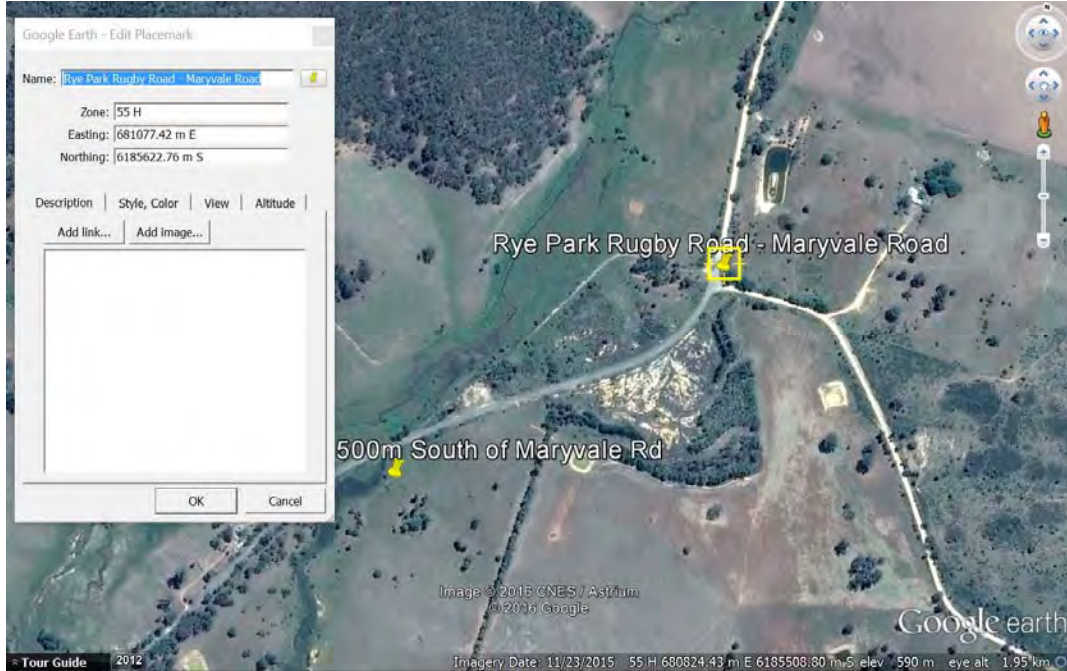
Detailed description of Further Assessment of Structures and potential upgrade options have been described below.

Type 1 - Geometry Check	Vertical Curve Checks to be completed and ensure that no alterations are required to flatten the existing Vertical Curve Radius. Also, some are likely to degrade in a relatively short period of time due to increased traffic and are likely to require some degree of maintenance, or in some cases, replacement of the concrete pavement. Temporary measures to reduce the VC such as CTB topping may be acceptable subject to approval of the local Authority.
Type 2 – Detailed Inspection	Due to access limitations, a further inspection and detailed measure of the structure is required.
Type 3 - Structural Calculations	More detailed assessment of the original engineering drawings and the physical condition of this structure should be completed prior use of this structure for transportation of Wind Turbine Components.
Type 4 - Insitu Strength Testing	Physical testing using non destructive methods such as Mod-Shock Vibration Analysis to assess structural capacity
Type 5 - Document upgrade	Some Structures are of an age an condition where physical works are required, without numerical of physical assessment.

Due to the type and nature of defects on structures S006 and S010, a potential upgrade solution is not possible without further analysis. Options may include measures such as shotcreting the invert of S006 – Metal Pipe Culverts, or Wrapping the Columns of S010 using Fibre Composite Materials. Without completing the more detailed assessments however, it is not possible to judge the extent of other un observed defects which could necessitate the complete removal and reinstatement of these structures.

3 APPENDIX A – CREEK CROSSING STRUCTURES

S001 - Rye Park Rugby Road 30m West of Maryvale Road Pipe Culvert – 3 x Dia 900 RCP, Fair Condition and Serviceable



S001 – Location Plan

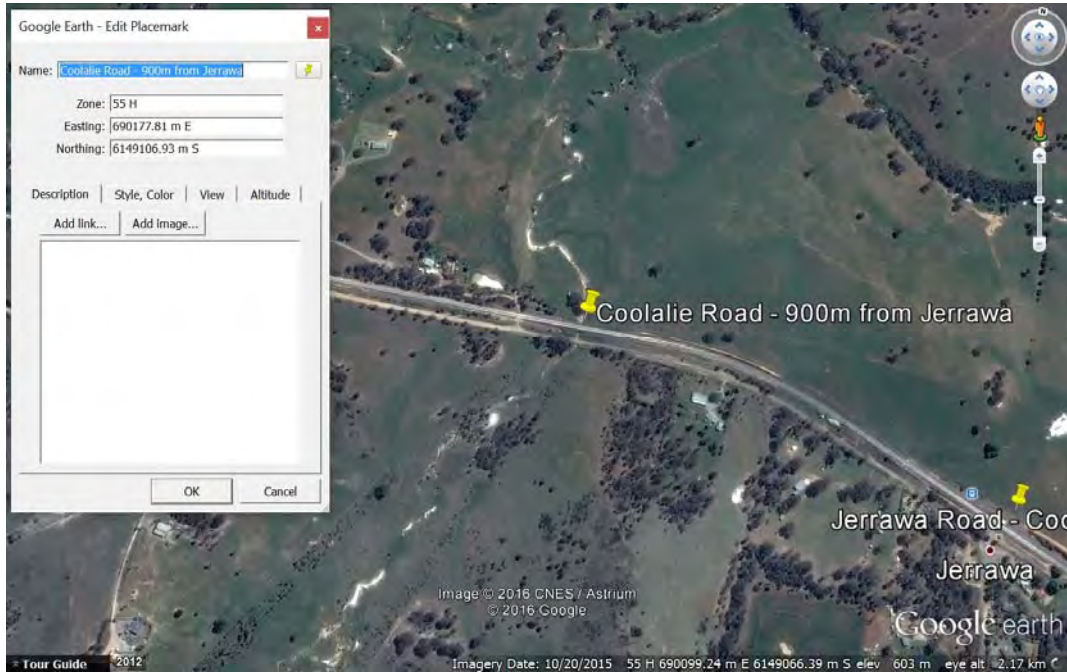


S001 – Pipe Culvert

S002 - Coolalie Road - 900m from Jerrawa

Concrete Causeway, Bitumen Seal, Dia 300 RCP Low Flow Pipe
Fair Condition and Serviceable.

Check Vertical geometry for HLP once transport requirements have been finalised.



S002 – Location Plan



S002 – Causeway, View to East



S002 – Causeway, View to West



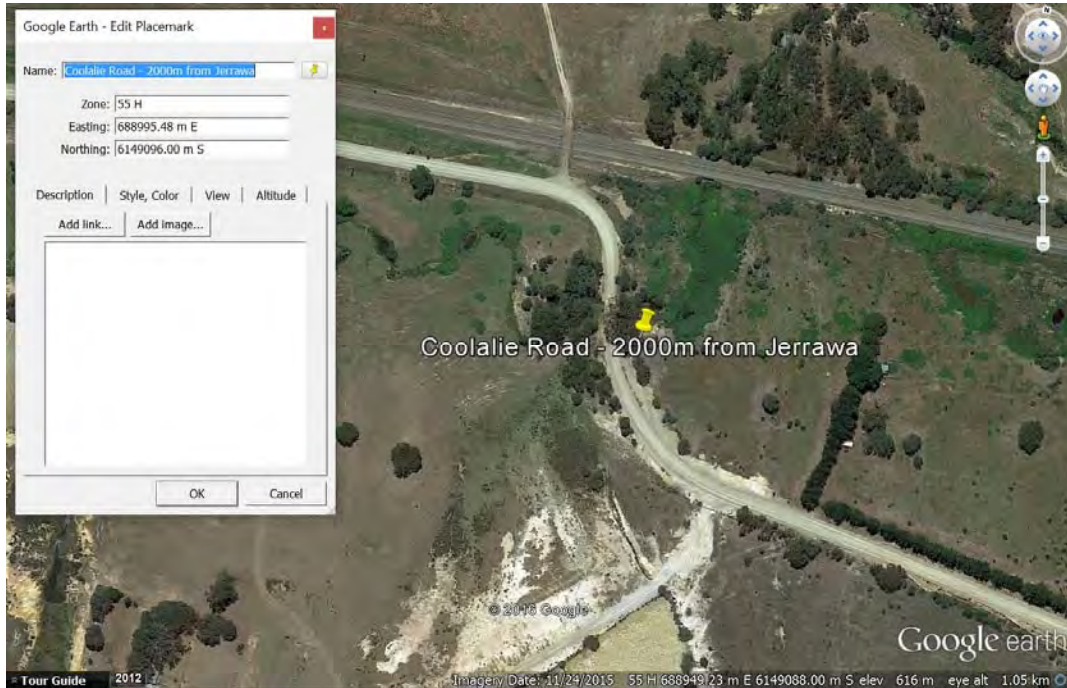
S002 – Causeway Low Flow Pipe

S003 - Coolalie Road - 2000m from Jerrawa

Concrete Causeway, Dia 300 RCP Low Flow Pipe

Poor Condition and Serviceable for Light Vehicles

Concrete Slab Failure over pipe requiring further assessment and likely replacement of pipe and partial reinstatement of concrete causeway slab.



S003 – Location Plan



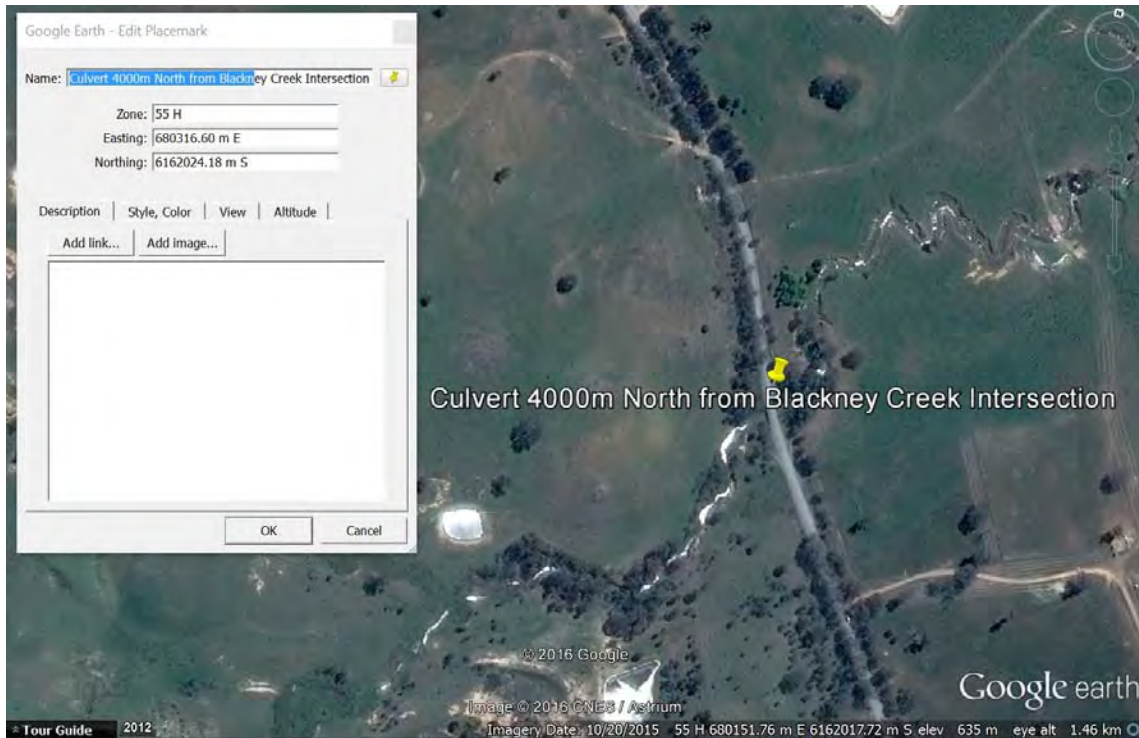
S003 – View from North



S003 - Causeway

S004 - Culvert 4000m North from Blackney Creek Intersection

Concrete Twin Box Culvert – Not able to inspect or measure due to drowned invert
Fair Condition and Serviceable, expected.
Further inspection required of Culvert internal condition



S004 – Location Plan



S004 – Culvert End View

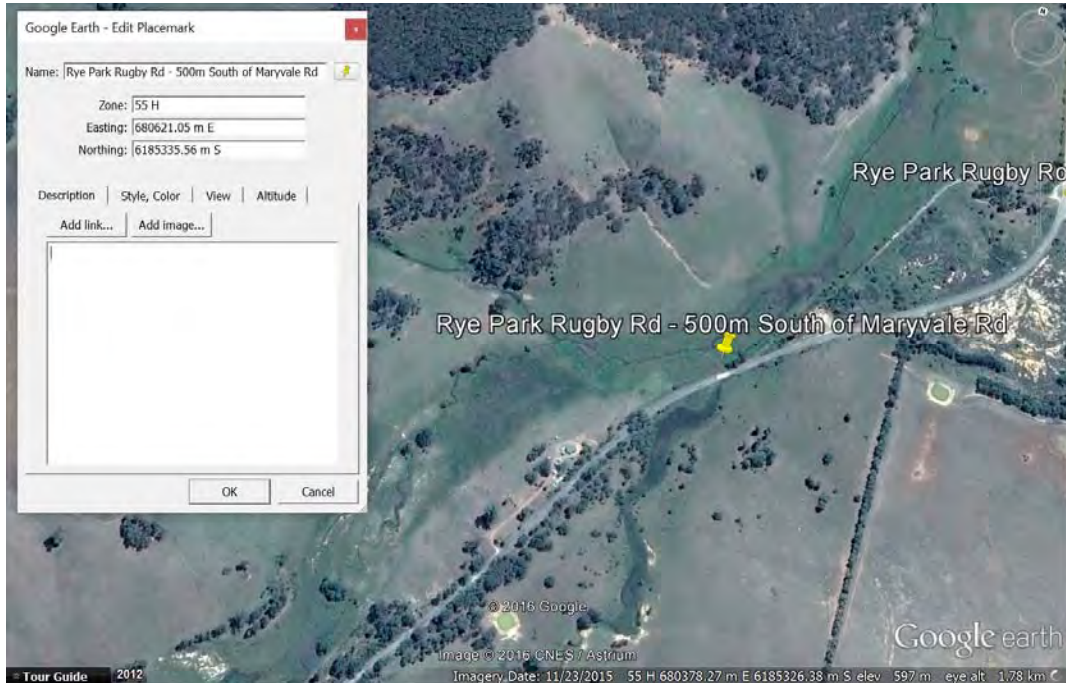
S005 - Rye Park Rugby Rd - 500m South of Maryvale Rd

Concrete Causeway, Dia 300 RCP Low Flow Pipe

Moderate Condition and Serviceable

Some Severe Concrete Cracking to Western End, Likely to carry loads, but may degrade over the course of the project and require repairs and / or reinstatement.

Vertical Geometry for HLP's to be verified by Survey.



S005 – Location Plan



S005 – View from West

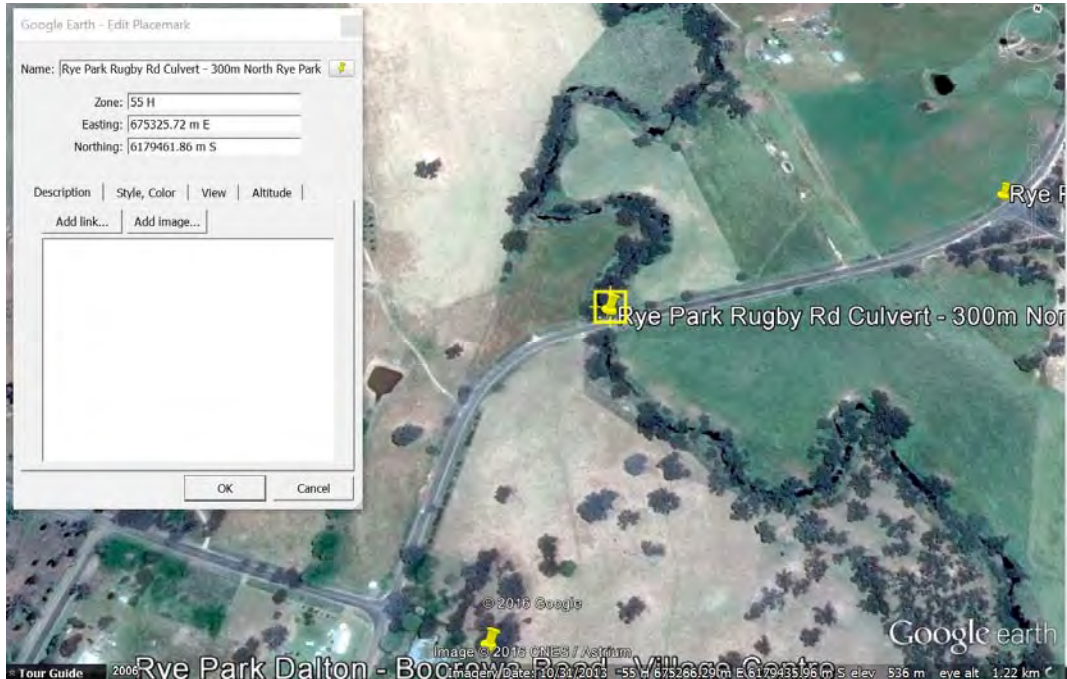
S006 - Rye Park Rugby Rd - Culvert - 300m North Rye Park

3 x Dia 3000 Multi Plate Metal Pipe Culverts, Concrete Headwalls, Assumed Earth Fill
Poor Condition and Serviceable

Some Severe Concrete Cracking to headwalls

Severe Corrosion to inverts of Culverts

Possibly able carry loads, but may degrade over the course of the project and require repairs
and / or reinstatement.



S006 – Location Plan



S006 – View from West

Level 2, 39 Sherwood Road
Toowong QLD 4066

mail@icubed.com.au
www.icubed.com.au

P: 07 3870 8888



S006 – Northern Headwall



S006 – View from North



S006 – Invert Condition - Typical



S006 – Internal View



S006 – View from North East



S006 – View from South West

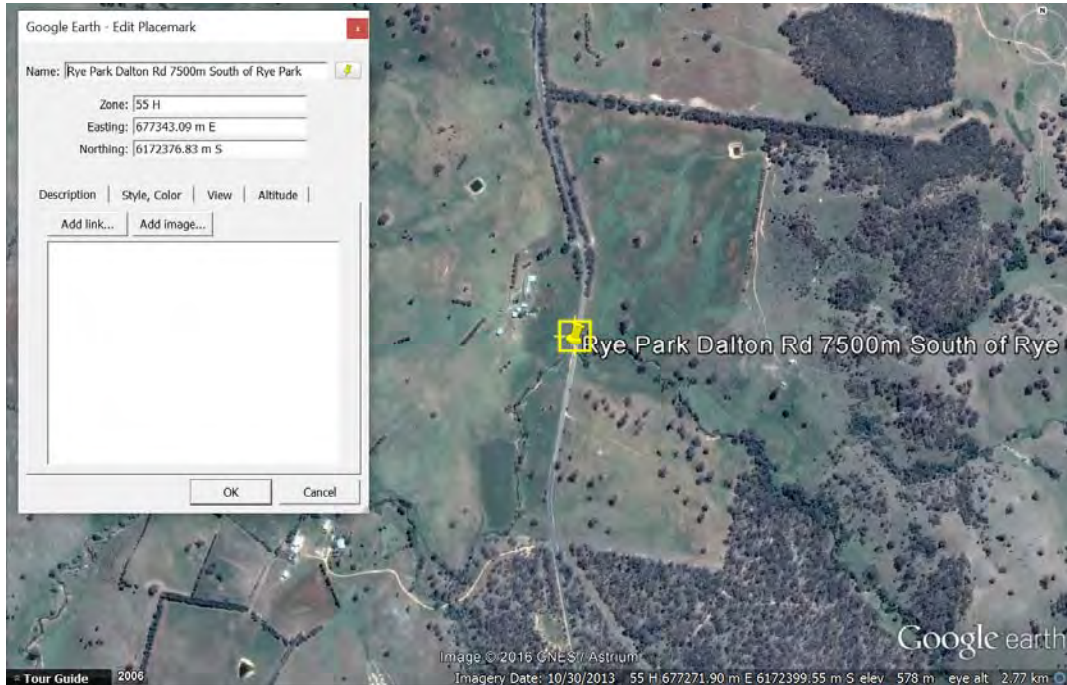
S007 - Rye Park Dalton Rd 7500m South of Rye Park

Concrete Causeway, Twin 1500 x 450 Low Flow Culverts

Fair Condition and Serviceable

Likely to carry loads, but may degrade over the course of the project and require repairs and / or reinstatement.

Vertical Geometry for HLP's to be verified by Survey.



S007 – Location Plan



S007 – View from South



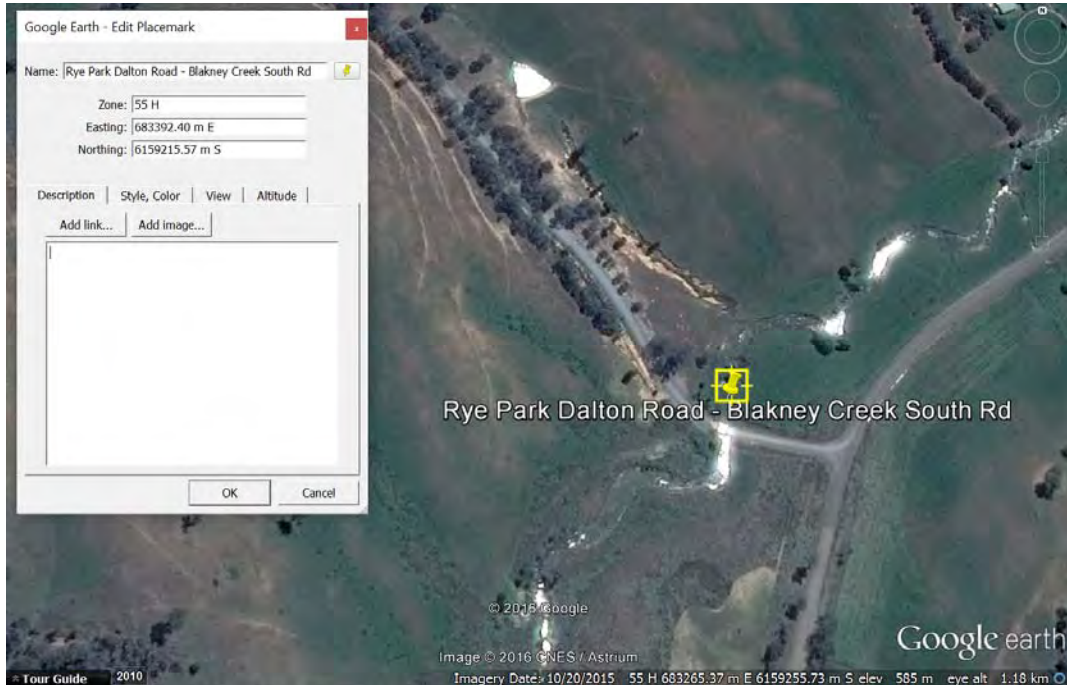
S007 – Low Flow Culverts

S008 - Rye Park Dalton Road - Blakney Creek South Rd

Concrete Causeway, Dia 300 Low Flow Pipe – Drowned Outlet
Fair Condition and Serviceable

Likely to carry loads, but may degrade over the course of the project and require repairs and / or reinstatement.

Vertical Geometry for HLP's to be verified by Survey.

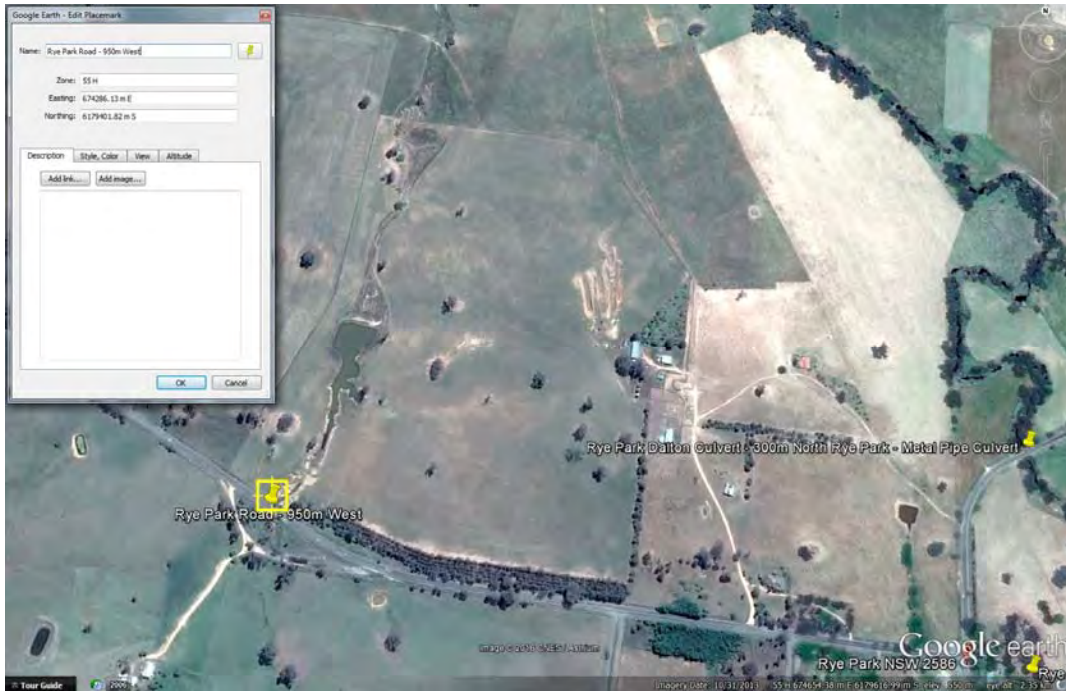


S008 – Location Plan



S008 – View from South

S009 - Rye Park Road - 950m West
Twin Dia 1500 RCP Culvert
Excellent Condition and Serviceable



S009 – Location Plan



S009 – View from West

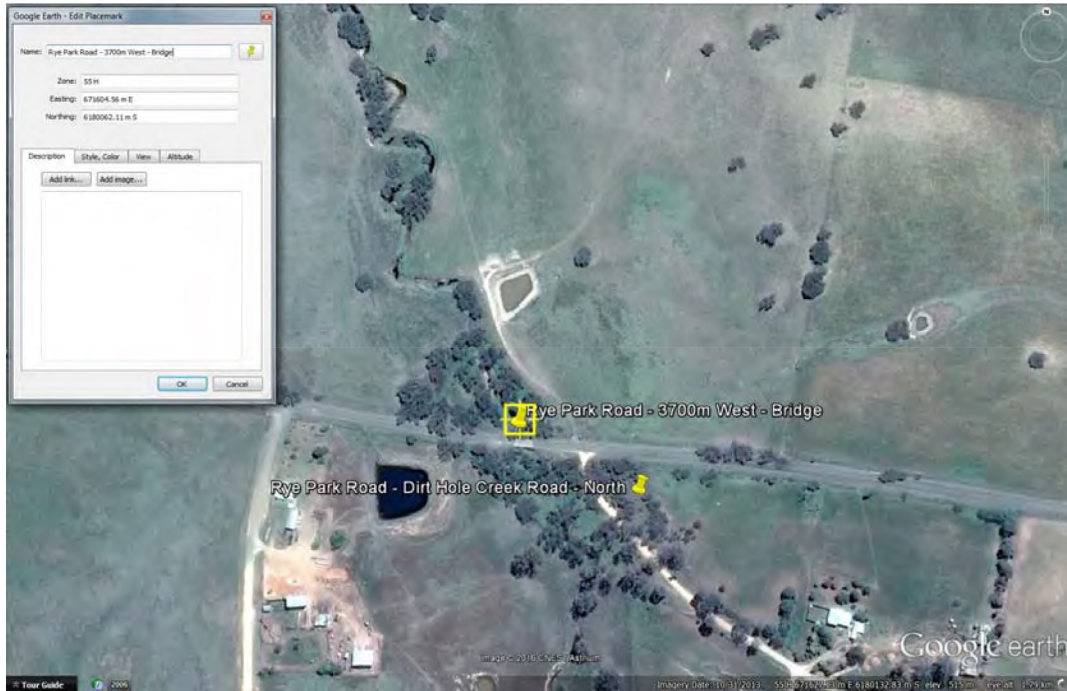


S009 – View from North – West

S010 - Rye Park Road - 3700m West – Bridge

Reinforced concrete bridge labeled DMR 1934, cast insitu with the deck and beams cast integrally. The Deck is approximately 6.15m wide, inside of Kerbs and is two spans, each approximately 7.4m. Each end abutment is integrated into a retaining wall, approximately 3.0m high and the central support comprises two hexagonal columns and rectangular headstock spanning between them. Refer Body of report for further comments.

Poor Condition and Servicable for Light Vehicles.



S010 – Location Plan



S010 – View from South



S010 – Bridge Label



S010 – Bridge Soffit View



S010 – Bridge Column, Vertical Cracking, Typical each face and both Columns



S010 – Southern Abutment

S011 - Rye Park Dalton Road - Lagoon Creek North

Single Dia 750 RCP Culvert

Good Condition and Serviceable, May require extension due to intersection upgrade



S011 – Location Plan

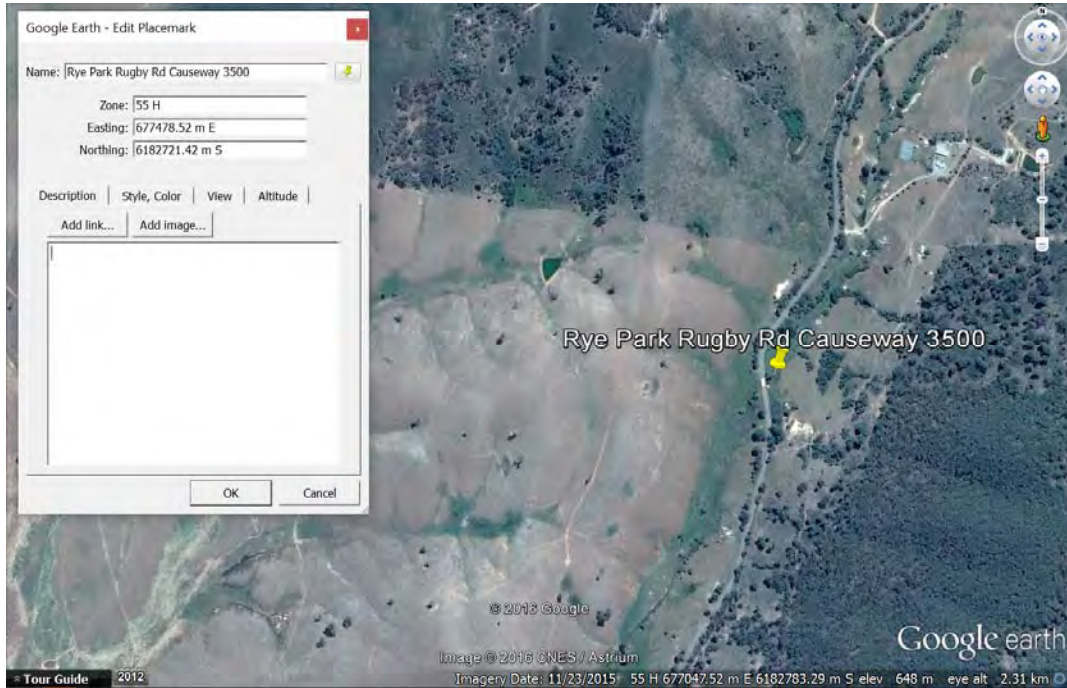


S011 – Dia 750 RCP

S012 - Rye Park Rugby Rd Culvert 3500

Concrete Causeway, Dia 300 RCP Low Flow Pipe
Poor Condition and Serviceable

Some Severe Concrete Cracking, Likely to carry loads, but very likely degrade over the course of the project and require repairs and / or reinstatement.
Vertical Geometry for HLP's to be verified by Survey.



S012 – Location Plan



S012 – View from South



S012 – View to South

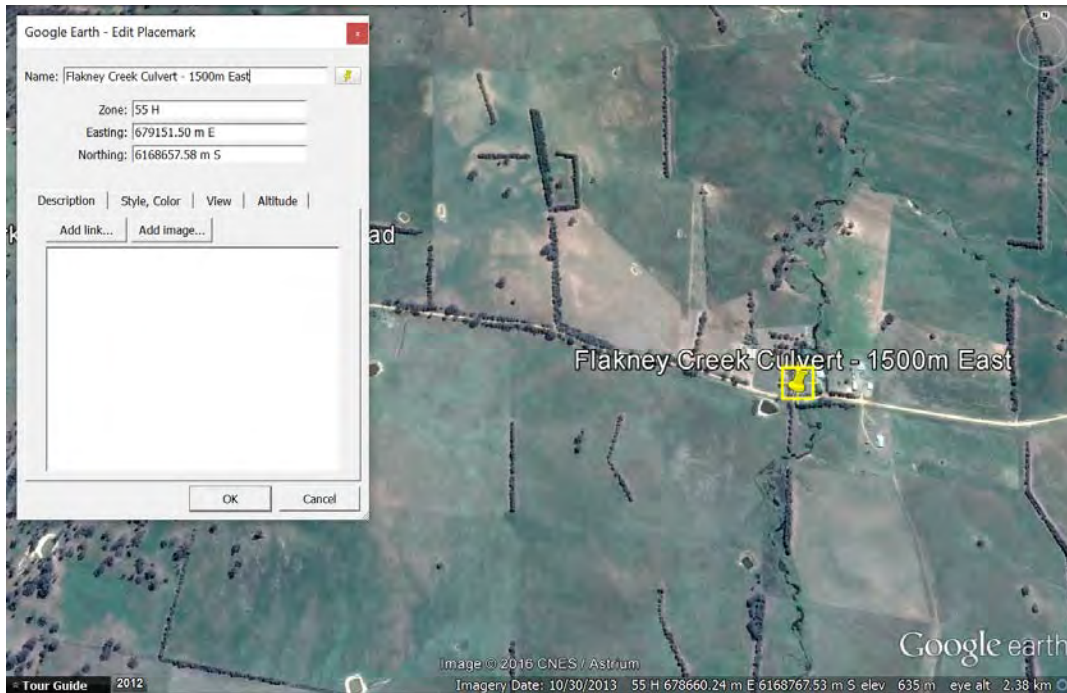


S012 – View to North

S013 - Flakney Creek Culvert - 1500m East

Dia 450 Recycled Steel Culvert
Poor Condition and Serviceable

Understood that this formation has been reinstated, following a severe washout of the road formation. This culvert and road formation will require complete re-construction, with appropriately sized culverts for the upstream catchment and protected against scour for overtopping events.



S013 – Location Plan



S013 – View from West
Level 2, 39 Sherwood Road
Toowong QLD 4066

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S013 – View from North

Appendix 2 – Swept path analysis of key intersections

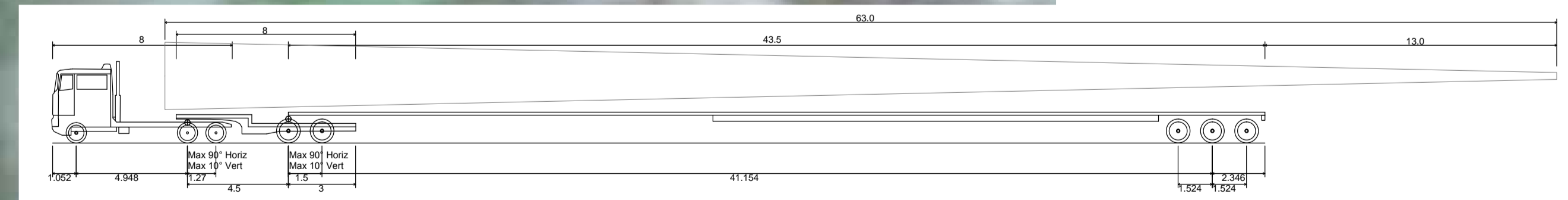




LEGEND

- PP POWER POLE
- SI STREET SIGN
- - - - EDGE OF ROAD
- TRUCK PATH
- BLADE OVERHANG
- CULVERT
- FENCE
- LOW LYING POWER LINES

NOTE:
LOCATIONS OF ROADS, ROAD FURNITURE, FENCES
AND BUILDINGS IS BASED ON AERIAL PHOTOGRAPHY
AND SITE VISITS.



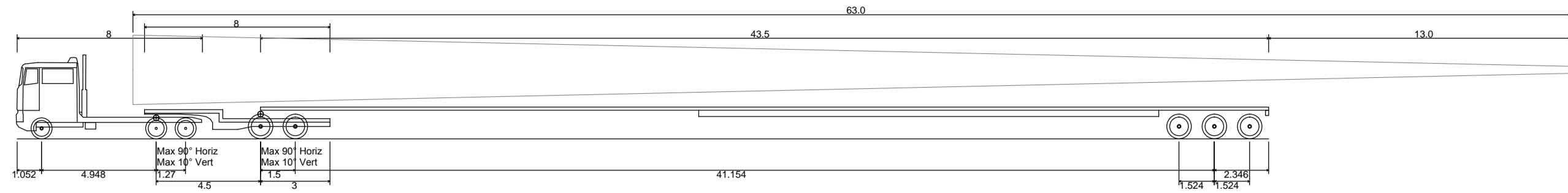
16-007-Blade Truck and Trailer (With Dolly)	
Overall Length	54.000m
Overall Width	3.048m
Overall Body Height	3.625m
Min Body Ground Clearance	0.348m
Max Track Width	3.048m
Lock-to-lock time	6.00s
Max Steering Angle (Virtual)	30.00°

BOOROWA ROAD/ YASS STREET INTERSECTION

SCALE 1:250

BLADE TRUCK AND TRAILER PROFILE

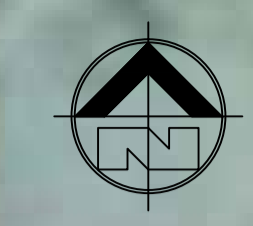
NTS



16-007-Blade Truck and Trailer (With Dolly)
 Overall Length 54.000m
 Overall Width 3.048m
 Overall Body Height 3.628m
 Min Body Ground Clearance 0.348m
 Max Track Width 3.048m
 Lock-to-lock time 6.00s
 Max Steering Angle (Virtual) 30.00°

BLADE TRUCK AND TRAILER PROFILE

NTS



LEGEND

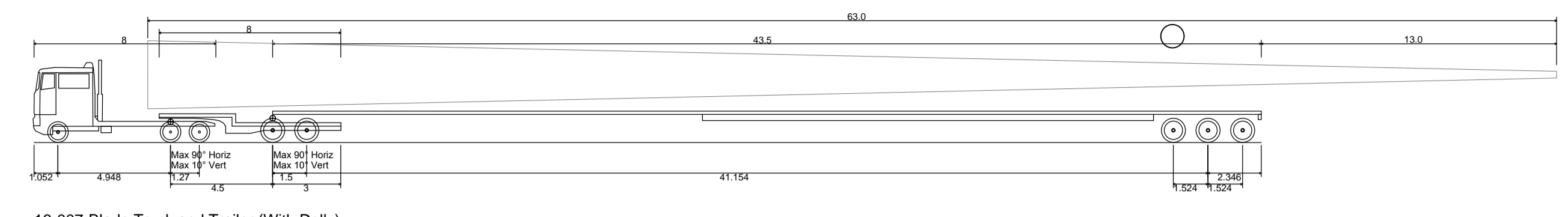
- PP POWER POLE
- SI STREET SIGN
- - - - EDGE OF ROAD
- TRUCK PATH
- BLADE OVERHANG
- CULVERT
- FENCE
- LOW LYING POWER LINES

NOTE:
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RYE PARK-RUGBY/ RYE PARK-CEMETERY ROAD INTERSECTION

SCALE 1:250



16-007-Blade Truck and Trailer (With Dolly)
 Overall Length 54.000m
 Overall Body Height 3.628m
 Min Body Ground Clearance 0.348m
 Max Track Width 3.048m
 Lock-to-lock time 6.00s
 Max Steering Angle (Virtual) 30.00°

BLADE TRUCK AND TRAILER PROFILE

NTS

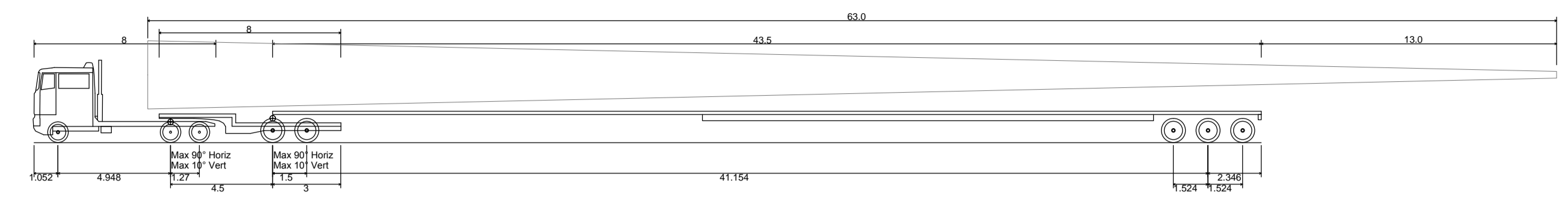
LEGEND

- PP POWER POLE
- SI STREET SIGN
- - - - - EDGE OF ROAD
- TRUCK PATH
- BLADE OVERHANG
- CULVERT
- FENCE
- LOW LYING POWER LINES

NOTE:
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BOOROWA/ DIRT HOLE CREEK ROAD INTERSECTION

SCALE 1:250



16-007-Blade Truck and Trailer (With Dolly)	
Overall Length	54.000m
Overall Body Height	3.048m
Overall Body Width	3.628m
Min Body Ground Clearance	0.348m
Max Track Width	3.048m
Lock-to-lock time	6.00s
Max Steering Angle (Virtual)	30.00°

BLADE TRUCK AND TRAILER PROFILE

NTS

DIRT HOLE CREEK ROAD/ YASS STREET INTERSECTION

SCALE 1:250

LEGEND

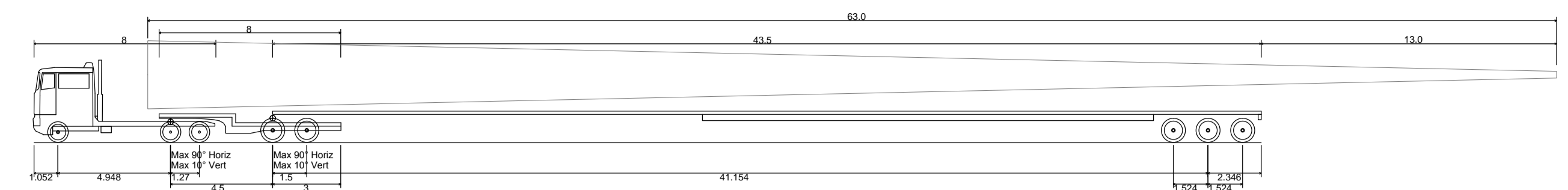
- PP POWER POLE
- SI STREET SIGN
- - - - EDGE OF ROAD
- TRUCK PATH
- BLADE OVERHANG
- CULVERT
- FENCE
- LOW LYING POWER LINES

NOTE:
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DIRT HOLE CREEK ROAD/ YASS STREET INTERSECTION

SCALE 1:250



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Overall Width	3.048m
Overall Body Height	3.628m
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Lock-to-lock time	6.00s
Max Steering Angle (Virtual)	30.00°

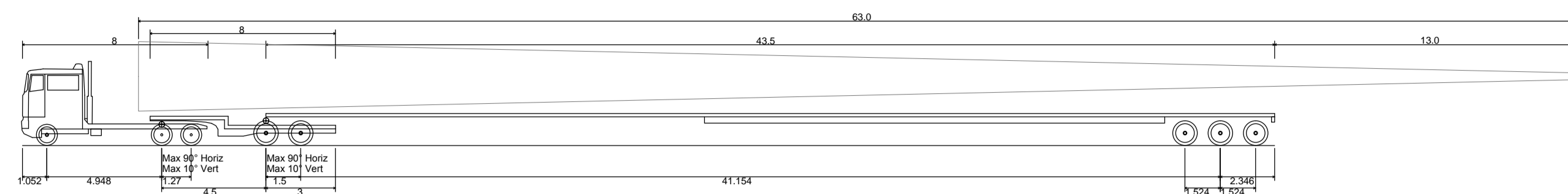
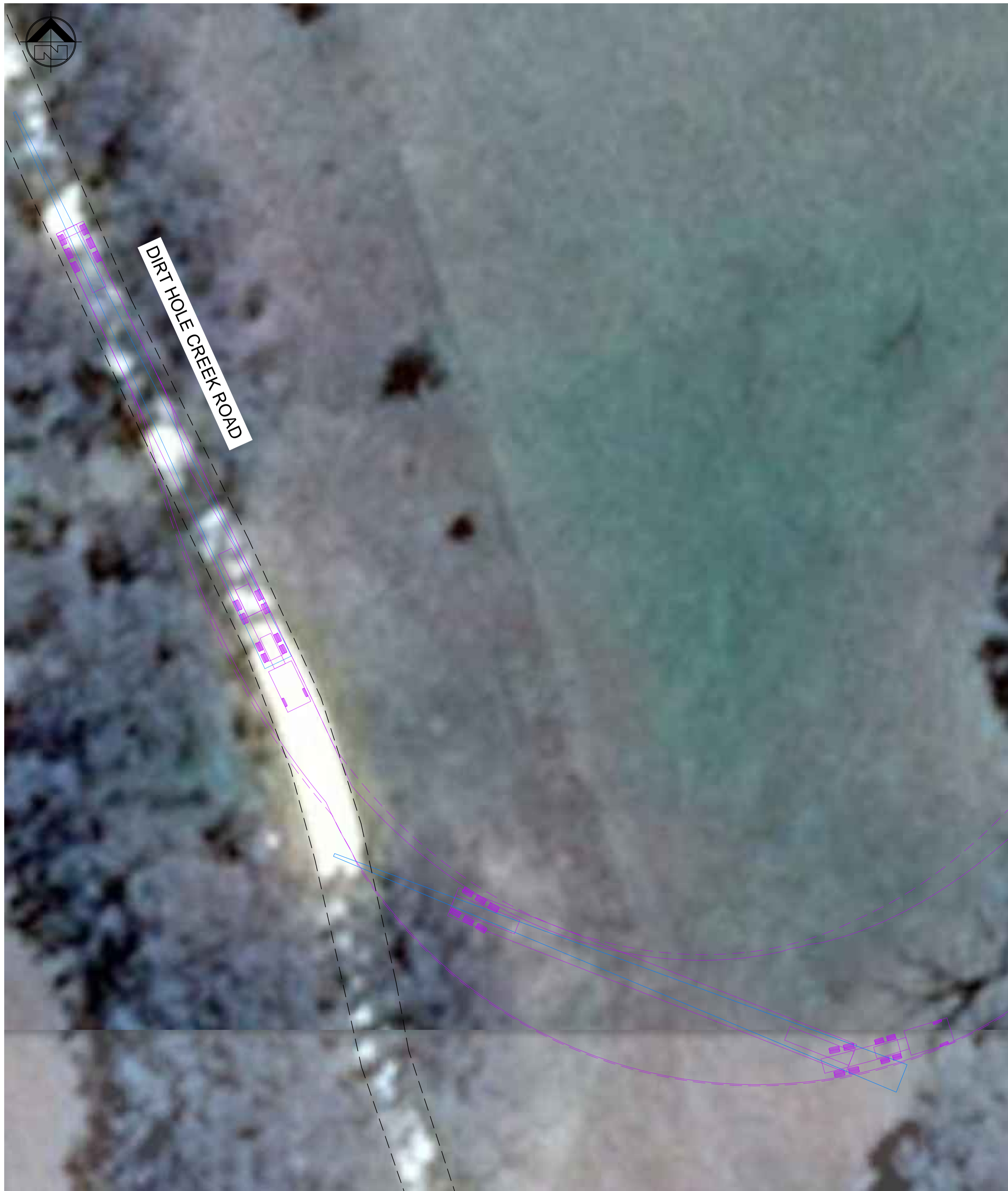
BLADE TRUCK AND TRAILER PROFILE

NTS

LEGEND

- PP POWER POLE
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- - - - - EDGE OF ROAD
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- FENCE
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BLADE TRUCK AND TRAILER PROFILE

NTS

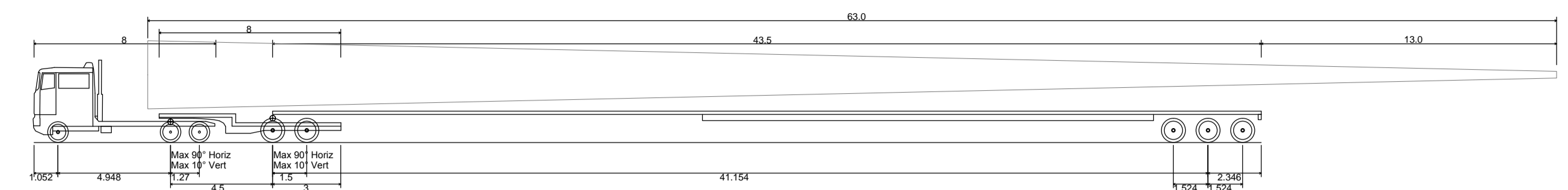
DIRT HOLE CREEK ROAD/ YASS STREET INTERSECTION

SCALE 1:250

LEGEND

- PP POWER POLE
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- TRUCK PATH
- BLADE OVERHANG
- CULVERT
- FENCE
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BLADE TRUCK AND TRAILER PROFILE

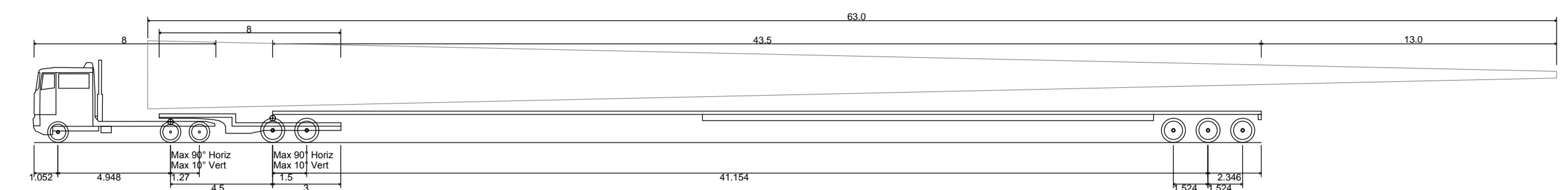
NTS

RYE PARK-DALTON/ RYE PARK-CEMETERY ROAD INTERSECTION

SCALE 1:250

- LEGEND**
- PP POWER POLE
 - SI STREET SIGN
 - - - - EDGE OF ROAD
 - TRUCK PATH
 - BLADE OVERHANG
 - CULVERT
 - FENCE
 - LOW LYING POWER LINES

NOTE:
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Overall Width	3.048m
Overall Body Height	3.628m
Min Body Ground Clearance	0.348m
Max Track Width	3.048m
Lock-to-lock time	6.00s
Max Steering Angle (Virtual)	30.00°

BLADE TRUCK AND TRAILER PROFILE

NTS

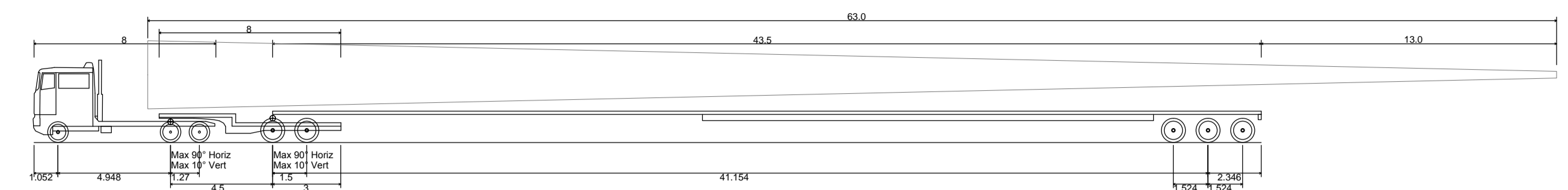
RYE PARK-CEMETARY/ LAGOON CREEK ROAD INTERSECTION

SCALE 1:250

LEGEND

- PP POWER POLE
- SI STREET SIGN
- - - - EDGE OF ROAD
- TRUCK PATH
- BLADE OVERHANG
- CULVERT
- FENCE
- LOW LYING POWER LINES

NOTE:
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AND SITE VISITS.



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Overall Width	3.048m
Overall Body Height	3.628m
Min Body Ground Clearance	0.348m
Max Track Width	3.048m
Lock-to-lock time	6.00s
Max Steering Angle (Virtual)	30.00°

BLADE TRUCK AND TRAILER PROFILE

NTS

LEGEND

- PP POWER POLE
- SI STREET SIGN
- - - - EDGE OF ROAD
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- BLADE OVERHANG
- CULVERT
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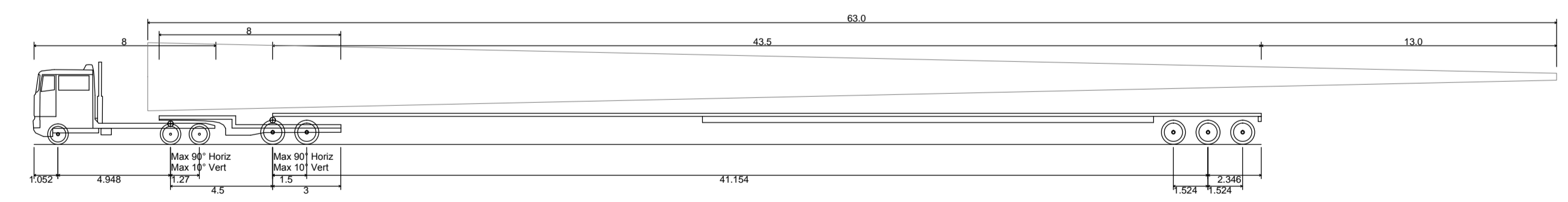
RYE PARK-DALTON/ FLAKNEY CREEK ROAD INTERSECTION

SCALE 1:250



RYE PARK-RUGBY/ MARYVALE ROAD INTERSECTION

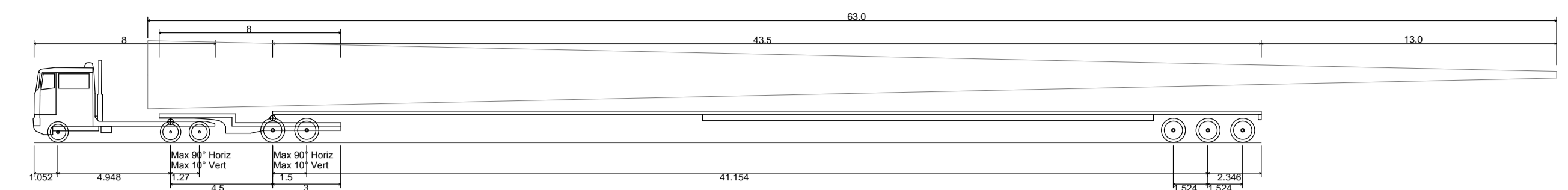
SCALE 1:250



16-007-Blade Truck and Trailer (With Dolly)	54.000m
Overall Length	3.048m
Overall Width	3.628m
Overall Body Height	0.348m
Min Body Ground Clearance	3.048m
Max Track Width	6.00s
Lock-to-lock time	30.00°
Max Steering Angle (Virtual)	

BLADE TRUCK AND TRAILER PROFILE

NTS



16-007-Blade Truck and Trailer (With Dolly)	
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BLADE TRUCK AND TRAILER PROFILE

NTS

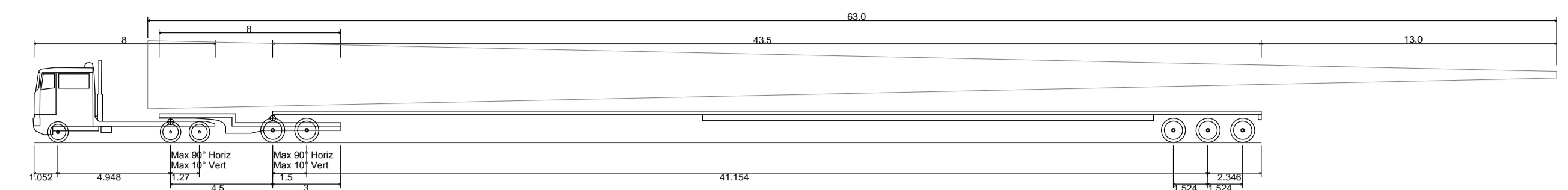
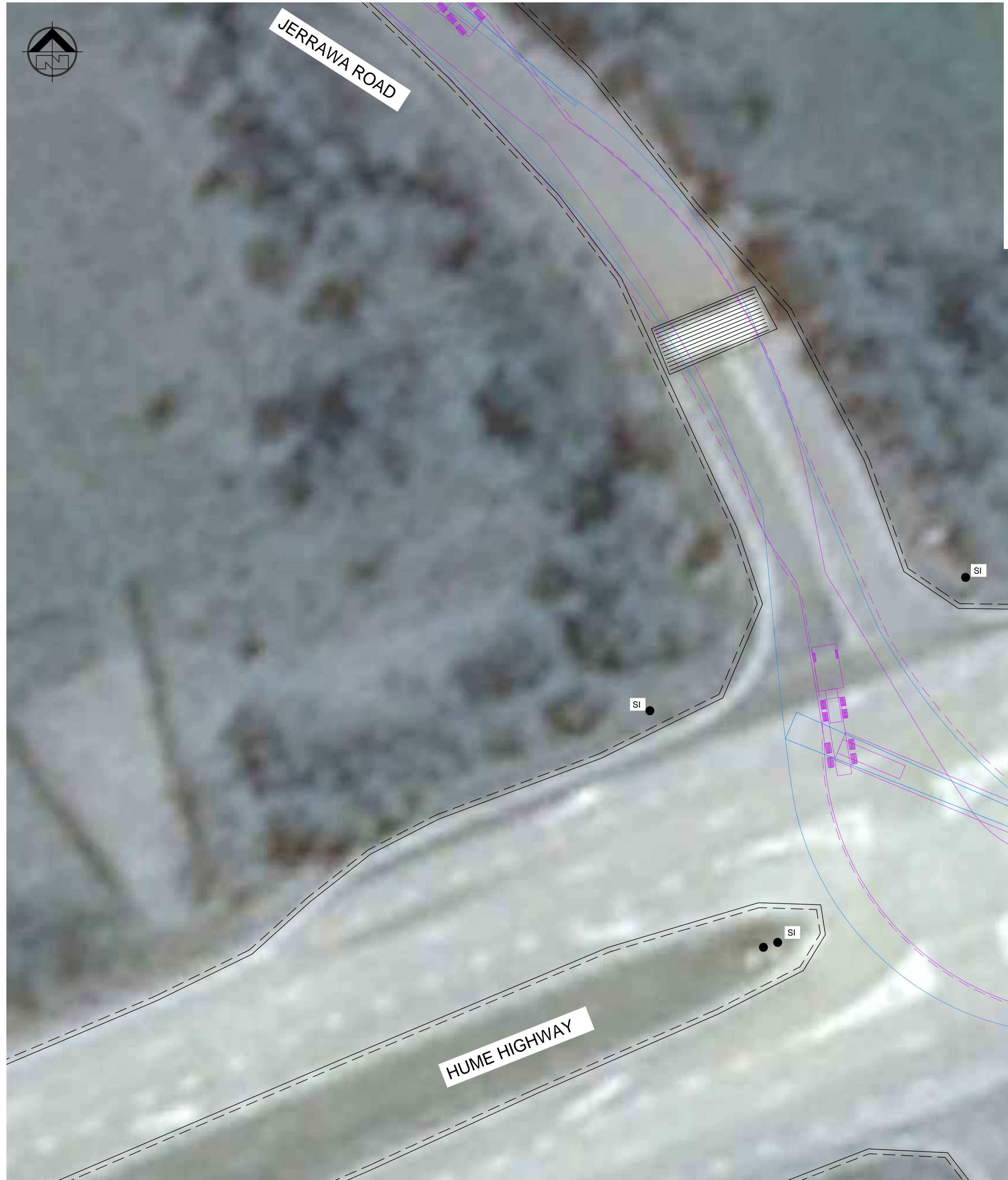
JERRAWA/ COOLALIE ROAD INTERSECTION

SCALE 1:250

LEGEND

- PP POWER POLE
- SI STREET SIGN
- - - - EDGE OF ROAD
- TRUCK PATH
- BLADE OVERHANG
- CULVERT
- FENCE
- LOW LYING POWER LINES

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16-007-Blade Truck and Trailer (With Dolly)

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Overall Body Height	3.628m
Min Body Ground Clearance	0.348m
Max Track Width	3.048m
Lock-to-lock time	6.00s
Max Steering Angle (Virtual)	30.00°

BLADE TRUCK AND TRAILER PROFILE

NTS

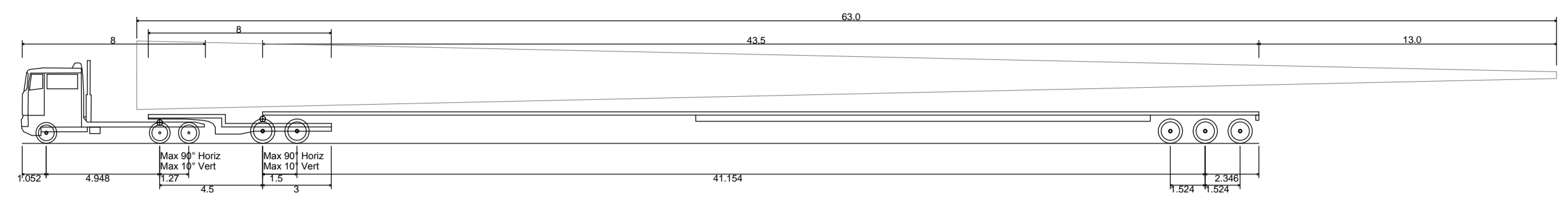
HUME HIGHWAY/ JERRAWA ROAD INTERSECTION

SCALE 1:250

LEGEND

- PP POWER POLE
- SI STREET SIGN
- - - - - EDGE OF ROAD
- TRUCK PATH
- BLADE OVERHANG
- CULVERT
- FENCE
- LOW LYING POWER LINES

NOTE:
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Overall Width	3.048m
Overall Body Height	3.628m
Min Body Ground Clearance	0.348m
Max Track Width	3.048m
Lock-to-lock time	6.00s
Max Steering Angle (Virtual)	30.00°

BLADE TRUCK AND TRAILER PROFILE

NTS

RYE PARK CEMETERY ROAD

SCALE 1:250

LEGEND

- PP POWER POLE
- SI STREET SIGN
- - - - - EDGE OF ROAD
- TRUCK PATH
- BLADE OVERHANG
- CULVERT
- FENCE
- LOW LYING POWER LINES

NOTE:
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BLADE TRUCK AND TRAILER PROFILE

NTS

RYE PARK-CEMETERY ROAD

RYE PARK-CEMETERY ROAD

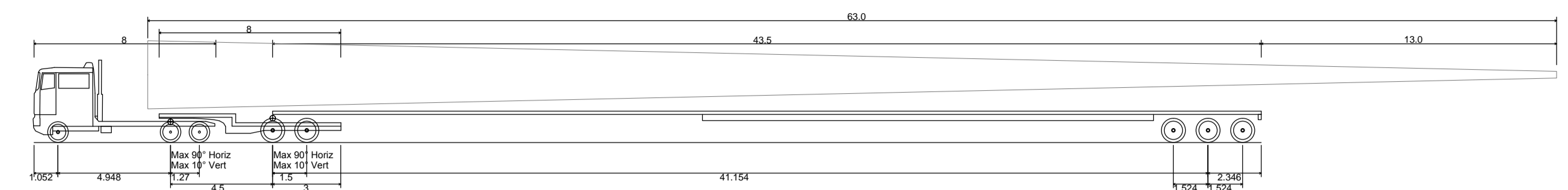
RYE PARK CEMETERY ROAD

SCALE 1:250

LEGEND

- PP POWER POLE
- SI STREET SIGN
- - - - EDGE OF ROAD
- TRUCK PATH
- BLADE OVERHANG
- CULVERT
- FENCE
- LOW LYING POWER LINES

NOTE:
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AND BUILDINGS IS BASED ON AERIAL PHOTOGRAPHY
AND SITE VISITS.



16-007-Blade Truck and Trailer (With Dolly)	
Overall Length	54.000m
Overall Width	3.048m
Overall Body Height	3.628m
Min Body Ground Clearance	0.348m
Max Track Width	3.048m
Lock-to-lock time	6.00s
Max Steering Angle (Virtual)	30.00°

BLADE TRUCK AND TRAILER PROFILE

NTS

RYE PARK CEMETERY ROAD

SCALE 1:500

LEGEND

- PP POWER POLE
- SI STREET SIGN
- - - - EDGE OF ROAD
- TRUCK PATH
- BLADE OVERHANG
- CULVERT
- FENCE
- LOW LYING POWER LINES

NOTE:
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AND BUILDINGS IS BASED ON AERIAL PHOTOGRAPHY
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