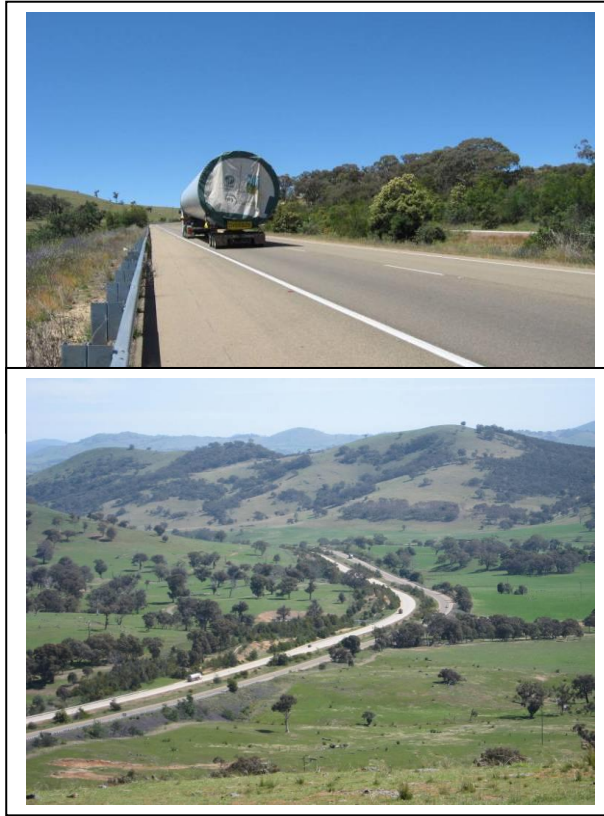


SUPPLEMENTARY TRAFFIC IMPACT STUDY



YASS VALLEY WIND FARM Coppabella and Marilba Precincts

Prepared for Yass Valley Wind Farm Pty Ltd
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1. Background

The original Traffic Impact Study was prepared by Bega Duo Designs in December 2008 and was included in Appendix 6 of the project Environmental Assessment (November 2009).

A Preferred Project Report which addressed submissions made to the EA was lodged in November 2013. The NSW Department of Planning and Infrastructure provided a number of comments in relation to traffic issues in January 2013 and again in September 2013. These comments (item 21 to 23) have been examined and the following opinions offered in support of the original conclusions reached and their relevance to the current proposal.

The current wind farm access proposal has been developed in consideration with the many of the issues raised in the original study with the result of significantly reducing traffic impacts at many locations. The number of access points has been reduced. Some road sections have been eliminated as being major access routes. The revisions are covered in section 3 of this report.

Prior to examining the proposed changes in detail it is necessary to review the principles adopted for the preparation of the original Traffic Impact Study.

2. Traffic Volumes, Level of Service & Impacts

2.1 General

Roads and Maritime Services (RMS) maintain a number of permanent traffic counters on its main road network which provide counts of annual average daily traffic (AADT). These counters have loop detectors inserted in the road pavement detecting volumes in both directions. There are a limited number of these counters and there is one station on the Hume Highway near Yass. Counts are taken at other non permanent stations over shorter time periods and adjusted with information obtained from permanent stations. There is a non permanent station near the study area on the Hume Highway at Bowning. The most recent data produced by RMS is dated 2006.

Counts on the other roads in the main roads network are carried out on an irregular basis as required by Road Planners and recent volumes are often not available. In rural areas where limited development has taken place it is common practice for planners to adopt and /or adjust traffic counts which may be 10 to 20 years old.

Short term counts (usually several weeks) are often carried out using pneumatic tube counters. The results of these counts need to be substantially adjusted with the seasonal data from permanent counters to provide reliable meaningful results.

2.2 Traffic Volumes Required for Assessment of Development Impacts

The road design guidelines for the design of roads and intersections are usually based on peak hourly volumes. Available guidelines for traffic generating developments are also based on peak hourly volumes. The Austroads design guidelines suggest that these volumes can be calculated as being 10 to 15 percent of the AADT. In the absence of reliable AADT volumes it is usual to obtain peak hourly volumes by observations at the site.

2.3 Precision of traffic count data

At road junctions the basic intersection layout (with no additional traffic lanes) will not require an upgrade until the through traffic approaching (in one direction) reaches approximately 100 vehicles per hour with 40 vehicles per hour turning. (ref. Austroads Guide to Traffic Engineering Practice Part 5 Intersections at grade Fig 6.41)

In practice, for the current wind farm project at Yass, these conditions would not be reached on the minor roads (all roads except for Hume Hwy and Burley Griffin Way) without a substantial increase (approx. 600%) in the existing traffic volumes included in the original report. Additional lanes are in place on all junctions to be used for major access on Hume Highway and Burley Griffin Way.

Traffic count data has also been used in the determination for the level of service provided by the roads in the study area. Section 4.7 of the original traffic study showed that an increase of at least 500 vehicles per day would be necessary to lower the level of service for any of the 2 or 4 lane roads.

2.4 Updated traffic volumes

The most recent traffic count data available for the South Western Region of the RMS is the 2006 data referred to in the original report. The estimated traffic volumes have been reviewed based on the latest available RMS records and the observations made during the original assessment. There are no changes in the estimated traffic volumes which have been shown in the table below. The accuracy of the adopted traffic counts on the minor roads is not significant in the assessment of traffic impacts, given the very low existing traffic volumes.

Road	AADT (vehicles per day)	Information source
Hume Highway at Bowning	7223	Obtained from RMS records
Burley Griffin Way Stn 94.085	1661	Obtained from RMS records
Burrinjuck Road	114	Obtained from RMS records
Paynes Road	Less than 200	Adjusted from quarry production rates
Illalong Road	70	Adjusted from counts taken
Whitefields Road	Less than 30	Adjusted from counts taken and discussions with land owners

Observations on the minor roads revealed hourly counts approaching zero as the traffic on these roads is generated primarily by the occupied properties.

2.5 Level of Service on Access Roads.

As indicated in the original report with an increase of 250 vehicles per day the level of service would remain at level A or B for all roads other than the roads that are basically single lane (e.g. Whitefields Road). It is proposed that any sections of single lane to be used for access would be upgraded to two lane.

2.6 Capacity and Safety at Intersections

With reference to the traffic volumes discussed in section 2.3 Precision of traffic count data, delay times at the intersections for turning vehicles at all of the junctions on the minor roads will remain acceptable without additional turn lanes based on the projected traffic volumes. (ref. Austroads Guide to Traffic Engineering Practice Part 5 Intersections at grade Sec. 6.8)

The major access intersections on the minor roads generally have an insufficient turning radius to accommodate the turning movements for RAVs (Restricted Access Vehicles) transporting turbine blades and will require upgrading. Preliminary field assessment of the swept paths at each junction in the study area was included in the original traffic study and a revised summary of the impacts is repeated in section 4 of this report. The full extents of the upgrading will be determined following the preparation of the Traffic Management Report.

The route for the transport of the major components from an Australian port has not been confirmed, but the components will enter the project area shown in Figure 01 via the Hume Highway from either direction. Transport of turbines and blades from Port Kembla has taken place for nearby wind farm projects at Cullerin and Bungendore. Tower sections have previously been transported from South Australia and Queensland. The determination of swept paths for junctions on likely routes outside the project area have not been carried out at this stage in the planning.

2.7 Bus Routes and School Zones

School bus routes are in place along Hume Highway, Burley Griffin Way and Burrinjuck Road. There are no school zones along the roads proposed for primary and secondary access.

The traffic management plan should consider the timing of oversize deliveries in relation to school bus schedules.

2.8 Road accident Data

Detailed road accident data has been requested from RMS for all of the roads in the project area. This information will require analysis to link any trends to the individual roads in the study area.

Statistical information is published annually ("Road traffic crashes in New South Wales 2011") and the most recent year available is 2011. (Pages 54 & 59 are included in Appendix 1). The information is based on Local Government Areas and Major Roads

Table 25 indicates that there were no fatal accidents on Hume Highway in Yass Valley Council and one fatality in Harden Shire. There were no other fatalities in Harden Shire and one in Yass Valley. The examination of previous years yields similar results.

With a relatively small sample group of accidents it is unlikely that detailed examination of the road accident data will reveal any accident groups which can be related to particular features in the study area.

3. Revised Wind Farm Layout

The revised wind farm layout is shown in Figure 1 on the following page.

Changes to the layout as included in the previous Traffic Study affecting traffic impacts are:

- Elimination of the turbine cluster at Carrolls Ridge.
- Elimination of the group of turbines requiring access from Berramangra Rd in the Coppabella Precinct.
- The adoption of four primary access points serving four groups of turbines.
- Adoption of an access point on Whitefields Road approximately 1 km from Hume Highway.
- Access along a route from the end of Paynes Road to be constructed as part of the Conroys Gap wind farm.
- Replacement of a timber bridge on Illalong Road at 3.13 km by Yass Valley Council.
- Refinement of the substation and power line locations.
- Inclusion of four secondary access points

The implications of these changes in respect to the Traffic Impacts discussed in the original Traffic Impact Study are discussed below:

Carrolls Ridge & Burrinjuck Road

The elimination of Carrolls Ridge Cluster will significantly reduce the construction traffic on Burrinjuck Road.

Coppabella Precinct

A number of turbines on the western extremity of the Coppabella precinct have been eliminated and access from Berremangra Road is not required. All access to the 87 turbines and a substation will be from Whitefields Road. The access point on Whitefields is closer to Hume Highway and will require a relatively short length of construction with minimal environmental impacts.

Primary Access Points

The four primary access points are all located on roads included in the original Traffic Impact Study and their location is shown on Figure 1.

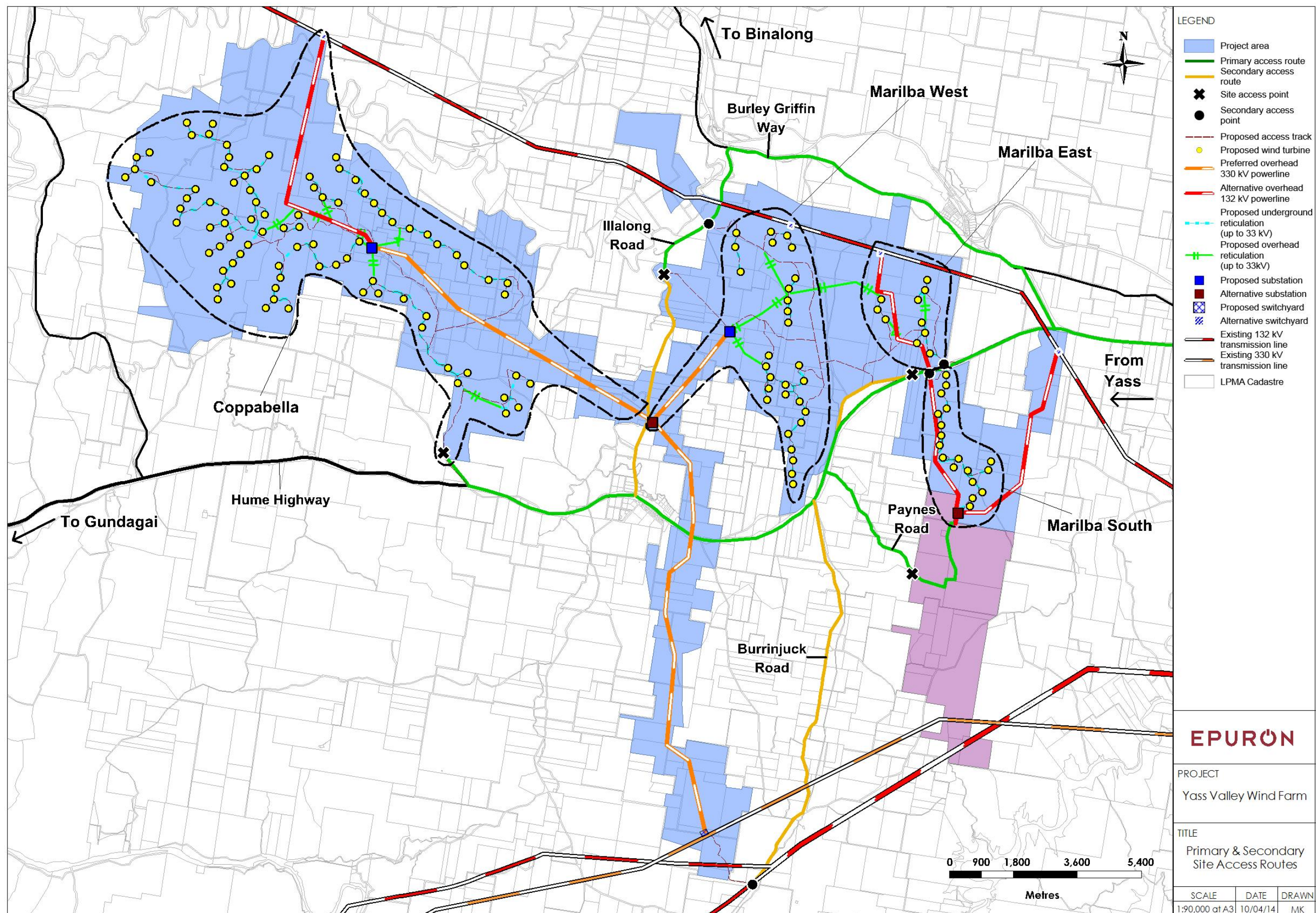


Figure 1– Primary & Secondary Site Access Routes

Paynes Road Primary Access

Paynes Road is currently bitumen sealed to the quarry access road at 1.3 km. It is proposed to reconstruct the remaining 2.7 km for access to the proposed Conroys Gap wind farm. The construction of the Conroys Gap wind farm is planned to precede construction of Yass Valley wind farm. Access will be provided to 18 turbines in the Southern Marilba group from the reconstructed Paynes Road. This access will eliminate the need for a primary access point to the south near the truck rest area at Conroys Gap.

Illalong Road Primary Access

A primary access point is proposed at approximately 4.5 km from Burley Griffin Way to provide access to 29 turbines and a substation in the Marilba West group. Access for light traffic may be provided at a secondary access point at approximately 2.4 km.

A ten tonne load limit is posted on Illalong Road to discourage heavy vehicles from possibly damaging the road surface. The bridge at 3.32 km has been replaced. It is now proposed that all heavy traffic access the Marilba West group from the North via Burley Griffin Way.

Marilba Station Primary Access

Access to the 10 turbines labeled “Marilba East” on Figure 1 will be via Marilba Station access and will eliminate the requirement for a Primary Access point to the north from Conroys Gap truck rest area.

Whitefields Road

Access to the Coppabella group of turbines will be via the Hume Highway and Whitefields Road. The wind farm site access road will commence at a point approximately 1.1 km along Whitefields Road.

Power line location

The proposed 330kV power line will cross the Hume Highway at approximately 30 kilometres from Yass. It is not proposed to locate any poles in the road reserve and access for construction to the south will be from a secondary access point on Burrinjuck Road. Access for the northern section will be from Illalong Road. Detailed design for the power line crossing has not been completed yet.

Secondary access point Burrinjuck Road

Access from Burrinjuck Road via an existing farm access at approximately 11.0 km from Hume Highway for the construction of a 330kV switchyard for connection to the existing TransGrid 330kV transmission line as well as for construction of some sections of the new 330kV powerline will be required. Information on the expected traffic generation during construction is included in Section 4.0 of this report.

Secondary access points at Conroys Gap

Major access points from Hume Highway were proposed in the original traffic impact study at Conroys Gap. Access via existing access gates on each side of the highway would utilise the entry and exit lanes provided for the roadside truck stop area. RMS (Roads & Maritime Services) has opposed the use of these points for primary access.

It is proposed to utilize these access points for restricted temporary access for light vehicles only. The current access configuration would only permit entry and exit in a westerly direction for the access on the southern side of Hume Highway and an easterly direction for the access on the northern side.

Secondary access point at 2.4km on Illalong Road

This access point may be required for light vehicle access to some areas of the Marilba West site.

4. Revised Program of Works and Traffic Generation

Figure 2 shows a program of works with associated traffic generation rates for the various vehicle types. The vehicle numbers represent the number of trips per day. The return journey is included in order to produce vehicles per day on the road network.

In order to present the worst case scenario it has been assumed that premixed concrete will be delivered to site. It is intended where possible for concrete to be mixed on site. This will reduce the number of vehicles during the peak period of construction as deliveries of raw materials can be delivered over a longer time frame.

During the peak period of construction the “program of works” schedule indicates total of approximately 250 construction vehicles per day on the major access routes and approximately 30 vehicles per day on Burrinjuck Road. Distribution of this traffic throughout the project road network, (as shown in Figure 1) and its impacts are discussed in section 5.

5. Summary of Traffic Impacts & Required Works

General

This summary should be read in conjunction with the impacts and safeguards presented in section 5 of the original Traffic Impact Study.

Hume Highway (Excluding Junctions)

The addition of up to 250 vehicles per day including up to 10 slower moving restricted access vehicles with escorts will have a minimal impact on the 7000 vehicles traveling on Hume Highway.

No reconstruction appears to be warranted. Traffic control and signposting will be required during peak construction periods.

Hume Highway Junctions (Burley Griffin Way, Paynes Road, Illalong Road)

These junctions are constructed to a high standard and are unlikely to require any road widening work to accommodate the turning movements proposed for this project.

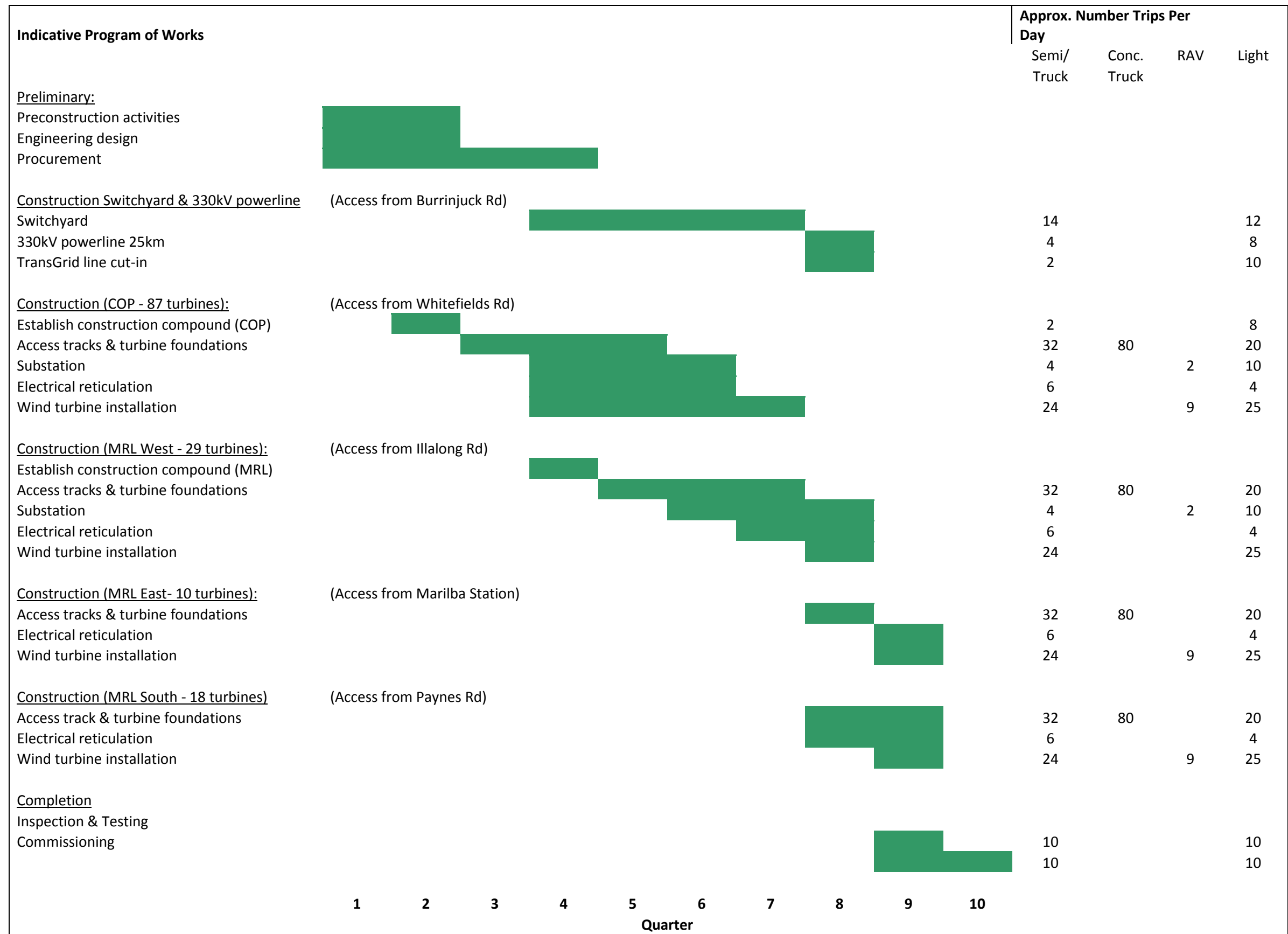


Figure 2 - Indicative Program of Works

Relocation of roadside furniture and minor clearing for sight distance may be required. Traffic control plans and signposting will be required as part of the traffic management plan for the oversize vehicles during peak construction periods.

Hume Highway Junctions (Conroys Gap Truck Stop Area)

These junctions on each side of the highway to be utilized as secondary access for light vehicles will require additional planning in conjunction with RMS. Potential vehicle conflicts would be minimised as the proposed access points could be located in the lower speed areas of the truck stop. Existing entry and exit lanes provide safe access to and from the Highway.

As each rest area has one way travel, drivers wishing to make a return journey would be required to make a “U” turn along the Hume Highway or return by another route. Safe turning areas along Hume Highway should be considered as part of the planning process.

It is anticipated that minimal construction will be required in the road reserve to provide safe access for light vehicles.

Hume Highway Junctions (Marilba Station access points)

Marilba Station has two access points which are described in section 3 of the original traffic study. The eastern junction with Hume Highway is considered to be the most suitable access point.

Detailed examination of vehicle paths is required to determine the extent of any road widening work to accommodate the turning movements proposed for this project. RMS approval to any work within the road reserve will be required. Relocation of roadside furniture and minor clearing for sight distance may be required in addition to minor pavement widening. Traffic control plans will be required as part of the traffic management plan for the oversize vehicles.

Hume Highway Junctions (Whitefields Road)

Detailed examination of vehicle paths is required to determine the extent of any road widening work to accommodate the turning movements proposed for this project. RMS approval to any work within the road reserve will be required. Relocation of roadside furniture and minor clearing for sight distance may be required in addition to minor pavement widening. Traffic control plans will be required as part of the traffic management plan for the oversize vehicles.

Burley Griffin Way and Junction with Illalong Road

This road and its junction with Illalong Road are constructed to a high standard and can be expected to provide an acceptable level of service with an increase of approximately 250 vehicles per day as indicated in section 4.7 of the original traffic impact study.

Illalong Road & Access Junctions

Illalong road will retain an acceptable level of service with an additional 250 vehicles per day. However, users will experience up to five times the amount of traffic during the peak construction period. The adjustments to be made by the local users to the

changed traffic conditions will need to be especially considered in the planning process especially in the traffic management plan.

The northern section of Illalong Road from Burley Griffin Way has been subject to recent pavement reconstruction works and the surface is in good condition. The two bridges to the south will not be crossed by heavy construction traffic.

While the alignment of Illalong Road is not of a high standard, it is not considered necessary to upgrade the alignment. Speed restrictions and/or advisory speed signs should be considered as part of the traffic management plan to be prepared.

Advance warning signs should be provided on the junctions as part of the traffic management plans. Monitoring of vehicle speeds should take place as part of the traffic management plan.

Plans should be prepared for the junctions at the two access points in consultation with Yass Valley Council. These junctions should be at least to the standard of the "BAR/BAL" treatment as described in. "Guide to Traffic Engineering Practice Part 5" by Austroads with safe intersection sight distance for a travel speed of 100km per hour on Illalong Road.

Whitefields Road

Whitefields Road requires reconstruction from the Hume Highway boundary as far as the proposed access point. Construction should provide for a minimum of 6.0m seal width and should be to a standard acceptable to Harden Shire Council

Paynes Road

As discussed previously in this report it is proposed to reconstruct Paynes Road to an improved two lane standard as part of the construction for the Conroys Gap Wind Farm.

It is assumed that additional improvements will not be necessary for the current project.

Burrinjuck Road and junction at approximately 11.0 km

Burrinjuck Road will experience an increase of up to 30 vehicles per day. This traffic is generated by the construction of the southern section of the power line and a 330kV switchyard at approximately 11.0 km from Hume Highway. No over mass or over dimensional vehicles will be required to access the site. This increase in traffic of approximately 20% will not have an impact on the level of service.

The pavement of Burrinjuck road is in poor condition at some locations. As the proposed construction will not generate a large number of heavy vehicles this damage should not be accelerated by the passage of construction vehicles.

Examination of vehicle paths for semi trailers and B-doubles is required to determine the extent of any road widening work to accommodate the turning movements proposed for this project. Yass Valley Council should be consulted for approval to any work within the road reserve. Relocation of roadside furniture and minor clearing for sight distance may be required in addition to minor pavement widening. Traffic control plans may be required as part of the traffic management plan.

6. About the Author

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Rodger has been involved in the survey, planning and design of road projects since commencing work with the Department of Main Roads NSW in 1966. Rodger gained knowledge in Traffic Engineering with the Roads and Traffic Authority Traffic Section in Sydney. Since opening his own business 'Bega Duo Designs' in 1993, Rodger has completed the planning of a wide variety of civil engineering and traffic engineering projects throughout NSW and ACT including Traffic Impact Studies for wind farms at Goulburn, Crookwell, Yass, Silverton, Nimmitabel & Glen Innes.

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Appendix 1 – Road Traffic Crash Statistics

Crashes, casualties, region, local government area, degree of crash & degree of casualty

Local Government Area	Degree of crash ¹				Degree of casualty ²		
	F	I C	N	Total crashes	K	I	Total killed & injured
SOUTH-EASTERN REGION							
Bega Valley	2	77	73	152	2	109	111
Bombala	1	11	10	22	1	16	17
Boorowa	1	17	8	26	1	18	19
Cooma-Monaro	1	39	38	78	1	57	58
Crookwell	0	17	13	30	0	18	18
Eurobodalla	3	127	104	234	3	199	202
Goulburn City	0	50	53	103	0	62	62
Gunning	2	25	32	59	3	35	38
Harden	1	21	20	42	1	31	32
Mulwaree	7	78	76	161	8	123	131
Queanbeyan City	0	54	68	122	0	62	62
Snowy River	4	35	50	89	4	67	71
Tallaganda	1	37	58	96	1	62	63
Yarrowlumla	1	57	66	124	1	76	77
Yass	1	68	87	156	1	100	101
Young	2	27	18	47	2	38	40
TOTAL	27	740	774	1,541	29	1,073	1,102

1 F – Fatal crash I C – Injury crash N – Non-casualty crash.

2 K – Killed I – Injured.

Crashes, casualties, route, local government area, degree of crash and degree of casualty

Route/Local Government Area	Degree of crash ¹				Degree of casualty ²		
	F	I C	N	Total crashes	K	I	Total killed & injured
HUME (SH 2) (ASHFIELD to ALBURY)							
Ashfield	1	14	25	40	1	23	24
Burwood	0	12	11	23	0	16	16
Strathfield	0	25	24	49	0	38	38
Bankstown City	0	107	81	188	0	144	144
Fairfield City	1	14	27	42	1	19	20
Liverpool City	0	106	114	220	0	144	144
Campbelltown City	0	58	62	120	0	68	68
Wollondilly	0	16	29	45	0	18	18
Wingecambee	2	28	50	80	2	42	44
Mulwaree	3	20	42	65	4	40	44
Goulburn City	0	0	4	4	0	0	0
Gunning	0	8	8	16	0	9	9
Yass	0	13	36	49	0	19	19
Harden	1	6	6	13	1	7	8
Gundagai	0	15	18	33	0	23	23
Wagga Wagga City	0	6	11	17	0	7	7
Holbrook	1	9	11	21	1	15	16
Hume	0	5	7	12	0	6	6
Albury City	0	8	17	25	0	10	10
Sub-total	9	470	583	1,062	10	648	658

1 F – Fatal crash I C – Injury crash N – Non-casualty crash.

2 K – Killed I – Injured.

Appendix 2 – Photographic Plates



PLATE 1 – Illalong Road New Bridge at 3.13 km



PLATE 2 – Illalong Road New Bridge at 3.13 km



PLATE 3 – Primary Access Point to Marilba West from Illalong Road



PLATE 4 - Primary Access Point to Marilba West from Illalong Road



PLATE 5 – Secondary Access Point to Marilba West from Illalong Road



PLATE 6 - Secondary Access Point to Marilba West from Illalong Road



PLATE 7 – Access to switchyard Burrinjuck Road at 11.7 km



PLATE 8 - Access to switchyard Burrinjuck Road at 11.7 km